

Executive Summary

- 1 This is the annual report of the National Atmospheric Emission Inventory (NAEI), which forms part of the UK emissions inventory programme funded by Defra and the Devolved Administrations. This report is produced by AEA, who have been compiling the UK emissions inventory since 1972 (although under different company names through the years).
- 2 **UK air pollutants** - This report presents the latest estimates of emissions to the atmosphere from the UK for the period 1970 to 2006. There are 44 pollutant species included in the 2006 annual inventory including 10 pollutant groups [non-methane volatile organic compounds (NMVOC), Particulate Matter (PM), polychlorinated dibenzo-dioxins and furans (PCDD/F), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), hydrofluorocarbons (HFC), perfluorocarbons (PFC), short-chain chlorinated paraffins (SCCP), polychlorinated naphthalenes (PCN) and polybrominated diphenyl ethers (PBDE)]. Size fractionation is available for particulate matter and speciation is available for: 500 NMVOCs, oxidation states of Hg, Ni and Cr and 11 PAHs. The pollutants considered in this report are:

Air Quality Pollutants

- particulate matter, PM₁₀ *
- black smoke
- carbon monoxide, CO
- benzene, C₆H₆
- 1,3-butadiene, C₄H₆
- PAH * †
- nitrogen oxides, NO_x
- sulphur dioxide, SO₂
- non-methane volatile organic compounds, NMVOC *
- ammonia, NH₃
- hydrogen chloride, HCl
- hydrogen fluoride, HF

Persistent Organic Pollutants

- polycyclic aromatic hydrocarbons, PAH * †
- dioxins and furans, PCDD/F
- polychlorinated biphenyls, PCB
- pesticides:
 - lindane, hexachlorobenzene, pentachlorophenol
- short-chain chlorinated paraffins, SCCPs
- polychlorinated naphthalenes, PCNs
- polybrominated diphenyl ethers, PBDEs

Base Cations

- calcium, Ca
- magnesium, Mg
- sodium, Na
- potassium, K

Greenhouse Gases

- carbon dioxide, CO₂
- methane, CH₄
- nitrous oxide, N₂O
- hydrofluorocarbons, HFC
- perfluorocarbons, PFC
- sulphur hexafluoride, SF₆

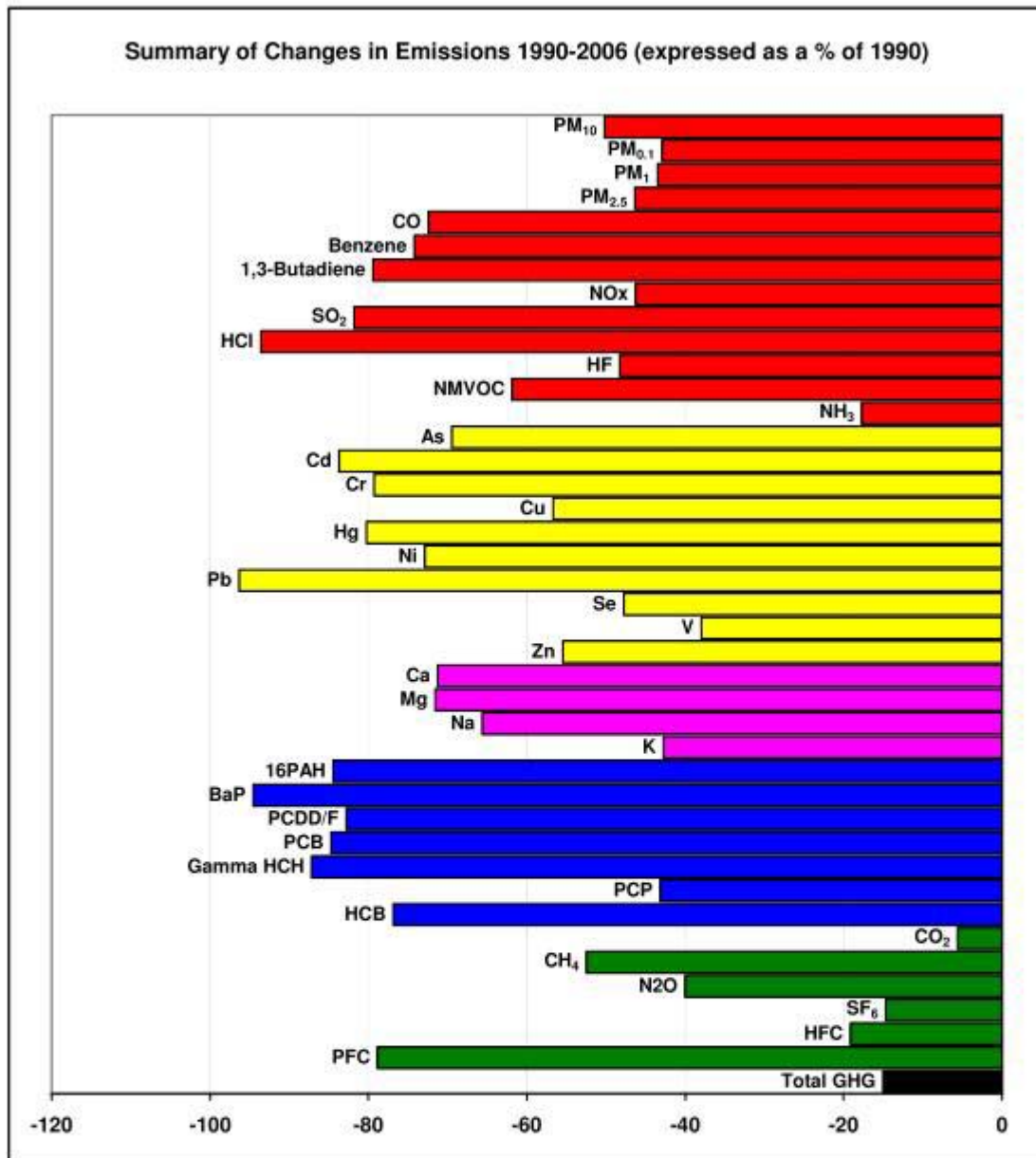
Heavy Metals

- arsenic, As
- beryllium, Be
- cadmium, Cd
- chromium, Cr *
- copper, Cu
- lead, Pb
- manganese, Mn
- mercury, Hg *
- nickel, Ni *
- tin, Sn
- selenium, Se
- vanadium, V
- zinc, Zn

* Pollutant emissions are given as a total emission and speciated emissions. Particulate matter emissions are given as PM₁₀, PM_{2.5}, PM_{1.0} and PM_{0.1}.

† Benzo[a]pyrene is included in the Air Quality Strategy, but appears in this report in the chapter on Persistent Organic Pollutants, as it is a PAH.

The change in emissions for these pollutants is summarised in the following plot. The change is given as the difference between the 1990 and 2006 emissions, expressed as a percentage of the 1990 values.



Emissions of all pollutants have decreased during this period.

- 3 **CO₂** – Emission estimates for CO₂ from the UK show a decrease of 6% between 1990 and 2006, giving an emission of 153 Mt of carbon in 2006. The most significant reductions arise from the public power and industrial combustion sectors. 2006 road transport emissions accounted for 21.6% of the total emissions.
- 4 **CH₄** - Estimates of methane emissions show a decrease of 53% from 1990 to 2006, giving emissions of 2.35 Mt in 2006. The largest sources are landfills, agriculture, natural gas

- distribution and coal mining. The reduction in emissions is largely due to the decline in the coal mining industry and increased levels of methane recovery on landfill sites.
- 5 **N₂O** - UK emissions of nitrous oxide were 0.123 Mt in 2006, corresponding to a decrease of 40% between 1990 and 2006. Emissions of nitrous oxide are dominated by those arising from the agricultural and passenger car sectors. Emission estimates of N₂O are highly uncertain (see Section 7.4).
- 6 **HFC, PFC and SF₆** - The UK emissions in 2006 were HFCs: 2.5 Mt of carbon equivalent, PFCs: 0.1 Mt of carbon equivalent and sulphur hexafluoride: 0.2 Mt of carbon equivalent. These correspond to reductions of 19%, 79% and 15% since 1990 for HFC, PFC and SF₆ respectively.
- 7 **PM** - The UK emissions of PM₁₀ declined by 50% between 1990 and 2006, giving an emission of 0.15 Mt in 2006. This reflects a trend away from coal use particularly by domestic users. Coal combustion in residential plants and road transport together contributed 31% of UK emissions of PM₁₀ in 2006. PM₁₀ emissions from road transport have shown a steady decline across recent years. Other PM size fractions are also included in this report. PM_{2.5} emissions have also fallen, but by a smaller amount, the largest source sector being road transport, accounting for 21% of the 2006 total emission.
- 8 **BS** - Black smoke emissions in the UK have significantly declined (by some 87% between 1970 and 2006). Emissions in 2006 were estimated to be 137 kt. These estimates are based on old measurement data and are hence very uncertain. They are included here for completeness only.
- 9 **CO** - Emissions in 2006 (2.3 Mt) represent a 72% reduction on the emissions in 1990. UK emissions of CO are dominated by those from road transport (43% of UK emissions in 2006). The change in emissions between 1990 and 2006 is dominated by the reduction in emissions from the road transport sector, caused by the increased use of three-way catalytic converters in cars.
- 10 **Benzene** - Emissions have decreased by 74% between 1990 and 2006, giving an emission of 14.4 kt in 2006. Fuel combustion in the residential sector is the most significant source of benzene, accounting for some 34% of UK emissions in 2006. The next most significant source is emissions from petrol fuelled passenger cars (15%). The decline in emissions over time is primarily due to a marked reduction in benzene emissions from road transport as a result of tighter European vehicle emission standards and fuel quality Directives being introduced.
- 11 **1,3-Butadiene** - Emissions in 2006 were estimated to be 2.5 kt, representing a decrease of 79% between 1990 and 2006. Emissions of 1,3-butadiene are dominated by fuel combustion in the road transport sector, which account for some 55% of the 2006 UK emissions. There have been significant reductions in the emissions from this sector due to the increase in the number of cars equipped with three-way catalytic converters.
- 12 **NO_x** - UK emissions of NO_x were approximately 3.0 Mt in 1990. Emissions have fallen significantly to around 1.6 Mt in 2006, representing a 46% reduction on the 1990 emissions estimate. This is primarily a consequence of: abatement measures in road transport, abatement measures in coal fired power stations and the increased use of other fuels for power generation. Together road transport and power stations contribute 57% of UK emissions in 2006.
- 13 **SO₂** - UK emissions of sulphur dioxide have fallen from 3.7 Mt in 1990 to 0.7 Mt in 2006, representing a decrease of 82%. This is a result of reduced emissions from the industrial and public power sectors arising from the decreasing use of high sulphur coal and increasing use of abatement equipment. Combustion of fuels in the power station, refining and manufacture of solid fuels sectors accounted for 65% of the 2006 UK SO₂ emissions.

- 14 **HCl** - UK emissions of hydrogen chloride have decreased by 94% between 1990 and 2006, giving an emission of 17 kt in 2006. This reduction is largely as a result of declining coal use.
- 15 **NM VOC** - UK emissions of NM VOC are estimated as 2.4Mt for 1990 and 0.91 Mt for 2006, thereby showing a decrease of 62%. The observed decrease arises primarily from tighter European vehicle emission standards and fuel quality directives being introduced and the impact of the Solvent emissions Directive.
- 16 **NH₃** - Total UK emissions of ammonia were estimated to be 0.31 Mt in 2006, compared to the 1990 estimate of 0.38 Mt, giving an 18% reduction. The agricultural sector accounted for 80% of ammonia emissions in 2006. There were increases in emissions from the road transport sector between 1990 and 2000, caused by the increased use of three-way catalytic converters. Improvements in these mean that emissions from the road transport sector are now declining. There have been decreases in the agricultural sector between 1990 and 2006 due to decreased agricultural livestock numbers.
- 17 **HF** - The total hydrogen fluoride emissions for 2006 are estimated to be 5.2 kt, representing a 48% reduction on the 1990 emission estimates. As with hydrogen chloride, the dominant source is coal combustion for public power contributing 67 % of emissions in 2006.
- 18 **POPs** - The 2006 UK emissions of persistent organic compounds may be summarised as follows: 1,209 t **PAH** (USEPA 16), 197 g I-TEQ **PCDD/F** (grams of "toxic equivalent" of dioxins & furans) and 1.00 t **PCB**. Emissions from all three of these pollutant groups have greatly decreased. Emissions in 2006 equate to decreases of 84%, 83% and 85% on the 1990 emissions, for PAHs, PCDD/Fs and PCBs respectively.
- 19 **Pb** - UK emissions of lead have declined sharply following the switch from leaded to unleaded and lead replacement petrol. Emissions in 2006 are estimated to be 0.11 kt, a decrease of 96% on the 1990 estimates. Road transport contributed only 2% of total UK emissions in 2006, compared to 74% in 1990.
- 20 The 2006 emission inventory indicates that the dominant sources of many of the air pollutants are from road transport and the use of coal (see table below).

Road Transport and Coal Combustion Contribution to Emissions of Selected Pollutants (2006)

Pollutant	Total Coal Combustion	Road Transport	Total Contribution
HCl	93%	0%	93%
HF	87%	0%	87%
16 PAHs	8%	62%	70%
Be	13%	53%	66%
SO ₂	61%	0%	61%
1,3-Butadiene	0%	55%	55%
NO _x	22%	32%	55%
CO	7%	43%	51%
Se	29%	21%	50%
Cu	7%	40%	47%
Carbon	25%	22%	46%
Mn	29%	7%	36%
Mg	35%	0%	35%
PM ₁₀	10%	21%	31%
Na	30%	0%	30%
Benzo[a]pyrene	15%	11%	26%
Benzene	2%	18%	20%
K	13%	0%	13%
Sn	10%	2%	12%
As	11%	0%	11%

It is therefore likely that future trends in emissions will be substantially determined by market demand and UK Government/devolved administration policies associated with these areas.

- 21 A copy of this report may be found at the NAEI web site (www.naei.org.uk) along with a facility for local interrogation of the data and links to data on emissions in other countries.

**ANNEX 2: Local Air Quality Management Technical Guidance
LAQM.TG(09)**

Local Air Quality Management Technical Guidance LAQM.TG(09), February 2009, Department for Environment, Food and Rural Affairs, 318pp

Examples of where the air quality objectives should and should not apply (Chapter 1, page 1-9)

Box 1.4: Examples of where the air quality objectives should/should not apply		
Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties ⁷ .	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

Verification of model results against monitoring data (taken from Annex 3, pages A3-44 to A3-51)

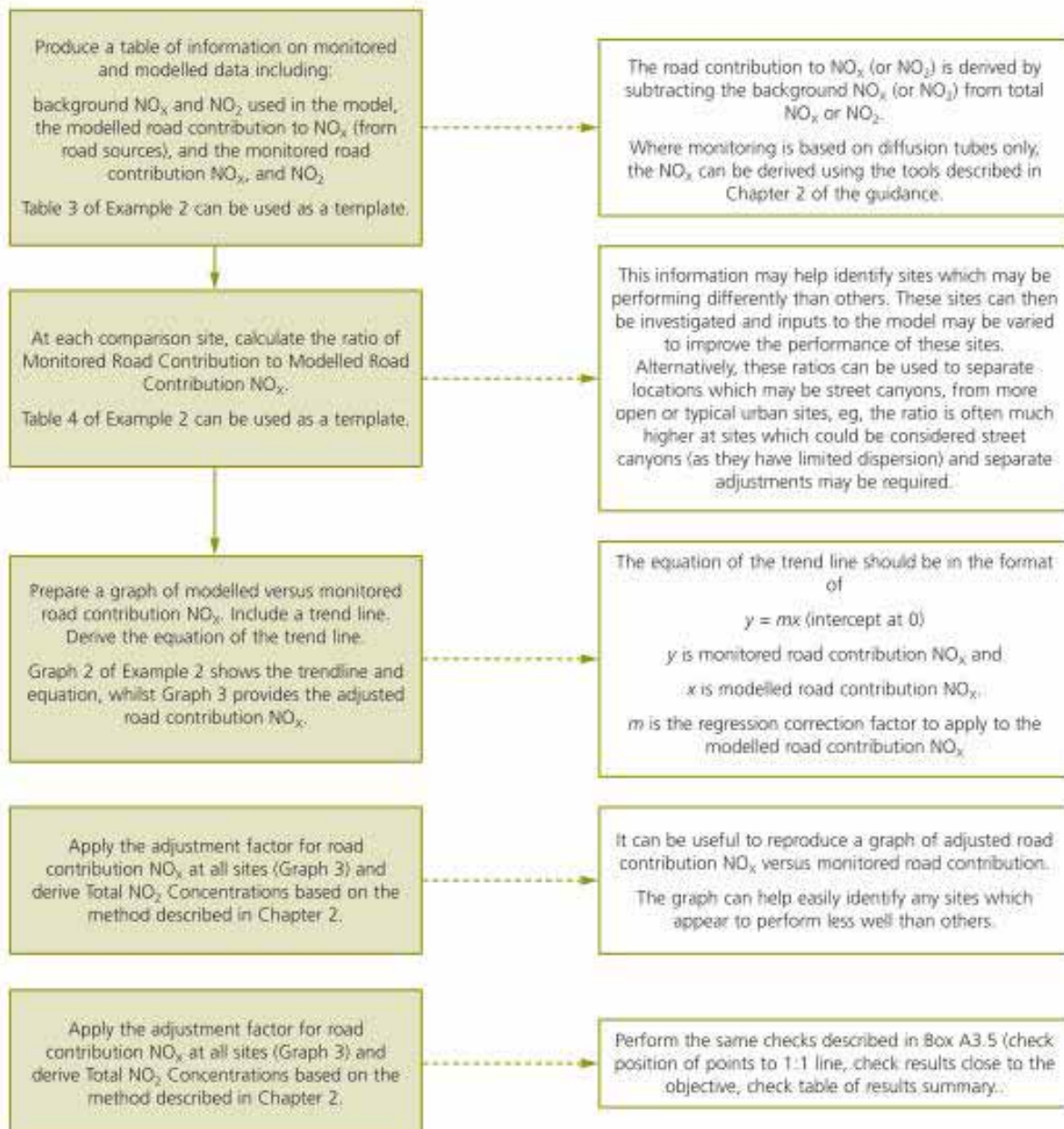
How do I verify and adjust my modelling?

- A3.243 The process of verifying and possible adjusting models can be a difficult process. Boxes A3.5 and A3.6 set out some of the common steps to be taken in order to assist local authorities in understanding if their modelling is appropriate (ie representative), and to help identify when adjustment of models may be required. This information is provided for NO_x/NO₂ of road traffic sources, but the same methods can be applied to PM₁₀ modelling. However, local authorities generally have much more limited PM₁₀ monitoring sites, and may only have one site. Therefore, care needs to be taken when applying model adjustment based on one monitoring site only as the adjustment may not be representative of other locations.
- A3.244 In the absence of any PM₁₀ data for verification, it may be appropriate to apply the road-NO_x adjustment to the modelled road-PM₁₀. If this identifies exceedences of the objective, then it would be appropriate to monitor PM₁₀ to confirm the findings.
- A3.245 When only road traffic sources have been modelled, the predicted concentration from the model, without any background, should be referred to as the "road source contribution". The road source contribution can be estimated for both monitored and modelled data by subtracting the background concentration from the total concentration. This may be for NO_x, NO₂ and PM₁₀.
- A3.246 As described above, there are a number of reasons why modelling and monitoring results differ. When modelling road traffic sources, errors are likely to apply to both the road source contribution and background contributions, however, it is common to apply the adjustment to the road source contribution. A number of examples of model verification of NO_x/NO₂ and adjustment based on the NO_x road contribution are also presented below in examples 1 to 3, whilst example 4 shows where background modelling has also been adjusted. The examples are:
- Example 1 No model adjustment is necessary
 - Example 2 Diffusion tubes are used to adjust the NO_x road contribution
 - Example 3 Continuous monitoring data are used, and different adjustments
 - Example 4 Adjustment of both background and road contribution NO_x.
- A3.247 When model adjustment is undertaken this should be based on NO_x and not NO₂. Where diffusion tubes are used in the calculation of the model adjustment, NO_x will need to be derived from NO₂. A tool for this purpose is provided at www.airquality.co.uk/archive/laqm/tools.php.
- A3.248 Local authorities are reminded that adjustment of modelling should not be based on the total NO_x (or NO₂) concentrations unless the adjustment is very small (for example within 5%). This is because any adjustment of the total concentration would also be applied to the background contribution. In many cases background is based on national maps or local monitoring, adjustment of this component could result in unrepresentative estimates of the background concentrations across the area. Such adjustment could result in unrealistic estimates of different source contributions and may affect the outcome of source apportionment studies undertaken as part of further assessments and action plans.
- A3.249 It is important to remember that a number of assumptions are made when undertaking model adjustment and it should be recognised that any adjustment carried out is a reflection of the specific scenario modelling and the availability and quality of input data and monitoring data.
- A3.250 Local authorities are encouraged to contact the Local Authority Air Quality Support Helpdesk for advice and assistance during the verification process.

Box A3.6: Comparison of road nitrogen oxides contributions followed by adjustment

The recommended method for converting NO_x to NO₂ and vice versa is described in Chapter 2. The modelled NO_x must be verified (which may include adjustment) before they are used within empirical equations or models.
The adjustment of NO₂ is often carried out on the component derived from local Road Traffic emissions – the Road Contribution.

If continuous monitoring is included within the model verification, then it is recommended that you check that the method used for converting NO_x to NO₂ applies at the monitoring site. Where the monitored NO₂ differs significantly from that derived using the conversion method, users may find additional adjustment is required as part of the model verification in order to correct for these differences.



In this example, results based on the modelled NO₂ taken from the dispersion model are clearly under-predicting at all sites. At the majority of sites the difference between modelled and monitoring concentrations is greater than 25%. The local authority would be unable to base any decisions related to LAQM on these results and needs to investigate the modelled results further as described in Box A3.5. No further improvement of the modelled results could be obtained on this occasion and the local authority must adjust the model.

Local monitoring data suggest that the background assumptions used are suitable, and the adjustment of the model is based on the road source contribution of NO_x as described in Box A3.6.

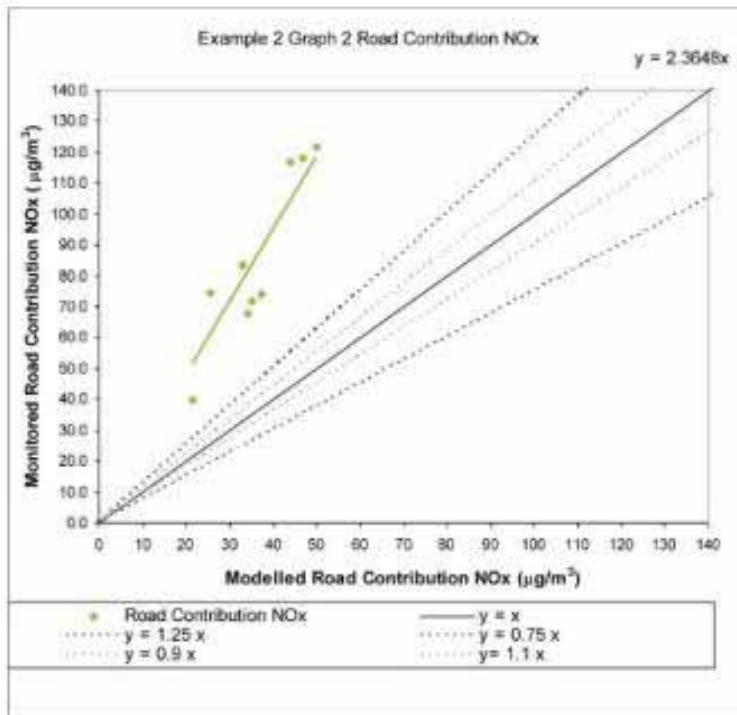
Example 2 Table 3 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x. Example 2 Graph 2 provides a comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x, and the equation of the trendline based on linear regression through 0. As this example uses diffusion tubes only, the Total Monitored NO_x concentration has been derived by back calculating NO_x from the NO_x/NO₂ relationship.

Example 2 Table 3

Site ID	Monitored total NO ₂	Monitored total NO _x	Background NO ₂	Background NO _x	Monitored road contribution NO ₂ (total - background)	Monitored road contribution NO _x (total - background)	Modelled road contribution NO _x (excludes background)
1	50.7	146.2	18.3	24.6	32.4	121.6	50.0
2	40.2	98.9	18.3	24.6	21.9	74.3	25.6
3	50.0	142.8	18.3	24.6	31.7	118.2	46.7
4	31.2	64.2	18.3	24.6	12.9	39.6	21.6
5	40.1	98.5	18.3	24.6	21.8	73.9	37.2
6	42.3	107.8	18.3	24.6	24.0	83.2	33.0
7	49.7	141.4	18.3	24.6	31.4	116.8	44.1
8	38.6	92.4	18.3	24.6	20.3	67.8	34.1
9	39.6	96.4	18.3	24.6	21.3	71.8	35.2

Example 2 Table 4

Site ID	Ratio of monitored road Contribution NO _x /modelled road contribution NO _x	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NO _x	Adjusted modelled total NO _x (incl. background NO _x)	Modelled total NO ₂ (based on empirical NO _x /NO ₂ relationship)	Monitored total NO ₂	% Difference [(modelled - monitored)/monitored] x100
1	2.43	See Example 2 Graph 2	118.2	142.8	50.0	50.7	-1
2	2.90		60.6	85.2	36.8	40.2	-8
3	2.53		110.4	135.0	48.3	50.0	-3
4	1.83		51.1	75.7	34.3	31.2	10
5	1.99		87.9	112.5	43.4	40.1	8
6	2.52		78.0	102.6	41.1	42.3	-3
7	2.65		104.2	128.8	47.0	49.7	-5
8	1.99		80.7	105.3	41.7	38.6	8
9	2.04		83.2	107.8	42.3	39.6	7
		2.365					



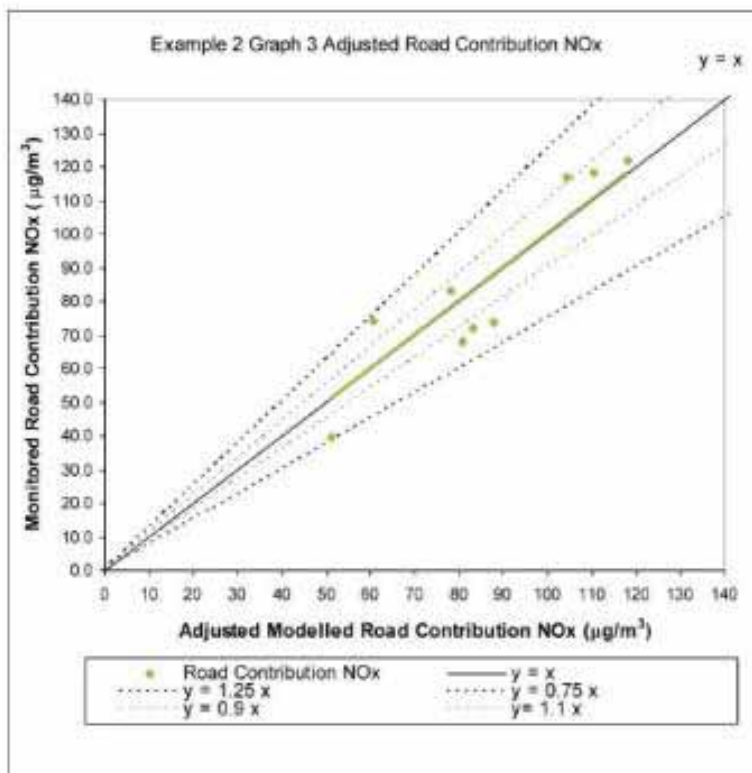
The Ratio of Monitored and Modelled Road Contribution NO_x at each location is also provided in Table 4. The ratios at all sites are similar indicating that the model is performing similarly at all of these sites, but there is some variability of the ratio.

Site location information indicates that all of the sites are in an urban area with an A road. In this case, using these individual ratios does not suggest that any sites need to be separated and adjusted based on different factors.

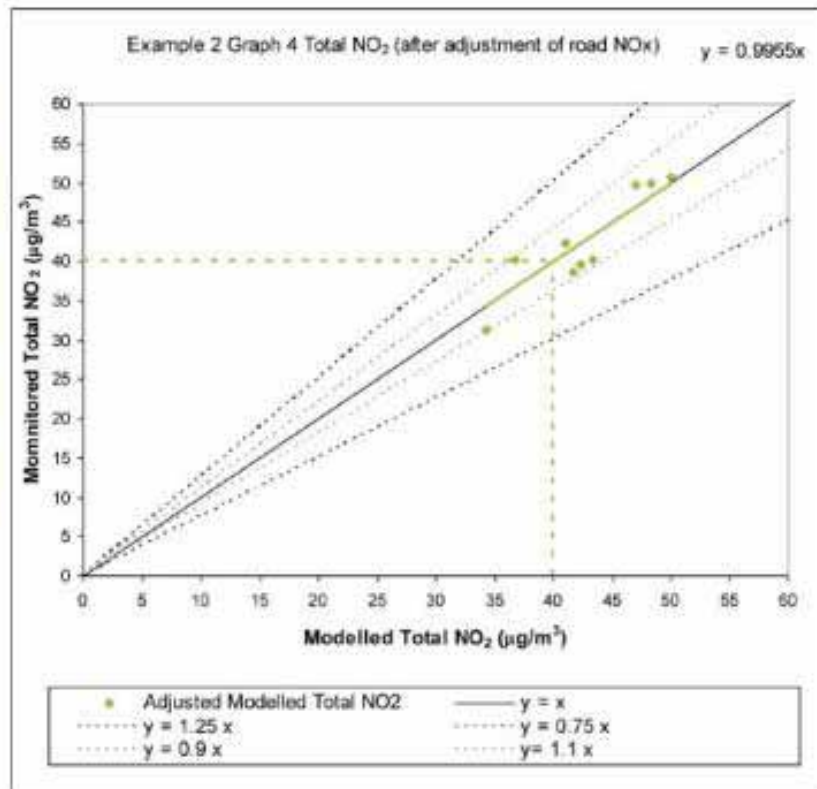
The equation of the trend line from Graph 2 is used to adjusted the Modelled Road Contribution NO_x at all sites and results compared in Graph 3.

The next step is to add background NO_x to the Adjusted Modelled Road Contribution NO_x and then convert to NO₂.

A comparison of Adjusted Modelled Total NO₂ versus Monitored Total NO₂ is repeated as shown in Graph 4 and Table 5.



Example 2: Summary table 5	
Within +10%	3
Within -10%	5
Within +/-10%	8
Within +10 to 25%	1
Within -10 to 25%	0
Within +/-10 to 25%	1
Over +25%	0
Under -25%	0
Greater +/-25%	0
Within +/-25%	9



A comparison of Adjusted Modelled Total NO₂ and Monitored Total NO₂ suggests that the adjusted model is performing well at all locations. The difference between modelled and monitored are all within 25% of each other (in this case all but one site is within 10%).

It must be remembered that in this case the NO_x / NO₂ relationship has been used when determining the Adjustment factor for the model and therefore a good comparison of modelled and monitored results would normally be expected. As described in Table 4 the ratio of Monitored Road Contribution NO_x and Modelled Road Contribution NO_x is similar at all verification sites, where these individual ratios vary considerably, then the overall performance of the final comparison would show greater differences.

Importantly, the adjusted model is showing no overall tendency to over or under-predict at sites close to or above the objective. Graph 4 shows the modelled total NO₂ versus Monitored Total NO₂ concentrations, and a linear regression line (through zero) has been derived. The equation of this line is close to 1 but this is expected as NO_x / NO₂ relationship has formed part of the verification and adjustment calculations in this case.

Background Pollutant Concentrations (taken from Chapter 2, pages 2-1 to 2-3)

CHAPTER 2: Tools and supporting information

Introduction

- 2.01 This chapter brings together a series of tools and other supporting information to help local authorities carry out their Review and Assessments. Where appropriate, the general approach and methodology is described, and the user is then referred to a website where more detailed information and spreadsheet tables or tools can be accessed. This allows information to be updated as and when necessary. Local authorities are encouraged to check that the latest versions of tables and tools are always used; this can be most easily achieved by registering for automatic updates with the Helpdesks (see Para 1.15).

Background pollutant concentrations

- 2.02 Emissions from local pollutant sources (such as roads, chimney-stacks etc) will be added to local background concentrations. In many situations the background contribution may represent a significant or dominant proportion of the total pollutant concentration, and it is thus important that authorities give careful consideration to background levels and how they are estimated for future years.
- 2.03 Background concentrations are expected to decline in future years as a result of Government and EU policies and legislation to reduce pollutant emissions¹¹. Where appropriate, specific advice on how to treat background concentrations is given in subsequent chapters. In many instances it is recommended that use is made of the national background maps, which are provided for each 1x1 km grid square across the UK. Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality. If the local background is derived from area-wide (regional) modelling, then the results should be validated against background monitoring sites and/or compared with the national maps.
- 2.04 For 1,3-butadiene, benzene, carbon monoxide (CO) and sulphur dioxide (SO₂), the background maps derived from a 2001 base year remain unchanged. These maps and a future year calculator may be accessed from the Internet¹².
- 2.05 For Nitrogen oxides (NO_x), nitrogen dioxide (NO₂) and particulate matter below 10 µm diameter (PM₁₀), new background maps have been prepared for this Guidance, derived from a 2006 base year, and are provided for all years up to 2020. An important change to the way in which these new background maps are provided means that it is now much simpler to avoid the problem of "double-counting", for example, where a very busy road passes through a grid square in a rural or suburban area. The various source contributions to the estimated background concentration in each 1x1 km grid square are now provided, such that it is possible to remove those sources that are explicitly modelled. The contributions from emissions inventory sources are provided separately for the sources within the 1 km x 1 km grid square and sources outside the 1 km x 1 km grid square.

This is to enable individual sectors to be subtracted from the total if a more detailed local assessment is to be carried out for that sector. Sector maps are not available for NO₂ (as it would not be feasible to produce them) but the projections of future year NO₂ do take account of the expected changes in the proportion of primary NO₂ emissions ("f-NO₂").

2.06 The sector contributions for NO_x in the background maps include:

- Motorways;
- A-roads (trunk and primary separately);
- Minor roads;
- Industry (point sources, combustion, energy production, fossil fuel extraction and waste);
- Domestic, institutional and commercial space heating;
- Aircraft;
- Rail;
- Other (shipping, minor roads and cold starts, off-road, rail and other emissions);
- Regional rural contribution.

2.07 The sector contributions for PM₁₀ in the background maps include:

- Motorways;
- A-roads (trunk and primary separately);
- Minor roads;
- Brake and tyre wear emissions from road traffic;
- Industry (point sources, agriculture, combustion, construction, energy production, fossil fuel extraction, industrial installations, quarries, solvents and waste);
- Domestic, institutional and commercial space heating;
- Rail;
- Secondary PM (organic and inorganic);
- Sea salt, regional primary PM and residual non-characterised sources;
- Other (aircraft, shipping, minor roads and cold starts, off-road, rail and other emissions).

2.08 The majority of these contributions are split into sources within the 1 km x 1 km grid square, designated "in" in the spreadsheets, and sources outside the 1 km x 1 km grid square, designated "out" in the spreadsheets. This makes it easier to avoid double counting of sources being explicitly modelled within the grid square, while retaining those source outside the grid square that are not being explicitly modelled.

2.09 The background maps can be accessed from the internet¹³.

Future year projections

2.10 In many cases, local authorities will need to consider background concentrations in different years, or project forwards data collected from monitoring campaigns. A number of different approaches are now used.

- 2.11 The approach for 1,3-butadiene, benzene, CO, lead and SO₂ remains unchanged, and authorities are advised to use the Year Adjustment Calculator spreadsheet available from the internet¹⁴.
- 2.12 For background NO_x, NO₂ and PM₁₀, there is no need to apply adjustment factors to the mapped data as was the case previously, as a separate map is now provided for each year. To adjust monitoring data from background locations, the year adjustment factors appropriate to any 1x1 km grid square can be simply calculated by comparing the maps for the two years in question. For example, if an authority wishes to project forwards a background measured concentration of NO₂ in 2008 to 2010, the appropriate factor would be the ratio between the 2010 and 2008 mapped concentrations for the appropriate grid square.
- 2.13 This approach cannot be used to adjust measured roadside NO₂ concentrations, due to the differing proportions of primary NO₂ emissions assumed in each year. Year adjustment factors for roadside NO₂ concentrations have been calculated, with different factors for London (Central, Inner and Outer) and the rest of the UK. The factors have been calculated as the average of modelled concentrations across approximately 1900 road links in London, and 7000 links elsewhere, taking into account the changes in traffic activity, and emission factors for NO_x and primary NO₂ (f-NO₂). The appropriate factors and an example of the approach are set out in Box 2.1.
- 2.14 Future year adjustment factors for measured roadside PM₁₀ also need a different approach, as set out in Box 2.2.

ANNEX 3: Guidance on Running the DMRB Screening Model

Guidance on Running the DMRB Screening Model, April 2009, Department for Environment, Food and Rural Affairs, 3pp

Accessed from internet, 20th May 2009, on

http://www.uwe.ac.uk/agm/review/mfaqfiles/DMRB_text_150409.pdf

FAQ: **Guidance on Running the DMRB Screening Model**

Introduction

1.01 The screening assessment for road traffic sources may be carried out using the screening model which has been prepared for the Design Manual for Roads and Bridges (DMRB) and has been published by the Highways Agency. A suitable version of the DMRB Screening Model (v1.03c) is available in Excel spreadsheet form and can be downloaded from the following link: [Click here to download the DMRB model](#)¹.

1.02 The DMRB screening model can be run to predict pollutant concentrations at receptor locations near to roads. It can be used to predict annual mean concentrations of nitrogen dioxide (NO₂) and PM₁₀, as well as oxides of nitrogen (NO_x), carbon monoxide, benzene and 1,3-butadiene. It also predicts the number of exceedences of 50 µg/m³ as a 24-hour mean PM₁₀ concentration. The model requires input data on annual average daily traffic flow (AADT), annual average speeds, the proportion of different vehicle types, the type of road, and the distance from the centre of the road to the receptor. Annex D, on page 64 of the DMRB guidance document gives instructions on how to run the model. [Click here to download the DMRB guidance document](#)².

1.03 The user is also required to input the background concentrations for the relevant year. Maps of background concentrations are available here: [Click here to download background concentrations](#)³.

Relevant Locations

1.04 Authorities are reminded that for the review and assessment of the annual mean and 24-hour mean objective, predictions should be carried out at relevant roadside locations. Further guidance of which locations will be relevant is given in Box 1.4 of LAQM TG(09).

Verification

1.05 The DMRB Screening Model is not always 'conservative'. It is therefore important to verify the results from the DMRB model against local

¹ Or paste the following text into your internet address bar:
[http://www.highways.gov.uk/business/documents/DMRB_Screening_Method_V1.03c__\(12-07-07\)_locked.zip](http://www.highways.gov.uk/business/documents/DMRB_Screening_Method_V1.03c__(12-07-07)_locked.zip)

² Or paste the following text into your internet address bar:
<http://www.standardsforhighways.co.uk/dmr/vol11/section3/ha20707.pdf>

³ Or paste the following text into your internet address bar:
<http://www.airquality.co.uk/archive/laqm/tools.php>

monitoring data. Further information about model verification is available in Annex 3 of LAQM TG(09).

Conversion of NO_x to NO₂

1.06 The method to convert roadside NO_x to NO₂ within the DMRB model was based on measurements made between 1999 and 2001. Recent evidence shows that the proportion of primary NO₂ in vehicle exhaust has increased⁴. This means that the relationship between NO_x and NO₂ at the roadside has changed from that currently used in the DMRB model.

1.07 A new NO_x to NO₂ calculator, is available as a spreadsheet. [Click here to download the NO_x to NO₂ calculator](#)⁵. The calculator applies to all road types and can also be used to estimate roadside NO_x from roadside NO₂ measurements.

1.08 Use of the DMRB model should now be adapted to use the new calculator. The way to do this is described in Box 1.

Box 1: Instructions for taking account of recent changes in NO₂/NO_x ratios using the DMRB Screening Model (v1.03c).

Step 1: Run the DMRB model as usual, but enter a value of zero as the background for both NO_x and NO₂.

Step 2: Take the NO_x concentration predicted by the DMRB model and paste it into the "Road increment NO_x" column of the NO_x to NO₂ calculator (see paragraph 1.07) (the background is added at this stage).

Step 3: Run the NO_x to NO₂ calculator to calculate total-NO₂.

Street Canyons

1.09 DMRB model validation work carried out by the Highways Agency has indicated that the model may significantly underpredict concentrations of nitrogen dioxide alongside urban city-centre roads classified as 'street canyons'. In this context, a street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. To avoid missing potential exceedences of the objective in such locations, the guidance given in Box 2 should be followed. Locations where this approach has been used should be clearly identified in the review and assessment report.

⁴ For additional information on this topic, see:
<http://www.defra.gov.uk/environment/airquality/publications/primaryno2-trends/pdf/primary-no-trends.pdf>

⁵ Or paste the following text into your internet address bar:
<http://www.airquality.co.uk/archive/laqm/tools.php>

Short-term objective for NO₂

1.10 If the annual mean objectives are not exceeded, the authority may confidently assume that the short-term (1-hour) objectives will also be met. However, if this approach is used, then care must be taken to include relevant locations where the hourly objectives might apply (see Box 1.4 of LAQM TG(09)). If the annual mean nitrogen dioxide concentration is greater than 60 µg/m³, then there is a risk that the 1-hour objective may also be exceeded.

Box 2: Instructions for taking account of street canyons using the DMRB Screening Model (v1.03c).

Step 1: Run the DMRB model and follow the instructions in Box 1. Record the road-NO₂ and **NOT** the total-NO₂ from the NO_x to NO₂ calculator.

Step 2: Multiply the Road-NO₂ by a factor of 2.

Step 3: Add this value onto the background-NO₂ (that was entered into the NO_x to NO₂ calculator) to give the "in-canyon total-NO₂".

Locations where this approach has been used should be clearly identified in the review and assessment report

**ANNEX 4: Detailed Assessment for Nitrogen Dioxide, 2008 and
Review and Assessment Progress Report, 2008**

**Detailed Assessment for Nitrogen Dioxide, 2008 and Review and Assessment
Progress Report, 2008, Teignbridge District Council, 2008, 46pp**

AQMA maps (page 2)

Figure 1: AQMA(s) at Newton Abbot Town Centre and south along the A380 through Kingskerswell.

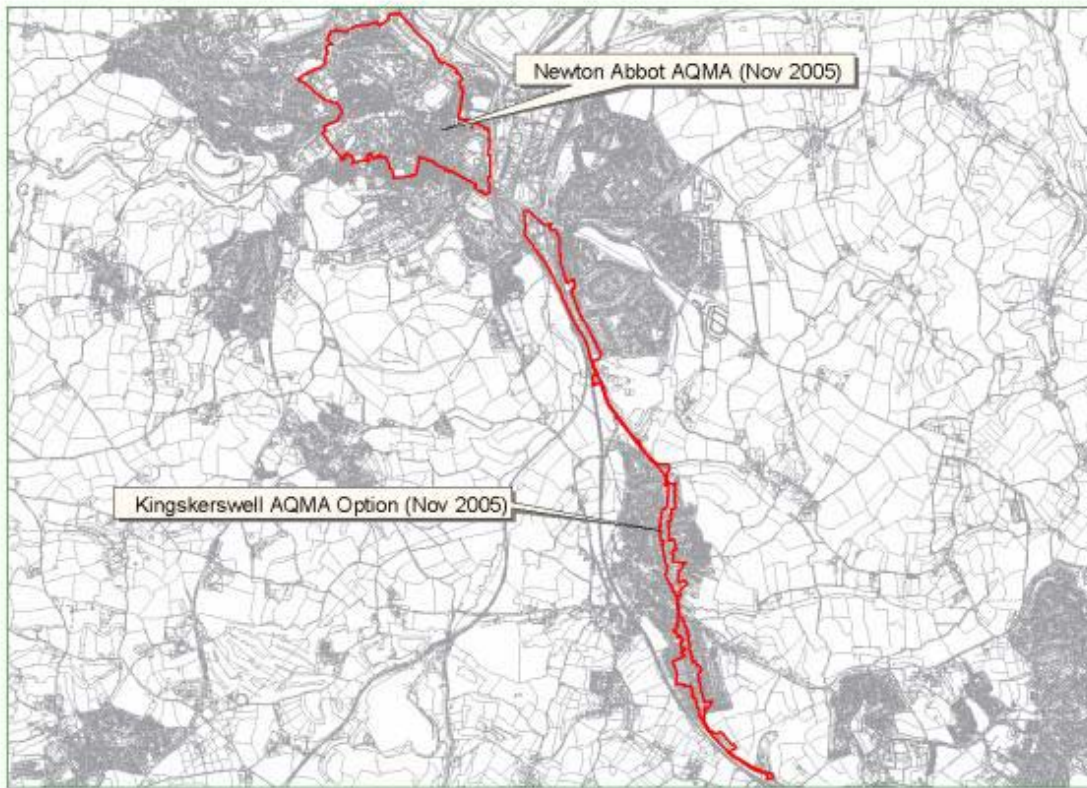


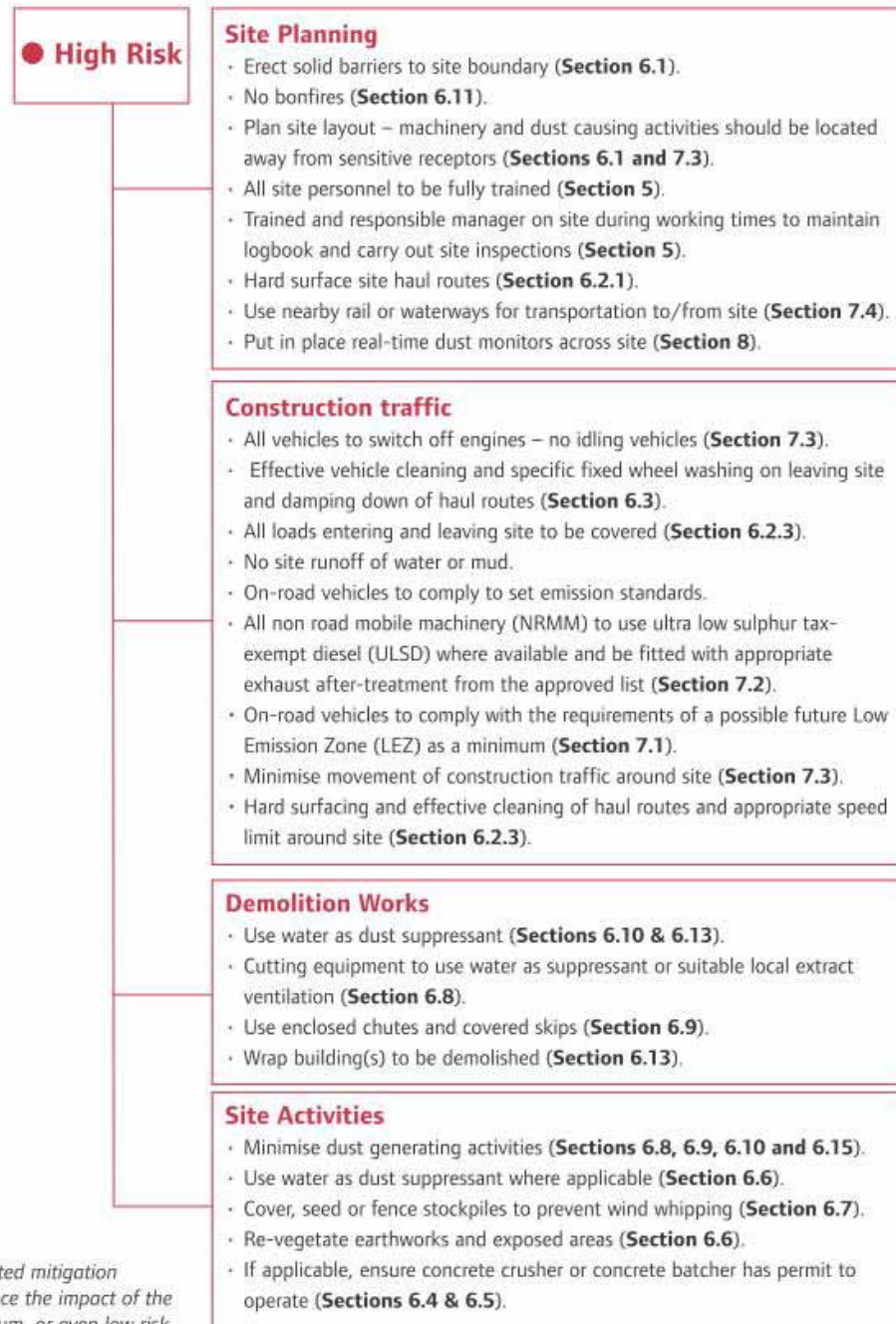
Figure 2: AQMA along Bitton Park Road, Teignmouth.



ANNEX 5: The control of dust and emissions from construction and demolition. Best Practice Guidance

The control of dust and emissions from construction and demolition. Best Practice Guidance, November 2006, London Councils and the Greater London Authority, 68pp

Mitigation measures for high risk sites (page 14)



Monitoring at high risk sites (pages 31-33)

8 Site monitoring

8.1 Site monitoring protocols

If best practicable means identified in **Sections 6 and 7** are followed correctly, then formation of dust and harmful emissions from construction sites should be minimised as much as possible. However, continuous site monitoring is still an important way of helping developers manage dust and PM₁₀ emissions from construction and demolition. The location of a construction site could impact on a local area to the extent where air quality is worsened within an existing air quality management area (AQMA) or is worsened to the extent where an AQMA needs to be declared by the relevant local authority.

This section specifies air quality monitoring protocols that should be followed according to the identified risk of the site. More information on the available measurement devices is included in **Appendix 5**. Monitoring of air pollution from all demolition and construction sites should be undertaken. This will vary from visual assessments for low risk sites to the installation of real time automatic monitors for PM₁₀ for high risk sites. On certain sites it may be appropriate to determine the baseline situation before construction begins. The local planning authority (LPA) will provide advice on the appropriate air quality monitoring procedure and timescale - the requirements of which will be determined on a case by case basis.

Where the LPA requires automatic real-time air quality monitoring to be carried out by the developer, two frequently used procedures are:

- monitoring along a transect (straight line) across the construction site, set up in the direction of the prevailing wind. This will allow the developer to take into account background levels to determine the relative contribution of air quality and dust emissions from the construction site. Prior monitoring of background air quality may not be needed in this case
- monitoring to take place close to sensitive receptors to assess any impact at these locations.

● Low Risk

- Employ best practice methods at all times.
- Take into account the impact of air quality and dust on occupational exposure standards to minimise worker exposure and breaches of air quality objectives that may occur outside the site boundary, such as by visual assessment.
- Keep an accurate log of complaints from the public.

● **Medium Risk**

- As for low risk sites.
- Determine the prevailing wind direction across the site using data from a nearby weather station. Permanent weather stations are only operated at few locations in and around London. Ideally a minimum of 12 months data should be used.
- If measuring along a transect:
 - Set up a transect across the site according to the direction of the prevailing wind.
 - Operate a minimum of two automatic particulate monitors to measure PM₁₀ levels at either end of the transect - either inside or outside the site boundary. These instruments should provide data that can be downloaded in real-time by the local authority.
- If monitoring at sensitive receptors:
 - Identify which location(s) need to be monitored and set up an automatic particulate monitor at each of these to measure representative PM₁₀ levels. These instruments should provide data that can be downloaded in real-time by the local authority.
- If relevant, supplement monitoring with hand held monitors to get on the spot readings at selected points, such as close to sensitive receptors.
- Consider also monitoring dust deposition and soiling rates as these can be used to indicate nuisance (**see Appendix 4**).

● **High Risk**

- As for medium risk sites.
- Set a site action level see **Section 8.2**.
- Determine prevailing wind direction, as for medium risk sites, or by setting up a weather station on site to measure local wind direction and speed.
- If measuring along a transect:
 - Set up a transect across the site according to the direction of the prevailing wind.
 - Operate a minimum of two automatic particulate monitors to measure PM₁₀ levels at either end of the transect - either inside or outside the site boundary. These instruments should provide data that can be downloaded in real-time by the local authority.
- The LPA may also require monitoring at sensitive receptors, if this is the case:
 - Identify which location(s) need to be monitored and set up an automatic particulate monitor at each of these to measure representative PM₁₀ levels. These instruments should provide data that can be downloaded in real-time by the local authority.

- If applicable, supplement with low cost automatic monitors or hand-held monitors, particularly focusing on any sensitive locations such as schools.
- Carry out dust deposition and soiling rate assessments following recommended procedures (see **Appendix 4**).
- Carry out a visual inspection of site activities, dust controls and site conditions and record in a daily dust log.
- Identify a responsible person on-site for dust monitoring who can access real-time PM₁₀ data from automatic monitors (e.g., at hourly or 15 minute intervals). Ensure that adequate quality assurance/quality control is in place.
- Agree a procedure to notify the local authority, so that immediate and appropriate measures can be put in place to rectify any problem. Alert mechanisms could include email, texts or alarm systems.
- Set up 24-hour phone hotlines so that residents can complain about high dust or PM₁₀ levels directly to the developer. Consider circulating summaries of monitoring results to the local community.

APPENDIX AQ 2 DISPERSION MODEL SET UP

Detailed Air Quality Modelling of Nitrogen Dioxide

- Detailed air quality modelling has been undertaken within the study area, using the CAL3QHCR dispersion model.
- The pollutant of primary concern is nitrogen dioxide. Therefore, detailed modelling has been undertaken for the Baseline (2008), and Do Minimum and Scheme scenarios in the opening year (2013) and the design year (2028). The Alliance Option has also been modelled in the opening year (2013) and the design year (2028).
- The methodology and input parameters used for the detailed modelling were:
 - All roads within the study area were digitised from the centreline data provided by OS maps and, where appropriate, the Scheme drawings.
 - Vehicle emissions on each road link were calculated using the latest emissions and vehicle profiles, provided by the National Atmospheric Emissions Inventory website (NAEI) as a function of year. The NAEI provides emission factors to 2025 only and, therefore, this assessment has assumed that the 2025 factors are applicable to 2028.
 - Traffic data were provided by PB traffic engineers, as annual average data and as mean hourly flows during the day, categorised by 4 periods of the day
 - AM Peak (0700 – 0859),
 - Interpeak (0900 – 1559)
 - PM Peak (1600 – 1759) and
 - Offpeak (1800 – 0659).
 - The data provided for each time period comprised
 - Total traffic flow
 - Fleet mix (as % Heavy Duty Vehicles)
 - Speed
 - Queue Length

- Traffic data were provided for 2008, 2013 and 2028. In the future years (2013 and 2028), traffic data were provided for the Do Minimum scenario, the Published Scheme scenario and the Alliance Option scenario.
- Annual mean nitrogen dioxide concentration was calculated, for all scenarios, at the facades of the sensitive (residential) receptors detailed in Table 3 in Volume 2 of this Proof. All receptors (gridded and discrete receptors) were set to 1.5 m above ground, a typical respiration height.
- For the opening year Do Minimum and Published Scheme scenarios, pollutant concentrations were also calculated on a Cartesian grid covering the study area. The grid resolution was determined by distance from the nearest road link as follows:-
 - Less than 160 m from nearest link = 10 m resolution,
 - Between 160 m and 300 m = 20 m resolution,
 - Between 300 m and 500 m = 60 m resolution; and
 - Greater than 500 m = 120 m resolution
- The effects of queued traffic on emissions have been included in the modelling. The speed of traffic within the queue is set to 5kph. Queuing is only assumed for the AM, Inter and PM peak periods.
- Meteorological data from Exeter Airport for 2008 have been used in the modelling. The wind rose for Exeter is shown in Diagram AQ A2-1. Winds from the south and north-westerly quadrants are dominant, with winds from the easterly sector occurring infrequently. Meteorological data is also gathered at Brixham, situated closer to Kingskerswell than Exeter. However, the wind climate at this location is dominated by the effects of its coastal location, with moderate to strong westerly to south-westerly winds predominating. Exeter wind data is considered to better represent conditions likely to be experienced inland at Kingskerswell. There is only ad-hoc measurement of cloud data at

Exeter and, therefore, Exeter wind and temperature data has been merged with cloud data collected at Brixham for the purposes of the dispersion modelling. The merging of meteorological datasets is considered acceptable practice for dispersion modelling..

- Background pollutant concentrations for nitrogen oxides were taken from the National Air Quality Information Archive mapped data, with the major roads sectors removed, for the relevant years. The 1km x 1km mapped averages were linearly interpolated to the 10m resolution of the dispersion model output and to the individual receptor locations. The interpolated data are shown in **Figure AQ 4**.
- The National Atmospheric Emissions Inventory provides vehicle emissions factors for nitrogen oxides. For comparison with the air quality objectives, the conversion of nitrogen oxide (NO_x) to nitrogen dioxide (NO₂) must be taken into account. The modelled NO_x concentrations were converted to NO₂ using the updated methodology and calculator (**Appendix AQ 1, Annex 3**) for computing roadside and total nitrogen dioxide. The calculator provides data to 2025 only and the 2025 data have been assumed to be applicable to 2028. In using the calculator, Teignbridge has been selected as the relevant local authority and the fraction of nitrogen oxides emitted as primary nitrogen dioxide has been based on the default parameters for “All other non-urban traffic”, where ‘other’ refers to outside London.
- The model results for the baseline year in the detailed modelling were verified against monitored data. All results in the report are presented as verified data. The verification methodology is provided in Appendix AQ 3.
- In the Kingskerswell Alliance Option, a tunnel is required under Penn Inn roundabout. This has been modelled using the following assumptions. Emissions from the southbound travelling traffic within the tunnel are emitted from the southern exit of the tunnel and dispersed along the southbound carriageway for 100metres by the

vehicle induced turbulence before dispersing under the action of ambient turbulence. Similarly, emissions from northbound travelling traffic within the tunnel are emitted from the northern exit of the tunnel and dispersed along the northbound carriageway for 100metres before dispersing in ambient air.

DMRB Screening Method

- The Screening Method was used to assess concentrations of nitrogen dioxide outside the detailed modelling study area, and concentrations of other pollutants at all receptors. The assessment years were 2008, 2013 and 2028, as for the detailed modelling.
- The method provides an initial test that is designed to establish whether a road scheme ought to be subjected to a more detailed air quality assessment. The most recent version of this spreadsheet, version 1.03c, was released in July 2007, and used in this assessment.
- Version 1.03c of the DMRB Screening Method is based on measurements of roadside pollutant concentrations made between 1999 and 2001. The increasing proportion of primary nitrogen dioxide emissions from road traffic, notably diesel engines and the use of catalytically regenerative particle traps on heavy duty vehicles, implies that the DMRB model relationship between nitrogen oxide and nitrogen dioxide is no longer appropriate. In April 2009, revised advice (**Appendix AQ 1, Annex 3**) on the use of the DMRB Screening Method was issued on behalf of Defra by their local air quality management helpdesk, and a calculator provided to adapt the use of the DMRB Screening Method for nitrogen dioxide prediction (available from <http://www.airquality.co.uk/archive/laqm/tools.php>).
- The methodology and input parameters used for the DMRB modelling were:
 - For each receptor, the method requires the input of distances from receptors to the centreline of relevant road links, traffic data of the road links and the background pollutant concentrations

- Relevant road links are defined as those within 200m of a receptor.
- The traffic data is input as annual averaged daily traffic, speeds and fleet mix (defined as the percentage of heavy and light duty vehicles)
- The DMRB screening method provides vehicle emissions factors to 2025 only. Therefore, the 2025 data were assumed applicable to 2028.
- Background pollutant concentrations for nitrogen oxides and particulate matter, PM₁₀, were taken from the National Air Quality Information Archive mapped data, with the major roads sectors removed, for the relevant years. The 1km x 1km mapped averages were linearly interpolated to the individual receptor locations. The interpolated data are shown in Figure AQ 4 and AQ 6 for nitrogen oxides and particulate matter respectively. Background concentrations of carbon monoxide, benzene and butadiene were taken to be represented by the spatial average of concentrations within the study area, factored to the relevant years using the LAQM TG(09) methodology.
- The model results for the baseline year in the detailed modelling were verified against monitored data. All results in the report are presented as verified data. The correction factor calculated for nitrogen oxides was assumed to be applicable to all pollutants. The verification methodology is provided in Appendix AQ 3.

APPENDIX AQ 3 MODEL VERIFICATION

Dispersion modelling is an inherently uncertain procedure with potential errors in the model output arising from either, or both, systematic or random errors.

Systematic errors occur where a distinct trend is apparent in the model output i.e. a tendency to under or over predict known values. This type of error may arise where emissions have been underestimated, or unrepresentative meteorological data used. Whilst it is rarely possible to identify a specific reason for the systematic error, the errors can be quantified and allowed for by comparing modelled concentrations against monitored concentrations in order to derive a scaling factor. Monitored data itself has an associated uncertainty. Therefore, in the adjustment for systematic errors, it is best to calculate the scaling factor on the basis of data from 3 or more monitoring stations. This study utilises the diffusion tube monitoring data collected by Teignbridge district council in 2008 for verification.

Random errors, as the name suggests, do not show a distinct trend and result in a scatter of modelled concentrations about monitored data even after an allowance for systematic error has been made. The degree of uncertainty i.e. random error, in the model results may be estimated by calculating the standard deviation of the verified modelled results.

For the assessment of the South Devon Link Road a single scaling factor has been generated for the study area. Table AQ A3.1 and Diagram AQ A3.1 show the comparison of modelled versus monitored annual mean nitrogen dioxide from the detailed model output prior to verification; Table AQ A3.2 and Diagram AQ A3.2 show the same comparison for the DMRB model output. Both the detailed model and the DMRB model results show a systematic under-prediction.

Since the correction of the modelled results relates to the road-side component of the pollutant only, the scaling factor is calculated by first removing the background contribution to the monitored and modelled concentrations and then comparing the roadside components only.

Following the methodology set out in LAQM TG(09), the verification is based on roadside nitrogen oxides. The Defra LAQM NOX to NO2 calculator has been used to calculate the roadside NOX from the diffusion tube data.

The dispersion model results show a stronger relationship with monitored concentrations ($R^2 = 0.73$ with detailed modelling, $R^2 = 0.70$ with DMRB screening method).

Table AQ 3.1: Comparison of Modelled versus Monitored 2008 Annual Mean Nitrogen Dioxide for Detailed Modelling

Location (Teignbridge ID)	Monitored NO ₂ (ug/m ³)	Background NO _x (ug/m ³)	Road NO _x (ug/m ³)		Ratio: Monitored to Modelled	Used for Verification
			Modelled	Monitored ^a		
11 Lyn Grove (20)	14.66	9.96	5.10	15.39	3.02	Yes
Westhill House (36)	46.93	9.40	21.12	111.24	5.27	Yes
1 Aller Cottages (37)	36.67	10.56	20.91	72.39	3.46	Yes
Aller Farmhouse (41)	45.33	9.79	24.10	104.3	4.33	Yes
Wywurree (56)	29.40	13.24	18.77	47.42	2.53	Yes
Verification Factor Used for Modelling (best straight line fit through zero)						3.99

a. Monitored data from 2008 calculated using Defra calculator

Diagram AQ 3.1: Comparison of Modelled versus Monitored 2008 Annual Mean Nitrogen Oxides for Detailed Modelling

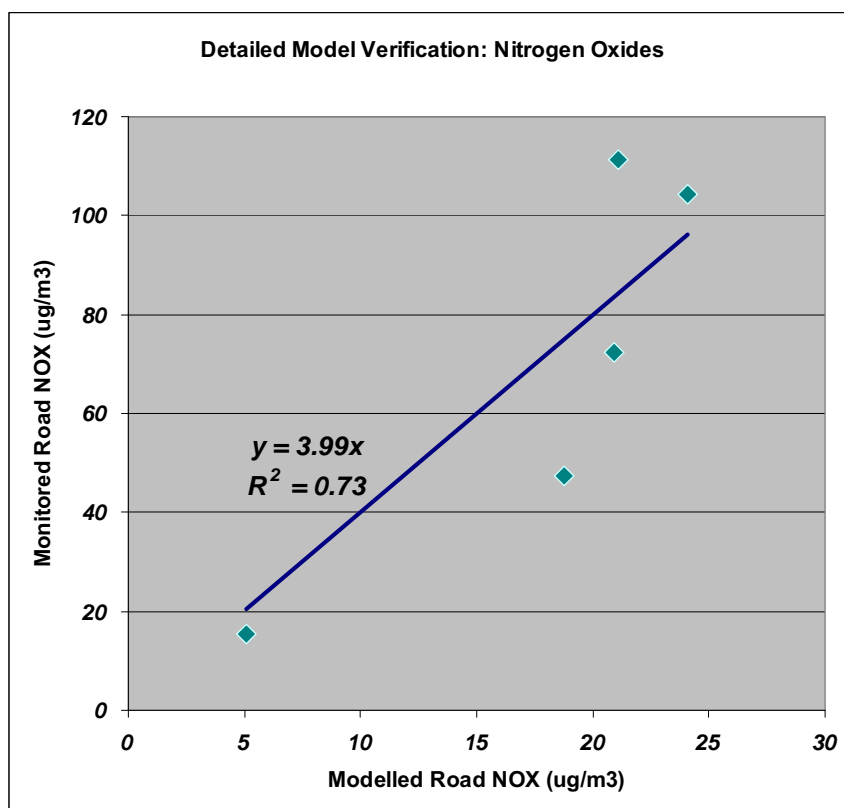
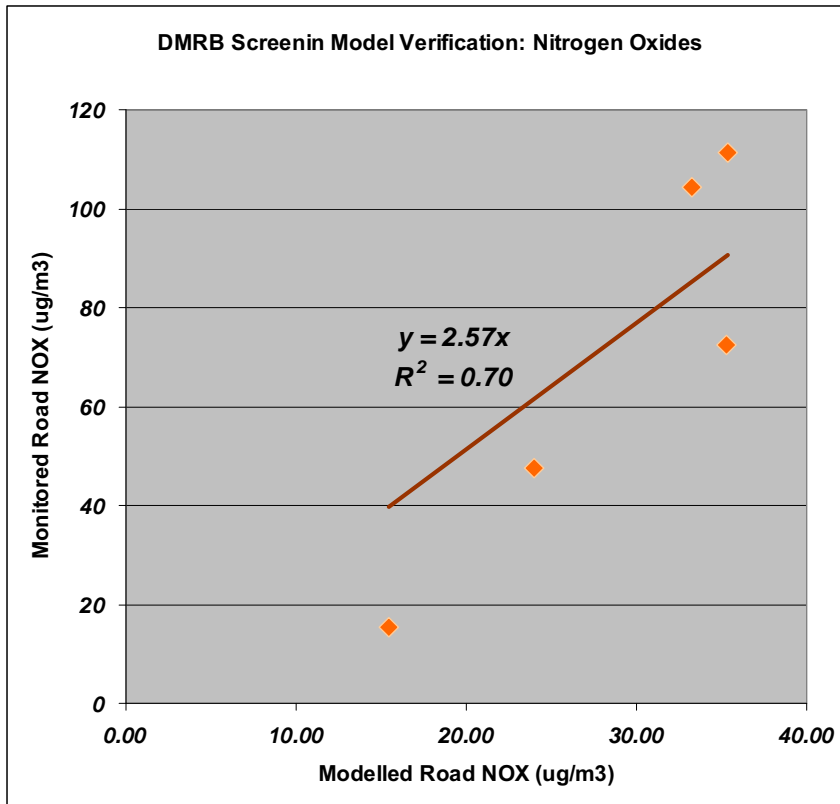


Table AQ 3.2: Comparison of Modelled versus Monitored 2008 Annual Mean Nitrogen Dioxide for DMRB Screening Method

Location (Teignbridge ID)	Monitored NO ₂ (ug/m ³)	Background NO _x (ug/m ³)	Road NO _x (ug/m ³)		Ratio: Monitored to Modelled	Used for Verification
			Modelled	Monitored ^a		
11 Lyn Grove (20)	14.66	9.96	15.45	15.39	1.00	Yes
Westhill House (36)	46.93	9.40	35.33	111.24	3.15	Yes
1 Aller Cottages (37)	36.67	10.56	35.29	72.39	2.05	Yes
Aller Farmhouse (41)	45.33	9.79	33.27	104.3	3.13	Yes
Wywurree (56)	29.40	13.24	23.98	47.42	1.98	Yes
Verification Factor Used for Modelling (best straight line fit through zero)						2.57

a. Monitored data from 2008 calculated using Defra calculator

Diagram AQ 3.2: Comparison of Modelled versus Monitored 2008 Annual Mean Nitrogen Oxides for DMRB Screening Model



APPENDIX AQ 4 BACKGROUND CONCENTRATIONS

Table AQ 4.1: Background pollutant concentrations for 2008

	Nitrogen Oxides	PM10	Benzene	1,3-Butadiene	Carbon Monoxide
<i>11 Lyn Grove</i>	9.96	16.15	0.288	0.105	0.141
<i>Westhill House</i>	9.40	15.88			
<i>1 Aller Cottages</i>	10.56	16.87			
<i>Aller Farmhouse</i>	9.79	16.00			
<i>Wywuree DM</i>	13.24	16.63			
<i>1 Pinewood Road DM</i>	13.04	16.64			
<i>27 St Lukes Road DM</i>	11.96	16.69			
<i>2 Aller Brake Road DM</i>	11.43	16.76			
<i>42 Aller Park Road DM</i>	10.88	16.86			
<i>Aller Orchard</i>	10.20	16.40			
<i>Aller Farmhouse</i>	9.79	16.00			
<i>Trees</i>	9.93	16.11			
<i>Chessels</i>	9.69	15.93			
<i>17 Newton Road</i>	9.56	15.92			
<i>Rock House</i>	9.39	16.20			
<i>8 Manor court</i>	9.24	15.83			
<i>1 Greenhill Road</i>	9.22	16.02			
<i>Huxnor Road</i>	9.14	15.93			
<i>8 Stadium Drive</i>	9.13	15.74			
<i>Old Halfway House</i>	9.13	15.74			
<i>20 Stadium Drive</i>	9.11	15.73			
<i>Coventry cottage</i>	9.13	15.75			
<i>Kerswell Gardens</i>	9.52	15.87			
<i>Edginswell House DM</i>	9.52	15.78			
<i>18 Darran Close</i>	11.33	16.12			
<i>Tree Tops (Coombesend Rd)</i>	11.05	16.09			
<i>147 Barton Hill Road</i>	11.73	16.19			
<i>160 Hele Road</i>	12.52	16.51			
<i>Claddon Lodge</i>	8.49	15.14			
<i>Crossways (Stoke Road)</i>	8.02	14.92			
<i>Lilac Cottage (Stoketeignhead)</i>	7.89	14.84			
<i>Torrington House</i>	13.39	16.68			
<i>45 Wolborough Street</i>	11.96	16.24			
<i>24 Trafalgar Close</i>	11.48	16.27			
<i>10 Cricketfield Road</i>	15.02	16.65			
<i>2 Maddacombe Road</i>	9.20	17.48			
<i>1 Hillside Cottage</i>	9.92	15.82			
<i>Sun Tor</i>	8.42	15.39			
<i>57b Old Exeter Road</i>	10.13	15.68			
<i>45 Torquay Road</i>	11.91	16.32			
<i>1 Abbotsbury Road</i>	14.29	16.59			
<i>46 Torquay Road</i>	13.99	16.53			
<i>131 East Street</i>	14.54	16.57			

Table AQ 4.2: Background pollutant concentrations for 2013

	Nitrogen Oxides	PM10	Benzene	1,3-Butadiene	Carbon Monoxide
<i>11 Lyn Grove</i>	8.51	9.63	0.274	0.090	0.114
<i>Westhill House</i>	7.97	9.51			
<i>1 Aller Cottages</i>	9.01	9.92			
<i>Aller Farmhouse</i>	8.36	9.58			
<i>Wywuree DM</i>	11.00	9.98			
<i>1 Pinewood Road DM</i>	10.81	9.98			
<i>27 St Lukes Road DM</i>	10.00	9.94			
<i>2 Aller Brake Road DM</i>	9.62	9.94			
<i>42 Aller Park Road DM</i>	9.23	9.93			
<i>Aller Orchard</i>	8.73	9.72			
<i>Aller Farmhouse</i>	8.36	9.58			
<i>Trees</i>	8.54	9.59			
<i>Chessels</i>	8.28	9.55			
<i>17 Newton Road</i>	8.14	9.53			
<i>Rock House</i>	8.00	9.55			
<i>8 Manor court</i>	7.78	9.49			
<i>1 Greenhill Road</i>	7.81	9.51			
<i>Huxnor Road</i>	7.74	9.48			
<i>8 Stadium Drive</i>	7.68	9.49			
<i>Old Halfway House</i>	7.69	9.50			
<i>20 Stadium Drive</i>	7.67	9.49			
<i>Coventry cottage</i>	7.68	9.52			
<i>Kerswell Gardens</i>	7.95	9.60			
<i>Edginswell House DM</i>	7.96	9.54			
<i>18 Darran Close</i>	9.60	9.73			
<i>Tree Tops (Coombesend Rd)</i>	9.31	9.70			
<i>147 Barton Hill Road</i>	9.58	9.78			
<i>160 Hele Road</i>	10.20	9.91			
<i>Claddon Lodge</i>	7.15	9.30			
<i>Crossways (Stoke Road)</i>	6.78	9.20			
<i>Lilac Cottage (Stoketeignhead)</i>	6.80	9.16			
<i>Torrington House</i>	11.13	10.01			
<i>45 Wolborough Street</i>	9.98	9.76			
<i>24 Trafalgar Close</i>	9.57	9.76			
<i>10 Cricketfield Road</i>	12.59	9.96			
<i>2 Maddacombe Road</i>	7.92	9.88			
<i>1 Hillside Cottage</i>	8.26	9.56			
<i>Sun Tor</i>	7.21	9.38			
<i>57b Old Exeter Road</i>	8.41	9.54			
<i>45 Torquay Road</i>	9.93	9.78			
<i>1 Abbotsbury Road</i>	12.03	9.95			
<i>46 Torquay Road</i>	11.70	9.90			
<i>131 East Street</i>	12.23	9.93			

Table AQ 4.3: Background pollutant concentrations for 2028

	Nitrogen Oxides	PM10	Benzene	1,3-Butadiene	Carbon Monoxide
<i>11 Lyn Grove</i>	7.33	9.50	0.288	0.097	0.119
<i>Westhill House</i>	6.79	9.38			
<i>1 Aller Cottages</i>	7.84	9.79			
<i>Aller Farmhouse</i>	7.18	9.45			
<i>Wywuree DM</i>	9.36	9.80			
<i>1 Pinewood Road DM</i>	9.18	9.79			
<i>27 St Lukes Road DM</i>	8.56	9.78			
<i>2 Aller Brake Road DM</i>	8.27	9.79			
<i>42 Aller Park Road DM</i>	7.99	9.80			
<i>Aller Orchard</i>	7.57	9.59			
<i>Aller Farmhouse</i>	7.18	9.45			
<i>Trees</i>	7.41	9.46			
<i>Chessels</i>	7.12	9.41			
<i>17 Newton Road</i>	6.98	9.40			
<i>Rock House</i>	6.87	9.43			
<i>8 Manor court</i>	6.60	9.35			
<i>1 Greenhill Road</i>	6.67	9.38			
<i>Huxnor Road</i>	6.61	9.35			
<i>8 Stadium Drive</i>	6.54	9.35			
<i>Old Halfway House</i>	6.54	9.35			
<i>20 Stadium Drive</i>	6.53	9.35			
<i>Coventry cottage</i>	6.56	9.38			
<i>Kerswell Gardens</i>	6.76	9.44			
<i>Edginswell House DM</i>	6.77	9.39			
<i>18 Darran Close</i>	8.18	9.56			
<i>Tree Tops (Coombesend Rd)</i>	7.86	9.54			
<i>147 Barton Hill Road</i>	7.96	9.59			
<i>160 Hele Road</i>	8.50	9.71			
<i>Claddon Lodge</i>	6.12	9.16			
<i>Crossways (Stoke Road)</i>	5.84	9.06			
<i>Lilac Cottage (Stoketeignhead)</i>	5.91	9.03			
<i>Torrington House</i>	9.48	9.83			
<i>45 Wolborough Street</i>	8.48	9.58			
<i>24 Trafalgar Close</i>	8.11	9.58			
<i>10 Cricketfield Road</i>	10.75	9.76			
<i>2 Maddacombe Road</i>	6.88	9.79			
<i>1 Hillside Cottage</i>	7.00	9.40			
<i>Sun Tor</i>	6.23	9.24			
<i>57b Old Exeter Road</i>	7.09	9.38			
<i>45 Torquay Road</i>	8.40	9.61			
<i>1 Abbotsbury Road</i>	10.33	9.76			
<i>46 Torquay Road</i>	9.96	9.71			
<i>131 East Street</i>	10.49	9.74			

APPENDIX AQ 5 MODEL RESULTS

Table AQ 5.1: Verified modelled concentrations of annual mean nitrogen oxides and nitrogen dioxide. Data for receptors 1 to 24 are taken from the detailed model, data for receptors 25 to 43 are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean Nitrogen Oxides (ug/m ³)					Annual Mean Nitrogen Dioxide (Objective = 40ug/m ³)				
		2008	2013		2028		2008	2013		2028	
		Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme	Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme
1	11 Lyn Grove	30.3	21.9	11.3	18.3	11.3	16.9	12.9	7.7	10.6	7.3
2	Westhill House	93.6	64.1	14.8	54.9	13.6	39.7	30.6	9.4	25.6	8.4
3	1 Aller Cottages	93.9	63.2		52.1		39.9	30.4		24.7	
4	Aller Farmhouse (LP)	105.9	71.3	16.2	59.4	17.4	43.2	33.2	10.1	27.2	10.2
5	Wywurree	88.1	59.8	64.2	49.3	60.7	38.5	29.2	30.9	23.7	27.8
6	1 Pinewood Road	67.9	47.8	56.1	40.7	52.6	32.0	24.5	27.8	20.4	24.9
7	27 St Lukes Road	46.9	32.7	41.2	27.2	40.0	24.0	18.0	21.7	14.7	20.1
8	2 Aller Brake Road	48.7	33.8	45.4	28.2	44.2	24.7	18.5	23.5	15.2	21.7
9	42 Aller Park Road	40.7	28.6	33.2	23.8	32.0	21.5	16.1	18.2	13.2	16.8
10	Aller Farmhouse (F)	101.4	68.4	15.8	56.9	17.0	42.0	32.2	9.9	26.4	10.0
11	Chessels	52.1	36.5	11.7	30.7	11.7	26.0	19.6	7.9	16.2	7.5
12	17 Newton Road	61.4	42.6	13.1	35.9	12.5	29.4	22.2	8.6	18.4	7.9
13	8 Manor court	81.8	55.6	15.0	46.0	12.5	36.2	27.4	9.5	22.3	7.9
14	8 Stadium Drive	54.7	37.6	18.7	31.1	16.0	26.9	20.1	11.3	16.3	9.6
15	Old Halfway House	103.9	70.0	21.4	57.7	17.8	42.6	32.7	12.7	26.6	10.4
16	20 Stadium Drive	25.1	18.1	22.5	15.0	19.9	14.5	11.0	13.2	9.1	11.4
17	Coventry cottage	103.1	69.2	28.7	57.0	24.2	42.4	32.4	16.1	26.3	13.3
18	Aller Orchard	18.5	14.2	19.8	12.1	18.6	11.4	9.1	11.9	7.7	10.8
19	Trees	13.3	12.0	29.7	10.9	28.3	8.9	8.0	16.6	7.1	15.2
20	Rock House	12.0	10.1	29.3	8.8	26.8	8.2	7.0	16.3	6.1	14.5
21	1 Greenhill Road	17.9	14.0	33.2	11.9	30.7	11.1	9.0	18.1	7.6	16.2
22	Huxnor Road	22.6	16.8	33.5	14.1	30.8	13.4	10.4	18.3	8.6	16.2
23	Kerswell Gardens	61.2	42.0	29.0	35.4	25.1	29.3	22.0	16.2	18.2	13.8
24	Edginswell House	42.5	30.9	34.8	27.1	32.8	22.1	17.1	18.9	14.6	17.1
25	18 Darran Close	44.7	34.3	34.1	29.1	29.7	23.1	18.7	18.6	15.5	15.8
26	Tree Tops	44.0	33.9	34.1	29.3	30.2	22.8	18.5	18.6	15.6	16.0
27	147 Barton Hill Road	34.6	30.7	13.0	25.3	11.5	18.9	17.1	8.5	13.9	7.4
28	160 Hele Road	73.7	61.4	49.3	50.7	39.8	33.9	29.8	25.1	24.2	20.0
29	Claddon Lodge	41.2	32.6	27.5	28.7	26.3	21.6	17.8	15.5	15.3	14.3
30	Crossways	35.4	27.9	24.4	25.0	22.9	19.1	15.7	14.0	13.6	12.7
31	Lilac Cottage	9.2	7.9	8.0	6.9	7.1	6.8	5.9	5.9	5.1	5.2
32	Torrington House	47.7	37.0	25.7	29.5	23.5	24.5	20.0	14.8	15.8	13.1
33	45 Wolborough Street	58.9	44.4	43.3	37.8	37.1	28.7	23.0	22.6	19.2	18.9
34	24 Trafalgar Close	53.2	39.1	38.8	31.8	31.8	26.5	20.8	20.7	16.7	16.7
35	10 Cricketfield Road	74.0	55.8	55.9	49.8	47.9	34.2	27.8	27.8	24.0	23.3
36	2 Maddacombe Road	10.5	8.8	8.4	7.5	7.3	7.4	6.3	6.2	5.4	5.3
37	1 Hillside Cottage	47.9	36.1	35.4	31.1	30.4	24.3	19.4	19.1	16.4	16.1
38	Sun Tor	76.3	62.6	33.4	47.6	33.8	34.4	30.0	18.2	22.9	17.5
39	57b Old Exeter Road	82.3	61.3	61.6	53.3	52.8	36.4	29.6	29.7	25.1	24.9
40	45 Torquay Road	133.2	95.1	94.7	77.1	77.2	50.3	41.0	40.9	33.0	33.0
41	1 Abbotsbury Road	37.6	29.9	29.2	27.2	27.5	20.3	16.8	16.4	14.8	14.9
42	46 Torquay Road	78.0	57.4	53.9	48.3	44.8	35.4	28.4	27.0	23.4	22.1
43	131 East Street	78.1	56.9	57.1	47.6	47.1	35.5	28.2	28.3	23.2	23.0

Table AQ 5.2: Verified modelled concentrations of annual mean PM₁₀ and exceedences of 50µg/m³ as a daily mean. Data are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean PM ₁₀ (Objective = 40ug/m ³)					Number of Days with Daily Mean PM ₁₀ >50ug/m ³ (Objective = 35 days)				
		2008	2013		2028		2008	2013		2028	
		Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme	Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme
1	11 Lyn Grove	20.4	18.5	16.4	17.9	16.3	3.9	1.8	0.5	1.3	0.4
2	Westhill House	25.7	21.8	17.0	20.8	16.8	14.1	6.0	0.7	4.4	0.6
3	1 Aller Cottages	26.8	22.8		21.6		17.1	7.7		5.7	
4	Aller Farmhouse (LP)	25.0	21.4	17.1	20.4	17.0	12.4	5.4	0.8	3.9	0.7
5	Wywurree	23.0	20.3	22.4	19.4	22.3	8.1	3.8	6.9	2.7	6.8
6	1 Pinewood Road	22.3	20.0	21.5	19.5	21.3	6.9	3.5	5.4	2.8	5.1
7	27 St Lukes Road	21.4	19.3	20.3	18.7	20.2	5.3	2.6	3.8	2.0	3.7
8	2 Aller Brake Road	21.4	19.3	23.1	18.6	23.1	5.3	2.6	8.4	1.9	8.3
9	42 Aller Park Road	20.4	18.7	16.5	18.2	16.4	3.9	2.0	0.5	1.5	0.5
10	Aller Farmhouse (F)	25.0	21.4	17.1	20.4	17.0	12.4	5.4	0.8	3.9	0.7
11	Chessels	21.6	19.2	16.6	18.5	16.5	5.7	2.5	0.5	1.8	0.5
12	17 Newton Road	22.8	20.0	17.1	19.3	17.0	7.7	3.4	0.8	2.6	0.7
13	8 Manor court	23.6	20.4	16.1	19.4	15.8	9.2	3.9	0.4	2.7	0.3
14	8 Stadium Drive	23.7	20.4	16.7	19.4	16.3	9.5	3.9	0.6	2.7	0.4
15	Old Halfway House	25.5	21.5	16.7	20.4	16.3	13.6	5.6	0.6	3.9	0.4
16	20 Stadium Drive	18.7	17.2	16.7	16.7	16.4	2.0	0.9	0.6	0.6	0.4
17	Coventry cottage	24.5	21.0	17.0	19.8	16.5	11.3	4.7	0.8	3.2	0.5
18	Aller Orchard	16.5	16.1	16.2	16.0	16.1	0.5	0.3	0.4	0.3	0.4
19	Trees	17.3	16.9	18.5	16.9	18.4	0.9	0.7	1.9	0.7	1.7
20	Rock House	16.4	15.8	17.9	15.7	17.4	0.4	0.3	1.3	0.2	1.0
21	1 Greenhill Road	19.7	18.2	19.7	17.8	19.6	3.1	1.6	3.1	1.2	2.9
22	Huxnor Road	19.0	17.6	20.3	17.2	19.9	2.3	1.1	3.8	0.8	3.3
23	Kerswell Gardens	21.8	19.3	16.3	18.4	15.9	6.0	2.6	0.4	1.8	0.3
24	Edginswell House	20.7	18.7	20.2	18.0	20.1	4.3	2.0	3.7	1.4	3.5
25	18 Darran Close	20.2	18.7	18.8	18.3	18.4	3.7	2.0	2.1	1.7	1.8
26	Tree Tops	20.3	18.9	19.0	18.6	18.7	3.8	2.2	2.3	1.9	2.0
27	147 Barton Hill Road	18.8	17.9	16.2	17.8	16.0	2.1	1.3	0.4	1.2	0.3
28	160 Hele Road	24.0	21.7	20.4	21.0	19.8	10.1	5.8	3.9	4.8	3.1
29	Claddon Lodge	19.0	17.7	17.0	17.5	17.1	2.3	1.2	0.8	1.1	0.8
30	Crossways	18.2	17.0	16.5	16.9	16.5	1.5	0.8	0.5	0.7	0.5
31	Lilac Cottage	15.0	14.6	14.6	14.5	14.5	0.1	0.0	0.0	0.0	0.0
32	Torrington House	20.5	18.9	18.2	18.5	18.1	4.1	2.2	1.6	1.8	1.5
33	45 Wolborough Street	22.1	20.0	19.9	19.5	19.4	6.5	3.4	3.3	2.9	2.7
34	24 Trafalgar Close	21.6	19.5	19.6	19.0	19.0	5.7	2.8	2.9	2.3	2.3
35	10 Cricketfield Road	24.1	21.5	21.5	21.1	21.0	10.3	5.5	5.5	4.8	4.7
36	2 Maddacombe Road	17.6	17.0	17.0	17.0	17.0	1.1	0.7	0.7	0.8	0.8
37	1 Hillside Cottage	19.7	17.8	17.6	17.5	17.3	3.1	1.2	1.1	1.0	0.9
38	Sun Tor	23.1	21.1	17.9	20.3	18.2	8.3	4.8	1.4	3.8	1.6
39	57b Old Exeter Road	24.7	22.5	22.6	22.0	21.9	11.8	7.2	7.3	6.3	6.2
40	45 Torquay Road	30.3	25.6	25.8	24.1	24.3	28.7	13.9	14.3	10.2	10.9
41	1 Abbotsbury Road	19.5	18.2	18.2	18.1	18.1	2.8	1.6	1.5	1.5	1.5
42	46 Torquay Road	23.9	21.2	20.7	20.5	20.0	9.8	5.0	4.4	4.0	3.4
43	131 East Street	24.0	21.1	21.1	20.4	20.3	10.1	4.9	4.9	3.9	3.8

Table AQ 5.3: Modelled change in pollutant concentrations with the Published Scheme. An increase in pollutant concentrations with the Scheme is shown as a positive number.

ID	Name	Change with Scheme (ug/m ³)		Change with Scheme (ug/m ³)		Change with Scheme (ug/m ³)		Change with Scheme (days)	
		Nitrogen Oxides		Nitrogen Dioxide		PM10		Days >50	
		2013	2028	2013	2028	2013	2028	2013	2028
1	11 Lyn Grove	-10.6	-7.0	-5.3	-3.3	-2.1	-1.6	-1.3	-0.9
2	Westhill House	-49.3	-41.3	-21.2	-17.2	-4.9	-4.0	-5.3	-3.8
3	1 Aller Cottages								
4	Aller Farmhouse (LP)	-55.1	-42.0	-23.1	-17.0	-4.3	-3.4	-4.6	-3.1
5	Wywurree	4.5	11.4	1.7	4.1	2.1	2.9	3.2	4.1
6	1 Pinewood Road	8.3	11.8	3.3	4.5	1.4	1.8	2.0	2.4
7	27 St Lukes Road	8.5	12.8	3.7	5.4	1.0	1.5	1.2	1.6
8	2 Aller Brake Road	11.6	15.9	5.0	6.6	3.9	4.5	5.8	6.4
9	42 Aller Park Road	4.6	8.2	2.1	3.6	-2.2	-1.8	-1.5	-1.1
10	Aller Farmhouse (F)	-52.5	-39.9	-22.2	-16.3	-4.3	-3.4	-4.6	-3.1
11	Chessels	-24.7	-19.0	-11.7	-8.7	-2.6	-2.0	-1.9	-1.3
12	17 Newton Road	-29.5	-23.4	-13.7	-10.5	-3.0	-2.3	-2.6	-1.9
13	8 Manor court	-40.5	-33.5	-17.9	-14.5	-4.3	-3.6	-3.5	-2.5
14	8 Stadium Drive	-18.9	-15.0	-8.7	-6.8	-3.7	-3.1	-3.3	-2.3
15	Old Halfway House	-48.6	-39.9	-20.0	-16.2	-4.8	-4.1	-5.0	-3.5
16	20 Stadium Drive	4.4	4.9	2.1	2.3	-0.5	-0.4	-0.2	-0.2
17	Coventry cottage	-40.5	-32.9	-16.3	-13.0	-3.9	-3.3	-3.9	-2.7
18	Aller Orchard	5.6	6.5	2.8	3.1	0.1	0.2	0.0	0.1
19	Trees	17.7	17.4	8.5	8.1	1.6	1.5	1.1	1.0
20	Rock House	19.1	18.0	9.3	8.4	2.1	1.7	1.1	0.8
21	1 Greenhill Road	19.1	18.7	9.1	8.6	1.5	1.8	1.5	1.7
22	Huxnor Road	16.7	16.7	7.8	7.6	2.7	2.8	2.7	2.5
23	Kerswell Gardens	-13.0	-10.3	-5.7	-4.4	-3.0	-2.5	-2.2	-1.5
24	Edginswell House	3.9	5.7	1.8	2.5	1.5	2.1	1.6	2.1
25	18 Darran Close	-0.2	0.6	-0.1	0.3	0.0	0.1	0.0	0.1
26	Tree Tops	0.2	0.9	0.1	0.4	0.1	0.1	0.1	0.1
27	147 Barton Hill Road	-17.7	-13.9	-8.6	-6.5	-1.7	-1.7	-0.9	-0.9
28	160 Hele Road	-12.1	-11.0	-4.7	-4.2	-1.3	-1.3	-1.9	-1.6
29	Claddon Lodge	-5.1	-2.3	-2.3	-1.0	-0.7	-0.4	-0.5	-0.3
30	Crossways	-3.5	-2.0	-1.6	-0.9	-0.5	-0.4	-0.2	-0.2
31	Lilac Cottage	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
32	Torrington House	-11.3	-6.1	-5.2	-2.7	-0.7	-0.4	-0.7	-0.3
33	45 Wolborough Street	-1.0	-0.7	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
34	24 Trafalgar Close	-0.3	0.0	-0.1	0.0	0.1	0.0	0.1	0.0
35	10 Cricketfield Road	0.1	-1.8	0.0	-0.7	0.0	-0.1	0.0	-0.1
36	2 Maddacombe Road	-0.3	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.0
37	1 Hillside Cottage	-0.7	-0.8	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1
38	Sun Tor	-29.2	-13.8	-11.8	-5.5	-3.1	-2.1	-3.5	-2.2
39	57b Old Exeter Road	0.3	-0.5	0.1	-0.2	0.1	-0.1	0.1	-0.1
40	45 Torquay Road	-0.5	0.1	-0.1	0.0	0.2	0.3	0.5	0.6
41	1 Abbotsbury Road	-0.7	0.4	-0.3	0.2	0.0	0.0	0.0	0.0
42	46 Torquay Road	-3.5	-3.5	-1.4	-1.4	-0.4	-0.4	-0.6	-0.6
43	131 East Street	0.1	-0.5	0.0	-0.2	0.0	-0.1	0.0	-0.1

Table AQ 5.4: Verified modelled concentrations of annual mean benzene and 1,3-butadiene. Data are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean Benzene (Objective = 5ug/m3)					Annual Mean 1,3-Butadiene (Objective = 2.25ug/m3)				
		2008	2013		2028		2008	2013		2028	
		Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme	Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme
1	11 Lyn Grove	0.93	0.56	0.32	0.58	0.34	0.39	0.33	0.12	0.34	0.13
2	Westhill House	0.73	0.90	0.38	0.93	0.40	0.72	0.61	0.16	0.63	0.17
3	1 Aller Cottages	0.65	0.94		0.95		0.80	0.67		0.67	
4	Aller Farmhouse (LP)	0.61	0.88	0.38	0.90	0.40	0.71	0.60	0.16	0.60	0.17
5	Wywurree	0.62	0.69	0.94	0.69	1.20	0.53	0.44	0.59	0.44	0.74
6	1 Pinewood Road	0.54	0.61	0.78	0.64	0.94	0.42	0.36	0.46	0.37	0.55
7	27 St Lukes Road	0.30	0.57	0.70	0.59	0.87	0.41	0.35	0.41	0.35	0.51
8	2 Aller Brake Road	0.93	0.58	0.99	0.60	1.28	0.42	0.36	0.63	0.36	0.80
9	42 Aller Park Road	0.37	0.51	0.28	0.52	0.29	0.35	0.29	0.09	0.30	0.10
10	Aller Farmhouse (F)	0.80	0.88	0.38	0.90	0.40	0.71	0.60	0.16	0.60	0.17
11	Chessels	0.79	0.62	0.35	0.64	0.37	0.46	0.39	0.14	0.40	0.15
12	17 Newton Road	0.43	0.76	0.39	0.79	0.41	0.57	0.49	0.16	0.50	0.17
13	8 Manor court	0.79	0.75	0.31	0.77	0.32	0.58	0.50	0.13	0.50	0.13
14	8 Stadium Drive	0.86	0.76	0.34	0.77	0.36	0.60	0.51	0.16	0.51	0.16
15	Old Halfway House	0.68	0.84	0.34	0.86	0.36	0.68	0.58	0.16	0.58	0.16
16	20 Stadium Drive	0.53	0.45	0.35	0.47	0.38	0.29	0.25	0.16	0.25	0.17
17	Coventry cottage	0.51	0.83	0.36	0.84	0.38	0.67	0.57	0.17	0.57	0.18
18	Aller Orchard	0.65	0.28	0.29	0.30	0.31	0.11	0.09	0.10	0.10	0.11
19	Trees	0.29	0.38	0.45	0.40	0.51	0.15	0.14	0.22	0.15	0.25
20	Rock House	0.39	0.28	0.39	0.29	0.43	0.11	0.10	0.19	0.10	0.21
21	1 Greenhill Road	0.87	0.43	0.50	0.44	0.60	0.25	0.22	0.29	0.23	0.34
22	Huxnor Road	0.47	0.38	0.53	0.40	0.63	0.22	0.20	0.32	0.21	0.37
23	Kerswell Gardens	0.46	0.65	0.31	0.67	0.33	0.49	0.42	0.13	0.42	0.14
24	Edginswell House	0.40	0.52	0.76	0.53	0.91	0.34	0.30	0.45	0.30	0.53
25	18 Darran Close	0.68	0.49	0.50	0.54	0.57	0.27	0.24	0.24	0.26	0.28
26	Tree Tops	0.48	0.44	0.46	0.50	0.54	0.24	0.21	0.22	0.23	0.25
27	147 Barton Hill Road	0.45	0.39	0.31	0.46	0.33	0.21	0.21	0.11	0.23	0.12
28	160 Hele Road	0.30	0.66	0.55	0.72	0.62	0.41	0.41	0.31	0.43	0.34
29	Claddon Lodge	0.46	0.48	0.42	0.54	0.47	0.25	0.23	0.19	0.26	0.22
30	Crossways	0.62	0.44	0.41	0.51	0.45	0.22	0.20	0.18	0.24	0.20
31	Lilac Cottage	0.62	0.29	0.29	0.30	0.30	0.11	0.10	0.10	0.10	0.11
32	Torrington House	0.72	0.44	0.44	0.50	0.49	0.25	0.23	0.20	0.25	0.23
33	45 Wolborough Street	0.29	0.61	0.58	0.68	0.63	0.35	0.31	0.30	0.35	0.33
34	24 Trafalgar Close	0.47	0.57	0.59	0.63	0.62	0.34	0.29	0.29	0.31	0.30
35	10 Cricketfield Road	0.61	0.70	0.71	0.78	0.79	0.42	0.38	0.38	0.43	0.42
36	2 Maddacombe Road	0.82	0.28	0.27	0.29	0.29	0.11	0.09	0.09	0.10	0.10
37	1 Hillside Cottage	1.09	0.45	0.43	0.51	0.46	0.24	0.21	0.20	0.24	0.22
38	Sun Tor	0.44	0.60	0.42	0.70	0.51	0.42	0.40	0.23	0.42	0.29
39	57b Old Exeter Road	0.66	0.82	0.84	0.98	0.96	0.49	0.45	0.46	0.54	0.52
40	45 Torquay Road	0.71	1.03	1.11	1.08	1.19	0.78	0.68	0.73	0.71	0.76
41	1 Abbotsbury Road	0.56	0.42	0.42	0.47	0.46	0.21	0.19	0.19	0.21	0.21
42	46 Torquay Road	0.90	0.63	0.64	0.68	0.68	0.43	0.38	0.38	0.40	0.40
43	131 East Street	0.94	0.69	0.69	0.76	0.74	0.46	0.41	0.41	0.45	0.44

Table AQ 5.5: Modelled change in pollutant concentrations with the Published Scheme.

ID	Name	Change with Scheme (ug/m ³)		Change with Scheme (ug/m ³)	
		Benzene		1,3-Butadiene	
		2013	2028	2013	2028
1	11 Lyn Grove	-0.24	-0.24	-0.21	-0.20
2	Westhill House	-0.52	-0.53	-0.46	-0.46
3	1 Aller Cottages				
4	Aller Farmhouse (LP)	-0.50	-0.50	-0.44	-0.43
5	Wywurree	0.25	0.51	0.14	0.30
6	1 Pinewood Road	0.17	0.30	0.10	0.18
7	27 St Lukes Road	0.13	0.28	0.06	0.16
8	2 Aller Brake Road	0.41	0.68	0.28	0.44
9	42 Aller Park Road	-0.23	-0.23	-0.20	-0.20
10	Aller Farmhouse (F)	-0.50	-0.50	-0.44	-0.43
11	Chessels	-0.27	-0.28	-0.26	-0.25
12	17 Newton Road	-0.37	-0.38	-0.33	-0.33
13	8 Manor court	-0.44	-0.45	-0.37	-0.37
14	8 Stadium Drive	-0.42	-0.42	-0.35	-0.35
15	Old Halfway House	-0.49	-0.49	-0.42	-0.42
16	20 Stadium Drive	-0.10	-0.09	-0.09	-0.08
17	Coventry cottage	-0.47	-0.46	-0.40	-0.39
18	Aller Orchard	0.01	0.01	0.00	0.01
19	Trees	0.07	0.11	0.08	0.10
20	Rock House	0.11	0.14	0.09	0.10
21	1 Greenhill Road	0.08	0.15	0.07	0.11
22	Huxnor Road	0.14	0.23	0.12	0.17
23	Kerswell Gardens	-0.34	-0.34	-0.28	-0.28
24	Edginswell House	0.24	0.38	0.15	0.23
25	18 Darran Close	0.02	0.03	0.01	0.01
26	Tree Tops	0.02	0.04	0.01	0.02
27	147 Barton Hill Road	-0.08	-0.13	-0.09	-0.10
28	160 Hele Road	-0.11	-0.10	-0.10	-0.09
29	Claddon Lodge	-0.06	-0.07	-0.03	-0.04
30	Crossways	-0.04	-0.06	-0.02	-0.04
31	Lilac Cottage	0.00	0.00	0.00	0.00
32	Torrington House	-0.01	-0.01	-0.03	-0.01
33	45 Wolborough Street	-0.03	-0.06	-0.02	-0.03
34	24 Trafalgar Close	0.02	-0.01	0.01	-0.01
35	10 Cricketfield Road	0.00	0.00	0.00	-0.01
36	2 Maddacombe Road	0.00	0.00	0.00	0.00
37	1 Hillside Cottage	-0.02	-0.04	-0.01	-0.02
38	Sun Tor	-0.18	-0.19	-0.17	-0.12
39	57b Old Exeter Road	0.02	-0.02	0.01	-0.01
40	45 Torquay Road	0.08	0.11	0.04	0.06
41	1 Abbotsbury Road	0.00	0.00	0.00	0.00
42	46 Torquay Road	0.00	0.00	0.00	0.00
43	131 East Street	0.00	-0.02	0.00	-0.01

Table AQ 5.6: Verified modelled concentrations of annual mean benzene carbon monoxide and change in concentration with the Published Scheme. Data are taken from the DMRB Screening Method.

ID	Name	Annual Mean Carbon Monoxide (mg/m ³)					Change with Scheme (mg/m ³)	
		2008	2013		2028		2013	2028
		Baseline	Do Minimum	Published Scheme	Do Minimum	Published Scheme		
1	11 Lyn Grove	0.30	0.26	0.16	0.26	0.17	-0.10	-0.10
2	Westhill House	0.52	0.46	0.21	0.47	0.22	-0.25	-0.25
3	1 Aller Cottages	0.53	0.46		0.45			
4	Aller Farmhouse (LP)	0.48	0.42	0.20	0.42	0.22	-0.21	-0.20
5	Wywurree	0.38	0.33	0.45	0.32	0.53	0.13	0.20
6	1 Pinewood Road	0.39	0.34	0.42	0.36	0.48	0.08	0.12
7	27 St Lukes Road	0.32	0.28	0.33	0.29	0.39	0.06	0.10
8	2 Aller Brake Road	0.32	0.27	0.48	0.27	0.57	0.21	0.29
9	42 Aller Park Road	0.28	0.24	0.12	0.24	0.12	-0.12	-0.11
10	Aller Farmhouse (F)	0.48	0.42	0.20	0.42	0.22	-0.21	-0.20
11	Chessels	0.34	0.30	0.18	0.30	0.19	-0.12	-0.11
12	17 Newton Road	0.40	0.35	0.21	0.36	0.23	-0.14	-0.13
13	8 Manor court	0.42	0.37	0.15	0.37	0.15	-0.22	-0.22
14	8 Stadium Drive	0.42	0.37	0.17	0.37	0.18	-0.20	-0.19
15	Old Halfway House	0.49	0.43	0.17	0.43	0.18	-0.26	-0.26
16	20 Stadium Drive	0.25	0.21	0.17	0.21	0.17	-0.04	-0.04
17	Coventry cottage	0.46	0.40	0.19	0.40	0.19	-0.22	-0.21
18	Aller Orchard	0.15	0.12	0.13	0.13	0.14	0.01	0.01
19	Trees	0.22	0.21	0.24	0.22	0.27	0.04	0.06
20	Rock House	0.14	0.12	0.19	0.12	0.20	0.07	0.07
21	1 Greenhill Road	0.28	0.25	0.29	0.26	0.35	0.04	0.08
22	Huxnor Road	0.24	0.22	0.29	0.22	0.35	0.08	0.12
23	Kerswell Gardens	0.36	0.31	0.15	0.31	0.16	-0.16	-0.15
24	Edginswell House	0.32	0.29	0.37	0.30	0.43	0.08	0.13
25	18 Darran Close	0.29	0.25	0.26	0.26	0.27	0.00	0.01
26	Tree Tops	0.24	0.20	0.20	0.21	0.21	0.00	0.01
27	147 Barton Hill Road	0.25	0.23	0.15	0.28	0.16	-0.08	-0.12
28	160 Hele Road	0.48	0.44	0.37	0.48	0.39	-0.07	-0.08
29	Claddon Lodge	0.32	0.29	0.24	0.32	0.28	-0.05	-0.03
30	Crossways	0.29	0.26	0.23	0.29	0.26	-0.03	-0.03
31	Lilac Cottage	0.15	0.12	0.13	0.13	0.13	0.00	0.00
32	Torrington House	0.30	0.26	0.28	0.28	0.33	0.02	0.05
33	45 Wolborough Street	0.43	0.38	0.37	0.39	0.38	-0.01	-0.02
34	24 Trafalgar Close	0.41	0.34	0.35	0.36	0.36	0.01	0.00
35	10 Cricketfield Road	0.50	0.45	0.45	0.47	0.47	0.00	0.00
36	2 Maddacombe Road	0.14	0.12	0.12	0.12	0.12	0.00	0.00
37	1 Hillside Cottage	0.30	0.27	0.25	0.28	0.27	-0.01	-0.02
38	Sun Tor	0.46	0.43	0.26	0.49	0.33	-0.17	-0.16
39	57b Old Exeter Road	0.58	0.53	0.54	0.57	0.56	0.01	0.00
40	45 Torquay Road	0.73	0.65	0.67	0.65	0.68	0.02	0.03
41	1 Abbotsbury Road	0.28	0.25	0.25	0.28	0.28	0.00	0.00
42	46 Torquay Road	0.45	0.40	0.38	0.42	0.39	-0.02	-0.03
43	131 East Street	0.46	0.41	0.41	0.42	0.42	0.00	-0.01

Table AQ 5.7: Verified modelled concentrations of annual mean nitrogen oxides and nitrogen dioxide for the Alliance Option proposed by Kingskerswell Alliance. Baseline and Do Minimum data are as Table AQ 5.1. Data for receptors 1 to 24 are taken from the detailed model, data for receptors 25 to 43 are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean Nitrogen Oxides (ug/m ³)					Annual Mean Nitrogen Dioxide (Objective = 40ug/m ³)						
		2008		2013		2028		2008		2013		2028	
		Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option	Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option		
1	11 Lyn Grove	30.3	21.9	24.5	18.3	20.3	16.9	12.9	14.1	10.6	11.6		
2	Westhill House	93.6	64.1	76.7	54.9	63.5	39.7	30.6	35.0	25.6	28.5		
3	1 Aller Cottages	93.9	63.2	96.2	52.1	77.1	39.9	30.4	41.2	24.7	32.9		
4	Aller Farmhouse (LP)	105.9	71.3	85.4	59.4	71.3	43.2	33.2	37.9	27.2	31.1		
5	Wywurree	88.1	59.8	64.5	49.3	52.9	38.5	29.2	31.0	23.7	25.1		
6	1 Pinewood Road	67.9	47.8	67.1	40.7	56.4	32.0	24.5	31.9	20.4	26.3		
7	27 St Lukes Road	46.9	32.7	41.4	27.2	36.3	24.0	18.0	21.8	14.7	18.6		
8	2 Aller Brake Road	48.7	33.8	45.9	28.2	39.6	24.7	18.5	23.7	15.2	20.0		
9	42 Aller Park Road	40.7	28.6	39.3	23.8	32.1	21.5	16.1	20.9	13.2	16.8		
10	Aller Farmhouse (F)	101.4	68.4	81.8	56.9	68.3	42.0	32.2	36.7	26.4	30.1		
11	Chessels	52.1	36.5	41.8	30.7	34.9	26.0	19.6	21.9	16.2	18.0		
12	17 Newton Road	61.4	42.6	55.8	35.9	47.4	29.4	22.2	27.5	18.4	22.9		
13	8 Manor court	81.8	55.6	70.7	46.0	59.0	36.2	27.4	32.9	22.3	27.0		
14	8 Stadium Drive	54.7	37.6	47.0	31.1	40.7	26.9	20.1	24.0	16.3	20.3		
15	Old Halfway House	103.9	70.0	89.9	57.7	76.9	42.6	32.7	39.2	26.6	32.7		
16	20 Stadium Drive	25.1	18.1	21.0	15.0	18.3	14.5	11.0	12.5	9.1	10.6		
17	Coventry cottage	103.1	69.2	79.7	57.0	75.2	42.4	32.4	36.0	26.3	32.2		
18	Aller Orchard	18.5	14.2	15.7	12.1	13.6	11.4	9.1	9.9	7.7	8.4		
19	Trees	13.3	12.0	11.3	10.9	11.3	8.9	8.0	7.7	7.1	7.3		
20	Rock House	12.0	10.1	9.7	8.8	8.8	8.2	7.0	6.8	6.1	6.1		
21	1 Greenhill Road	17.9	14.0	13.2	11.9	11.9	11.1	9.0	8.6	7.6	7.6		
22	Huxnor Road	22.6	16.8	16.0	14.1	14.0	13.4	10.4	10.0	8.6	8.6		
23	Kerswell Gardens	61.2	42.0	46.5	35.4	41.2	29.3	22.0	23.8	18.2	20.5		
24	Edginswell House	42.5	30.9	29.3	27.1	27.0	22.1	17.1	16.4	14.6	14.6		
25	18 Darran Close	44.7	34.3	33.8	29.1	29.2	23.1	18.7	18.4	15.5	15.6		
26	Tree Tops	44.0	33.9	33.9	29.3	29.7	22.8	18.5	18.5	15.6	15.8		
27	147 Barton Hill Road	34.6	30.7	18.2	25.3	18.5	18.9	17.1	11.1	13.9	10.7		
28	160 Hele Road	73.7	61.4	52.1	50.7	45.5	33.9	29.8	26.2	24.2	22.2		
29	Claddon Lodge	41.2	32.6	32.6	28.7	29.1	21.6	17.8	17.9	15.3	15.5		
30	Crossways	35.4	27.9	28.3	25.0	25.6	19.1	15.7	15.9	13.6	13.9		
31	Lilac Cottage	9.2	7.9	8.4	6.9	7.8	6.8	5.9	6.1	5.1	5.5		
32	Torrington House	47.7	37.0	38.1	29.5	33.9	24.5	20.0	20.4	15.8	17.7		
33	45 Wolborough Street	58.9	44.4	42.5	37.8	36.1	28.7	23.0	22.3	19.2	18.5		
34	24 Trafalgar Close	53.2	39.1	39.4	31.8	31.5	26.5	20.8	20.9	16.7	16.6		
35	10 Cricketfield Road	74.0	55.8	55.2	49.8	46.9	34.2	27.8	27.6	24.0	22.9		
36	2 Maddacombe Road	10.5	8.8	8.8	7.5	7.5	7.4	6.3	6.3	5.4	5.4		
37	1 Hillside Cottage	47.9	36.1	35.8	31.1	30.7	24.3	19.4	19.3	16.4	16.2		
38	Sun Tor	76.3	62.6	38.5	47.6	37.7	34.4	30.0	20.4	22.9	19.1		
39	57b Old Exeter Road	82.3	61.3	61.2	53.3	51.9	36.4	29.6	29.6	25.1	24.5		
40	45 Torquay Road	133.2	95.1	95.5	77.1	78.4	50.3	41.0	41.1	33.0	33.4		
41	1 Abbotsbury Road	37.6	29.9	28.1	27.2	24.0	20.3	16.8	15.9	14.8	13.4		
42	46 Torquay Road	78.0	57.4	56.3	48.3	48.0	35.4	28.4	28.0	23.4	23.3		
43	131 East Street	78.1	56.9	56.6	47.6	47.0	35.5	28.2	28.1	23.2	22.9		

Table AQ 5.8: Verified modelled concentrations of annual mean PM₁₀ and exceedences of 50µg/m³ as a daily mean for the Alliance Option proposed by the Kingskerswell Alliance. Data are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean PM ₁₀ (Objective = 40ug/m ³)					Number of Days with Daily Mean PM ₁₀ >50ug/m ³ (Objective = 35 days)				
		2008	2013		2028		2008	2013		2028	
		Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option	Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option
1	11 Lyn Grove	20.4	18.5	18.6	17.9	18.0	3.9	1.8	1.9	1.3	1.4
2	Westhill House	25.7	21.8	23.4	20.8	21.9	14.1	6.0	8.9	4.4	6.1
3	1 Aller Cottages	26.8	22.8	24.2	21.6	22.9	17.1	7.7	10.5	5.7	8.0
4	Aller Farmhouse (LP)	25.0	21.4	22.2	20.4	21.2	12.4	5.4	6.6	3.9	5.0
5	Wywuree	23.0	20.3	20.6	19.4	19.7	8.1	3.8	4.2	2.7	3.0
6	1 Pinewood Road	22.3	20.0	20.5	19.5	19.8	6.9	3.5	4.1	2.8	3.2
7	27 St Lukes Road	21.4	19.3	19.5	18.7	19.2	5.3	2.6	2.8	2.0	2.5
8	2 Aller Brake Road	21.4	19.3	19.9	18.6	19.2	5.3	2.6	3.3	1.9	2.5
9	42 Aller Park Road	20.4	18.7	19.2	18.2	18.7	3.9	2.0	2.4	1.5	2.0
10	Aller Farmhouse (F)	25.0	21.4	22.2	20.4	21.2	12.4	5.4	6.6	3.9	5.0
11	Chessels	21.6	19.2	20.0	18.5	19.2	5.7	2.5	3.4	1.8	2.5
12	17 Newton Road	22.8	20.0	21.5	19.3	20.6	7.7	3.4	5.5	2.6	4.2
13	8 Manor court	23.6	20.4	21.0	19.4	20.2	9.2	3.9	4.7	2.7	3.7
14	8 Stadium Drive	23.7	20.4	20.6	19.4	20.4	9.5	3.9	4.2	2.7	3.9
15	Old Halfway House	25.5	21.5	22.1	20.4	21.4	13.6	5.6	6.4	3.9	5.3
16	20 Stadium Drive	18.7	17.2	16.7	16.7	16.6	2.0	0.9	0.6	0.6	0.5
17	Coventry cottage	24.5	21.0	21.3	19.8	21.0	11.3	4.7	5.2	3.2	4.7
18	Aller Orchard	16.5	16.1	16.0	16.0	16.0	0.5	0.3	0.3	0.3	0.3
19	Trees	17.3	16.9	16.6	16.9	16.9	0.9	0.7	0.5	0.7	0.7
20	Rock House	16.4	15.8	15.8	15.7	15.7	0.4	0.3	0.3	0.2	0.2
21	1 Greenhill Road	19.7	18.2	17.9	17.8	17.9	3.1	1.6	1.4	1.2	1.3
22	Huxnor Road	19.0	17.6	17.4	17.2	17.3	2.3	1.1	1.0	0.8	0.9
23	Kerswell Gardens	21.8	19.3	19.5	18.4	19.2	6.0	2.6	2.8	1.8	2.5
24	Edginswell House	20.7	18.7	19.6	18.0	19.3	4.3	2.0	2.9	1.4	2.6
25	18 Darran Close	20.2	18.7	18.7	18.3	18.4	3.7	2.0	2.0	1.7	1.7
26	Tree Tops	20.3	18.9	19.0	18.6	18.7	3.8	2.2	2.2	1.9	2.0
27	147 Barton Hill Road	18.8	17.9	16.8	17.8	17.0	2.1	1.3	0.6	1.2	0.7
28	160 Hele Road	24.0	21.7	20.8	21.0	20.5	10.1	5.8	4.5	4.8	4.1
29	Claddon Lodge	19.0	17.7	17.7	17.5	17.6	2.3	1.2	1.2	1.1	1.1
30	Crossways	18.2	17.0	17.1	16.9	17.0	1.5	0.8	0.8	0.7	0.7
31	Lilac Cottage	15.0	14.6	14.7	14.5	14.6	0.1	0.0	0.0	0.0	0.0
32	Torrington House	20.5	18.9	19.5	18.5	19.5	4.1	2.2	2.9	1.8	2.8
33	45 Wolborough Street	22.1	20.0	19.9	19.5	19.4	6.5	3.4	3.2	2.9	2.7
34	24 Trafalgar Close	21.6	19.5	19.6	19.0	18.9	5.7	2.8	2.9	2.3	2.2
35	10 Cricketfield Road	24.1	21.5	21.4	21.1	20.8	10.3	5.5	5.4	4.8	4.4
36	2 Maddacombe Road	17.6	17.0	17.0	17.0	17.0	1.1	0.7	0.7	0.8	0.8
37	1 Hillside Cottage	19.7	17.8	17.7	17.5	17.4	3.1	1.2	1.2	1.0	1.0
38	Sun Tor	23.1	21.1	18.7	20.3	19.0	8.3	4.8	2.0	3.8	2.3
39	57b Old Exeter Road	24.7	22.5	22.4	22.0	21.8	11.8	7.2	7.0	6.3	5.9
40	45 Torquay Road	30.3	25.6	25.7	24.1	24.2	28.7	13.9	14.1	10.2	10.6
41	1 Abbotsbury Road	19.5	18.2	18.1	18.1	17.7	2.8	1.6	1.4	1.5	1.2
42	46 Torquay Road	23.9	21.2	21.0	20.5	20.4	9.8	5.0	4.8	4.0	4.0
43	131 East Street	24.0	21.1	21.1	20.4	20.3	10.1	4.9	4.9	3.9	3.7

Table AQ 5.9: Modelled change in pollutant concentrations with the Alliance Option proposed by the Kingskerswell Alliance. An increase in pollutant concentrations with the Alliance Option is shown as a positive number.

ID	Name	Change with Alliance Option (ug/m ³)		Change with Alliance Option (ug/m ³)		Change with Alliance Option (ug/m ³)		Change with Alliance Option (days)	
		Nitrogen Oxides		Nitrogen Dioxide		PM10		Days >50	
		2013	2028	2013	2028	2013	2028	2013	2028
1	11 Lyn Grove	2.6	2.1	1.2	1.0	0.1	0.1	0.1	0.1
2	Westhill House	12.6	8.6	4.4	2.9	1.6	1.1	2.9	1.7
3	1 Aller Cottages	33.0	25.0	10.9	8.2	1.4	1.3	2.8	2.3
4	Aller Farmhouse (LP)	14.2	11.9	4.7	3.9	0.7	0.8	1.2	1.2
5	Wywurree	4.7	3.6	1.8	1.3	0.3	0.3	0.5	0.4
6	1 Pinewood Road	19.3	15.7	7.4	5.9	0.5	0.3	0.6	0.4
7	27 St Lukes Road	8.7	9.1	3.8	3.9	0.2	0.5	0.3	0.5
8	2 Aller Brake Road	12.1	11.4	5.2	4.8	0.6	0.6	0.7	0.6
9	42 Aller Park Road	10.7	8.3	4.8	3.6	0.5	0.5	0.5	0.4
10	Aller Farmhouse (F)	13.5	11.4	4.6	3.8	0.7	0.8	1.2	1.2
11	Chessels	5.3	4.3	2.3	1.8	0.8	0.7	1.0	0.7
12	17 Newton Road	13.2	11.5	5.3	4.5	1.5	1.4	2.0	1.7
13	8 Manor court	15.1	13.0	5.5	4.7	0.6	0.8	0.8	0.9
14	8 Stadium Drive	9.4	9.6	3.9	4.0	0.2	1.0	0.3	1.2
15	Old Halfway House	19.8	19.3	6.5	6.2	0.5	1.0	0.9	1.4
16	20 Stadium Drive	2.9	3.3	1.4	1.5	-0.5	-0.2	-0.3	-0.1
17	Coventry cottage	10.5	18.2	3.6	5.9	0.4	1.2	0.5	1.5
18	Aller Orchard	1.5	1.6	0.8	0.8	-0.1	0.0	0.0	0.0
19	Trees	-0.7	0.4	-0.4	0.2	-0.3	0.0	-0.2	0.0
20	Rock House	-0.4	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
21	1 Greenhill Road	-0.8	0.0	-0.4	0.0	-0.3	0.1	-0.2	0.1
22	Huxnor Road	-0.8	-0.1	-0.4	0.0	-0.2	0.1	-0.1	0.1
23	Kerswell Gardens	4.4	5.7	1.8	2.3	0.2	0.8	0.3	0.8
24	Edginswell House	-1.6	0.0	-0.7	0.0	0.8	1.3	0.9	1.2
25	18 Darran Close	-0.5	0.1	-0.2	0.0	0.0	0.0	0.0	0.0
26	Tree Tops	-0.1	0.4	0.0	0.2	0.0	0.1	0.0	0.1
27	147 Barton Hill Road	-12.5	-6.9	-5.9	-3.1	-1.1	-0.8	-0.7	-0.5
28	160 Hele Road	-9.2	-5.3	-3.6	-2.0	-0.9	-0.5	-1.4	-0.7
29	Claddon Lodge	0.1	0.5	0.0	0.2	0.0	0.1	0.0	0.1
30	Crossways	0.4	0.7	0.2	0.3	0.0	0.1	0.0	0.1
31	Lilac Cottage	0.5	0.8	0.3	0.4	0.1	0.1	0.0	0.0
32	Torrington House	1.0	4.4	0.4	1.9	0.6	1.0	0.6	1.0
33	45 Wolborough Street	-1.9	-1.8	-0.8	-0.7	-0.2	-0.2	-0.2	-0.2
34	24 Trafalgar Close	0.3	-0.3	0.1	-0.2	0.1	-0.1	0.1	-0.1
35	10 Cricketfield Road	-0.6	-2.9	-0.2	-1.1	-0.1	-0.3	-0.1	-0.4
36	2 Maddacombe Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	1 Hillside Cottage	-0.2	-0.5	-0.1	-0.2	0.0	-0.1	0.0	-0.1
38	Sun Tor	-24.1	-9.9	-9.6	-3.9	-2.3	-1.3	-2.8	-1.5
39	57b Old Exeter Road	-0.1	-1.4	0.0	-0.5	-0.1	-0.2	-0.1	-0.4
40	45 Torquay Road	0.4	1.3	0.1	0.4	0.1	0.2	0.3	0.4
41	1 Abbotsbury Road	-1.8	-3.1	-0.8	-1.4	-0.2	-0.4	-0.1	-0.3
42	46 Torquay Road	-1.1	-0.3	-0.4	-0.1	-0.1	0.0	-0.2	0.0
43	131 East Street	-0.3	-0.6	-0.1	-0.2	0.0	-0.1	0.0	-0.1

Table AQ 5.10: Verified modelled concentrations of annual mean benzene and 1,3-butadiene for the Alliance Option proposed by the Kingskerswell Alliance. Data are taken from the DMRB Screening Method. Exceedences of the air quality objectives are shown in bold italic.

ID	Name	Annual Mean Benzene (Objective = 5ug/m3)					Annual Mean 1,3-Butadiene (Objective = 2.5ug/m3)				
		2008	2013		2028		2008	2013		2028	
		Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option	Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option
1	11 Lyn Grove	0.93	0.56	0.62	0.58	0.63	0.39	0.33	0.38	0.34	0.37
2	Westhill House	0.73	0.90	1.12	0.93	1.16	0.72	0.61	0.81	0.63	0.82
3	1 Aller Cottages	0.65	0.94	1.25	0.95	1.31	0.80	0.67	0.93	0.67	0.96
4	Aller Farmhouse (LP)	0.61	0.88	1.06	0.90	1.12	0.71	0.60	0.74	0.60	0.77
5	Wywurree	0.62	0.69	0.80	0.69	0.82	0.53	0.44	0.53	0.44	0.54
6	1 Pinewood Road	0.54	0.61	0.69	0.64	0.72	0.42	0.36	0.42	0.37	0.43
7	27 St Lukes Road	0.30	0.57	0.67	0.59	0.75	0.41	0.35	0.43	0.35	0.49
8	2 Aller Brake Road	0.93	0.58	0.73	0.60	0.76	0.42	0.36	0.48	0.36	0.50
9	42 Aller Park Road	0.37	0.51	0.62	0.52	0.65	0.35	0.29	0.39	0.30	0.40
10	Aller Farmhouse (F)	0.80	0.88	1.06	0.90	1.12	0.71	0.60	0.74	0.60	0.77
11	Chessels	0.79	0.62	0.80	0.64	0.82	0.46	0.39	0.53	0.40	0.53
12	17 Newton Road	0.43	0.76	1.02	0.79	1.10	0.57	0.49	0.71	0.50	0.76
13	8 Manor court	0.79	0.75	0.87	0.77	0.97	0.58	0.50	0.61	0.50	0.65
14	8 Stadium Drive	0.86	0.76	0.81	0.77	0.99	0.60	0.51	0.57	0.51	0.70
15	Old Halfway House	0.68	0.84	0.96	0.86	1.08	0.68	0.58	0.69	0.58	0.76
16	20 Stadium Drive	0.53	0.45	0.41	0.47	0.47	0.29	0.25	0.22	0.25	0.26
17	Coventry cottage	0.51	0.83	0.89	0.84	1.09	0.67	0.57	0.64	0.57	0.78
18	Aller Orchard	0.65	0.28	0.28	0.30	0.30	0.11	0.09	0.09	0.10	0.10
19	Trees	0.29	0.38	0.35	0.40	0.40	0.15	0.14	0.13	0.15	0.16
20	Rock House	0.39	0.28	0.28	0.29	0.29	0.11	0.10	0.10	0.10	0.10
21	1 Greenhill Road	0.87	0.43	0.41	0.44	0.46	0.25	0.22	0.21	0.23	0.24
22	Huxnor Road	0.47	0.38	0.37	0.40	0.41	0.22	0.20	0.19	0.21	0.21
23	Kerswell Gardens	0.46	0.65	0.70	0.67	0.84	0.49	0.42	0.47	0.42	0.56
24	Edginswell House	0.40	0.52	0.63	0.53	0.75	0.34	0.30	0.38	0.30	0.45
25	18 Darran Close	0.68	0.49	0.49	0.54	0.55	0.27	0.24	0.23	0.26	0.27
26	Tree Tops	0.48	0.44	0.44	0.50	0.50	0.24	0.21	0.21	0.23	0.24
27	147 Barton Hill Road	0.45	0.39	0.35	0.46	0.41	0.21	0.21	0.14	0.23	0.18
28	160 Hele Road	0.30	0.66	0.59	0.72	0.71	0.41	0.41	0.34	0.43	0.40
29	Claddon Lodge	0.46	0.48	0.48	0.54	0.57	0.25	0.23	0.23	0.26	0.27
30	Crossways	0.62	0.44	0.45	0.51	0.52	0.22	0.20	0.20	0.24	0.25
31	Lilac Cottage	0.62	0.29	0.29	0.30	0.31	0.11	0.10	0.10	0.10	0.11
32	Torrington House	0.72	0.44	0.54	0.50	0.65	0.25	0.23	0.30	0.25	0.36
33	45 Wolborough Street	0.29	0.61	0.59	0.68	0.66	0.35	0.31	0.30	0.35	0.33
34	24 Trafalgar Close	0.47	0.57	0.58	0.63	0.60	0.34	0.29	0.29	0.31	0.29
35	10 Cricketfield Road	0.61	0.70	0.69	0.78	0.75	0.42	0.38	0.37	0.43	0.40
36	2 Maddacombe Road	0.82	0.28	0.28	0.29	0.29	0.11	0.09	0.09	0.10	0.10
37	1 Hillside Cottage	1.09	0.45	0.45	0.51	0.49	0.24	0.21	0.21	0.24	0.23
38	Sun Tor	0.44	0.60	0.48	0.70	0.59	0.42	0.40	0.27	0.42	0.33
39	57b Old Exeter Road	0.66	0.82	0.79	0.98	0.91	0.49	0.45	0.44	0.54	0.49
40	45 Torquay Road	0.71	1.03	1.06	1.08	1.12	0.78	0.68	0.70	0.71	0.74
41	1 Abbotsbury Road	0.56	0.42	0.41	0.47	0.44	0.21	0.19	0.18	0.21	0.19
42	46 Torquay Road	0.90	0.63	0.63	0.68	0.68	0.43	0.38	0.37	0.40	0.40
43	131 East Street	0.94	0.69	0.69	0.76	0.74	0.46	0.41	0.40	0.45	0.43

Table AQ 5.11: Modelled change in pollutant concentrations with the Alliance Option proposed by the Kingskerswell Alliance.

ID	Name	Change with Alliance Option (ug/m ³)		Change with Alliance Option (ug/m ³)	
		Benzene		1,3-Butadiene	
		2013	2028	2013	2028
1	11 Lyn Grove	0.05	0.05	0.04	0.03
2	Westhill House	0.22	0.23	0.19	0.18
3	1 Aller Cottages	0.31	0.36	0.27	0.30
4	Aller Farmhouse (LP)	0.18	0.22	0.15	0.17
5	Wywurree	0.12	0.13	0.09	0.09
6	1 Pinewood Road	0.08	0.08	0.06	0.06
7	27 St Lukes Road	0.10	0.16	0.08	0.13
8	2 Aller Brake Road	0.14	0.17	0.12	0.14
9	42 Aller Park Road	0.11	0.13	0.09	0.11
10	Aller Farmhouse (F)	0.18	0.22	0.15	0.17
11	Chessels	0.18	0.18	0.14	0.13
12	17 Newton Road	0.26	0.31	0.22	0.26
13	8 Manor court	0.12	0.20	0.11	0.15
14	8 Stadium Drive	0.05	0.22	0.06	0.18
15	Old Halfway House	0.12	0.23	0.11	0.18
16	20 Stadium Drive	-0.04	0.01	-0.03	0.00
17	Coventry cottage	0.06	0.25	0.07	0.21
18	Aller Orchard	0.00	0.00	0.00	0.00
19	Trees	-0.03	0.00	-0.01	0.00
20	Rock House	0.00	0.00	0.00	0.00
21	1 Greenhill Road	-0.02	0.01	-0.01	0.01
22	Huxnor Road	-0.01	0.01	-0.01	0.01
23	Kerswell Gardens	0.04	0.17	0.05	0.15
24	Edginswell House	0.11	0.23	0.07	0.14
25	18 Darran Close	0.00	0.01	0.00	0.00
26	Tree Tops	0.00	0.00	0.00	0.00
27	147 Barton Hill Road	-0.04	-0.05	-0.06	-0.05
28	160 Hele Road	-0.07	-0.01	-0.07	-0.03
29	Claddon Lodge	0.00	0.02	0.00	0.01
30	Crossways	0.00	0.02	0.00	0.01
31	Lilac Cottage	0.01	0.01	0.00	0.01
32	Torrington House	0.10	0.15	0.07	0.12
33	45 Wolborough Street	-0.02	-0.03	-0.02	-0.03
34	24 Trafalgar Close	0.01	-0.03	0.00	-0.02
35	10 Cricketfield Road	-0.01	-0.03	-0.01	-0.03
36	2 Maddacombe Road	0.00	0.00	0.00	0.00
37	1 Hillside Cottage	0.00	-0.02	0.00	-0.01
38	Sun Tor	-0.11	-0.12	-0.13	-0.09
39	57b Old Exeter Road	-0.02	-0.07	-0.01	-0.04
40	45 Torquay Road	0.03	0.04	0.02	0.03
41	1 Abbotsbury Road	-0.01	-0.03	-0.01	-0.02
42	46 Torquay Road	0.00	0.00	0.00	0.00
43	131 East Street	0.00	-0.03	0.00	-0.02

Table AQ 5.12: Verified modelled concentrations of annual mean benzene carbon monoxide and change in concentration with the Alliance Option proposed by Kingskerswell Alliance. Data are taken from the DMRB Screening Method.

ID	Name	Annual Mean Carbon Monoxide (mg/m ³)					Change with Alliance Option (mg/m ³)	
		2008	2013		2028		2013	2028
		Baseline	Do Minimum	Alliance Option	Do Minimum	Alliance Option		
1	11 Lyn Grove	0.30	0.26	0.27	0.26	0.27	0.01	0.01
2	Westhill House	0.52	0.46	0.57	0.47	0.58	0.12	0.11
3	1 Aller Cottages	0.53	0.46	0.57	0.45	0.59	0.11	0.14
4	Aller Farmhouse (LP)	0.48	0.42	0.47	0.42	0.49	0.05	0.07
5	Wywurree	0.38	0.33	0.35	0.32	0.35	0.02	0.02
6	1 Pinewood Road	0.39	0.34	0.37	0.36	0.38	0.03	0.02
7	27 St Lukes Road	0.32	0.28	0.29	0.29	0.33	0.02	0.04
8	2 Aller Brake Road	0.32	0.27	0.32	0.27	0.34	0.05	0.06
9	42 Aller Park Road	0.28	0.24	0.27	0.24	0.29	0.04	0.05
10	Aller Farmhouse (F)	0.48	0.42	0.47	0.42	0.49	0.05	0.07
11	Chessels	0.34	0.30	0.36	0.30	0.36	0.06	0.06
12	17 Newton Road	0.40	0.35	0.45	0.36	0.48	0.10	0.13
13	8 Manor court	0.42	0.37	0.40	0.37	0.43	0.03	0.06
14	8 Stadium Drive	0.42	0.37	0.38	0.37	0.46	0.01	0.09
15	Old Halfway House	0.49	0.43	0.46	0.43	0.51	0.03	0.08
16	20 Stadium Drive	0.25	0.21	0.19	0.21	0.21	-0.02	0.00
17	Coventry cottage	0.46	0.40	0.42	0.40	0.50	0.01	0.10
18	Aller Orchard	0.15	0.12	0.12	0.13	0.13	0.00	0.00
19	Trees	0.22	0.21	0.18	0.22	0.22	-0.03	0.00
20	Rock House	0.14	0.12	0.12	0.12	0.12	0.00	0.00
21	1 Greenhill Road	0.28	0.25	0.24	0.26	0.27	-0.02	0.01
22	Huxnor Road	0.24	0.22	0.20	0.22	0.23	-0.01	0.01
23	Kerswell Gardens	0.36	0.31	0.32	0.31	0.38	0.01	0.07
24	Edginswell House	0.32	0.29	0.34	0.30	0.38	0.04	0.08
25	18 Darran Close	0.29	0.25	0.25	0.26	0.26	0.00	0.00
26	Tree Tops	0.24	0.20	0.20	0.21	0.21	0.00	0.00
27	147 Barton Hill Road	0.25	0.23	0.18	0.28	0.23	-0.05	-0.05
28	160 Hele Road	0.48	0.44	0.40	0.48	0.45	-0.04	-0.03
29	Claddon Lodge	0.32	0.29	0.29	0.32	0.32	0.00	0.00
30	Crossways	0.29	0.26	0.26	0.29	0.30	0.00	0.01
31	Lilac Cottage	0.15	0.12	0.13	0.13	0.14	0.01	0.01
32	Torrington House	0.30	0.26	0.40	0.28	0.48	0.14	0.20
33	45 Wolborough Street	0.43	0.38	0.37	0.39	0.39	-0.01	-0.01
34	24 Trafalgar Close	0.41	0.34	0.35	0.36	0.35	0.01	-0.01
35	10 Cricketfield Road	0.50	0.45	0.44	0.47	0.46	-0.01	-0.01
36	2 Maddacombe Road	0.14	0.12	0.12	0.12	0.12	0.00	0.00
37	1 Hillside Cottage	0.30	0.27	0.26	0.28	0.28	0.00	-0.01
38	Sun Tor	0.46	0.43	0.32	0.49	0.40	-0.11	-0.09
39	57b Old Exeter Road	0.58	0.53	0.52	0.57	0.55	-0.01	-0.02
40	45 Torquay Road	0.73	0.65	0.66	0.65	0.66	0.01	0.01
41	1 Abbotsbury Road	0.28	0.25	0.24	0.28	0.25	-0.01	-0.02
42	46 Torquay Road	0.45	0.40	0.39	0.42	0.42	-0.01	0.00
43	131 East Street	0.46	0.41	0.41	0.42	0.42	0.00	-0.01

APPENDIX AQ 6 WEBTAG WORKSHEETS

TAG Local Air Quality Worksheets for the Published Scheme

PM₁₀, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	346	534	560	637	2077
Total properties across all routes (some)	325	523	573	646	2067
<i>Do-minimum</i> PM ₁₀ assessment across all routes	6864.795	9079.786	9067.838	10155.88	Total assessment PM ₁₀ (I): 35168.29727
<i>Do-something</i> PM ₁₀ assessment across all routes	5974.72	8748.563	9264.006	10306.19	Total assessment PM ₁₀ (II): 34293.48192
Net total assessment for PM₁₀, all routes (II-I)					-874.8153467
Number of properties with an improvement					1479
Number of properties with no change					0
Number of properties with a deterioration					540

PM₁₀, ROUTE 1.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Besigheim Way A380 (Scheme end)					
Properties (amin)	5	43	78	91	217
Properties (asome)	5	43	78	91	217
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 23.84394	At 70m: 18.1469	At 115m: 16.57445	At 175m: 16.09033	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 23.10951	At 70m: 17.92199	At 115m: 16.50087	At 175m: 16.05991	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	119.2197	780.3168	1292.807	1464.22	Total route assess PM ₁₀ (I): 3656.563392
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsume)	115.5475	770.6456	1287.068	1461.452	Total route assess PM ₁₀ (II): 3634.712813
Net total route assessment for PM₁₀ (II-I)					-21.85057946

PM₁₀, ROUTE 2.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Torquay Road (Penn Inn to Kingskerswell)					
Properties (amin)	80	99	76	119	374
Properties (asome)	63	88	89	128	368
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 20.13731	At 70m: 17.06212	At 115m: 16.21558	At 175m: 15.95412	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 22.75904	At 70m: 17.82029	At 115m: 16.46716	At 175m: 16.04735	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	1610.985	1689.15	1232.384	1898.54	Total route assess PM ₁₀ (I): 6431.058377
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsume)	1433.819	1568.185	1465.577	2054.061	Total route assess PM ₁₀ (II): 6521.643128
Net total route assessment for PM₁₀ (II-I)					90.58475034

PM₁₀, ROUTE 3.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Newton Rd through Kingskerswell					
Properties (amin)	253	353	322	302	1230
Properties (asome)	253	353	322	302	1230
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 19.74466	At 70m: 16.94766	At 115m: 16.17769	At 175m: 15.93988	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 17.17537	At 70m: 16.19864	At 115m: 15.92977	At 175m: 15.84673	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	4995.4	5982.523	5209.216	4813.844	Total route assess PM ₁₀ (I): 21000.98261
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsume)	4345.368	5718.121	5129.386	4785.711	Total route assess PM ₁₀ (II): 19978.5868
Net total route assessment for PM₁₀ (II-I)					-1022.395813

PM₁₀, ROUTE 4.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Rd (South of Kingskerswell)	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	1	0	0	0	1
Properties (asome)	1	0	0	0	1
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 19.93916	At 70m: 17.00436	At 115m: 16.19646	At 175m: 15.94693	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 17.94353	At 70m: 16.43863	At 115m: 16.08544	At 175m: 15.82825	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	19.93916	0	0	0	Total route assess PM ₁₀ (I): 19.93916196
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	17.94353	0	0	0	Total route assess PM ₁₀ (II): 17.94353449
Net total route assessment for PM₁₀ (II-I)					-1.995627465

PM₁₀, ROUTE 5.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Riviera Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	4	8	15	27
Properties (asome)	0	4	8	15	27
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 21.51278	At 70m: 17.4631	At 115m: 16.3483	At 175m: 16.00399	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 21.98224	At 70m: 17.59996	At 115m: 16.3936	At 175m: 16.02101	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	0	69.85242	130.7864	240.0598	Total route assess PM ₁₀ (I): 440.6986521
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	0	70.39985	131.1488	240.3152	Total route assess PM ₁₀ (II): 441.8638097
Net total route assessment for PM₁₀ (II-I)					1.165157658

PM₁₀, ROUTE 6.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Hanelin Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	2	4	5	10	21
Properties (asome)	2	4	5	10	21
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 20.13421	At 70m: 17.06122	At 115m: 16.21528	At 175m: 15.95401	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 19.58659	At 70m: 16.90157	At 115m: 16.16244	At 175m: 15.93415	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	40.26842	68.24487	81.07639	159.5401	Total route assess PM ₁₀ (I): 349.1297328
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	39.17317	67.60629	80.81218	159.3415	Total route assess PM ₁₀ (II): 346.9331491
Net total route assessment for PM₁₀ (II-I)					-2.196583666

PM₁₀, ROUTE 7.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	31	71	99	206
Properties (asome)	1	31	71	99	202
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 15.79674	At 70m: 15.79674	At 115m: 15.79674	At 175m: 15.79674	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 22.86802	At 70m: 17.85819	At 115m: 16.47907	At 175m: 16.05313	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	78.9837	489.699	1121.569	1563.877	Total route assess PM ₁₀ (I): 3254.128605
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	22.86802	553.6039	1170.014	1589.26	Total route assess PM ₁₀ (II): 3335.745617
Net total route assessment for PM₁₀ (II-I)					81.61701214

PM₁₀, ROUTE 8.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass alongside T...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	0	0	1	1
Properties (asome)	0	0	0	1	1
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 16.54097	At 70m: 16.02264	At 115m: 15.92058	At 175m: 15.79674	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 23.07341	At 70m: 17.91375	At 115m: 16.50839	At 175m: 16.05308	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	0	0	0	15.79674	Total route assess PM ₁₀ (I): 15.7967408
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	0	0	0	16.05308	Total route assess PM ₁₀ (II): 16.05307708
Net total route assessment for PM₁₀ (II-I)					0.256336281

NO₂, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m	50-100m	100-150m	150-200m	0-200m
	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Total properties across all routes (min)	346	534	560	637	2077
Total properties across all routes (some)	325	523	573	646	2067
<i>Do-minimum</i> NO ₂ assessment across all routes	8499.29	6419.57	4549.15	4417.17	Total assessment NO ₂ (I): 23885.18
<i>Do-something</i> NO ₂ assessment across all routes	5428.27	5445.86	4565.35	4513.55	Total assessment NO ₂ (II): 19953.03
Net total assessment for NO₂, all routes (II-I)					-3932.15
<i>Number of properties with an improvement</i>					1262
<i>Number of properties with no change</i>					0
<i>Number of properties with a deterioration</i>					757

NO₂, ROUTE 1.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Besigheim Way A380 (Scheme end t...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	43	78	91	217
Properties (asome)	5	43	78	91	217
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 33.19	At 70m: 15.24	At 115m: 9.32	At 175m: 7.41	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 33.5	At 70m: 15.35	At 115m: 9.36	At 175m: 7.42	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	165.95	655.32	726.96	674.31	Total route assess NO ₂ (I): 2222.54
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	167.5	660.05	730.08	675.22	Total route assess NO ₂ (II): 2232.85
Net total route assessment for NO₂ (II-I)					10.31

NO₂, ROUTE 2.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Road (Penn Inn to Kingske...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	80	99	76	119	374
Properties (asome)	63	88	89	128	368
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 25.68	At 70m: 12.44	At 115m: 8.34	At 175m: 7.03	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 35.15	At 70m: 15.99	At 115m: 9.6	At 175m: 7.5	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	2054.4	1231.56	633.84	836.57	Total route assess NO ₂ (I): 4756.37
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	2214.45	1407.12	854.4	960	Total route assess NO ₂ (II): 5435.97
Net total route assessment for NO₂ (II-I)					679.6

NO₂, ROUTE 3.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Newton Rd through Kingskerswell	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	253	353	322	302	1230
Properties (asome)	253	353	322	302	1230
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 24.41	At 70m: 12	At 115m: 8.18	At 175m: 6.97	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 11.66	At 70m: 7.85	At 115m: 6.77	At 175m: 6.44	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	6175.73	4236	2633.96	2104.94	Total route assess NO ₂ (I): 15150.63
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	2949.98	2771.05	2179.94	1944.88	Total route assess NO ₂ (II): 9845.85
Net total route assessment for NO ₂ (II-I)					-5304.78

NO₂, ROUTE 4.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Rd (South of Kingskerswell)	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	1	0	0	0	1
Properties (asome)	1	0	0	0	1
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 25.28	At 70m: 12.3	At 115m: 8.29	At 175m: 7.01	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 17.04	At 70m: 9.61	At 115m: 7.76	At 175m: 6.41	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	25.28	0	0	0	Total route assess NO ₂ (I): 25.28
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	17.04	0	0	0	Total route assess NO ₂ (II): 17.04
Net total route assessment for NO ₂ (II-I)					-8.24

NO₂, ROUTE 5.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Riviera Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	4	8	15	27
Properties (asome)	0	4	8	15	27
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 30.61	At 70m: 14.25	At 115m: 8.97	At 175m: 7.27	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 31.66	At 70m: 14.65	At 115m: 9.11	At 175m: 7.33	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	0	57	71.76	109.05	Total route assess NO ₂ (I): 237.81
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	0	58.6	72.88	109.95	Total route assess NO ₂ (II): 241.43
Net total route assessment for NO ₂ (II-I)					3.62

NO₂, ROUTE 6.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Hanelin Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	2	4	5	10	21
Properties (asome)	2	4	5	10	21
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 23.39	At 70m: 11.64	At 115m: 8.06	At 175m: 6.93	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 21.75	At 70m: 11.09	At 115m: 7.87	At 175m: 6.85	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	46.78	46.56	40.3	69.3	Total route assess NO ₂ (I): 202.94
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	43.5	44.36	39.35	68.5	Total route assess NO ₂ (II): 195.71
Net total route assessment for NO ₂ (II-I)					-7.23

NO₂, ROUTE 7.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	31	71	99	206
Properties (asome)	1	31	71	99	202
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 6.23	At 70m: 6.23	At 115m: 6.23	At 175m: 6.23	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (b _{some})	At 20m: 35.8	At 70m: 16.28	At 115m: 9.7	At 175m: 7.55	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	31.15	193.13	442.33	616.77	Total route assess NO ₂ (I): 1283.38
<i>Do-something</i> NO ₂ assessment (<i>c = asome*b_{some}</i>)	35.8	504.68	688.7	747.45	Total route assess NO ₂ (II): 1976.63
Net total route assessment for NO ₂ (II-I)					693.25

NO₂, ROUTE 8.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass alongside To	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	0	0	1	1
Properties (asome)	0	0	0	1	1
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 10.03	At 70m: 7.4	At 115m: 6.88	At 175m: 6.23	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (b _{some})	At 20m: 36.5	At 70m: 16.55	At 115m: 9.85	At 175m: 7.55	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	0	0	0	6.23	Total route assess NO ₂ (I): 6.23
<i>Do-something</i> NO ₂ assessment (<i>c = asome*b_{some}</i>)	0	0	0	7.55	Total route assess NO ₂ (II): 7.55
Net total route assessment for NO ₂ (II-I)					1.32

Worksheet 1: Regional Air Quality - Strategy and Plan Level

Option Name: South Devon Link Road Published Scheme					
Present Year: 2008		Future Year: 2013			
Tonnes per year					
	Do-Minimum		Do-Something	Do-Something compared with	
	Present	Future	Future	Present Do-Min	Future Do-Min
	A	B	C	D=C-A	E=C-B
NO _x	310	233	251	-59	18
PM ₁₀	10.7	8.0	8.4	-2.3	0.4

APPRAISAL- Greenhouse Gases

Proposal Name: South Devon Link Road (Published Scheme)

Current Year of Appraisal: 2008

Proposal Opening year: 2013

Project (Road/Rail or Road and Rail): Road

Overall Assessment Score:

Net Present Value of Carbon Emissions of Proposal (£):

-869,000

(60 Year Period)

*positive value reflects a net benefit (i.e. carbon emissions reduction)

Quantitative Assessment:

Change in Carbon Emissions over 60 year appraisal period (tonnes):

25,304

(between 'with scheme' and 'without scheme' scenarios)

Change in Carbon Emissions in Opening year (tonnes):

699

(between 'with scheme' and 'without scheme' scenarios)

Qualitative Comments:

The scheme results in an increase in carbon emissions in all years.

Sensitivity Analysis:

Description:

Upper Estimate Net Present Value of Carbon Emissions of Proposal (£):

-1,473,000

Lower Estimate Net Present Value of Carbon Emissions of Proposal (£):

-568,000

Data Sources:

Data from TUBA May 2009

TAG Local Air Quality Worksheets for the Alliance Option

PM₁₀, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	346	534	560	637	2077
Total properties across all routes (some)	346	534	560	637	2077
<i>Do-minimum</i> PM ₁₀ assessment across all routes	6864.795	9079.786	9067.838	10155.88	Total assessment PM ₁₀ (I): 35168.29727
<i>Do-something</i> PM ₁₀ assessment across all routes	7257.04	9265.154	9133.115	10181.09	Total assessment PM ₁₀ (II): 35836.40027
Net total assessment for PM ₁₀ , all routes (II-I)					668.1029934
Number of properties with an improvement					48
Number of properties with no change					148
Number of properties with a deterioration					1823

PM₁₀, ROUTE 1.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Besigheim Way A380 (Scheme end)					
Properties (amin)	5	43	78	91	217
Properties (asome)	5	43	78	91	217
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 23.84394	At 70m: 18.1469	At 115m: 16.57445	At 175m: 16.09033	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 26.84	At 70m: 19.01	At 115m: 16.86	At 175m: 16.19	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	119.2197	780.3168	1292.807	1464.22	Total route assess PM ₁₀ (I): 3656.563392
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	134.2168	817.2977	1315.106	1473.674	Total route assess PM ₁₀ (II): 3740.294318
Net total route assessment for PM ₁₀ (II-I)					83.73092604

PM₁₀, ROUTE 2.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Torquay Road (Penn Inn to Kingskerswell)					
Properties (amin)	80	99	76	119	374
Properties (asome)	80	99	76	119	374
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 20.13731	At 70m: 17.06212	At 115m: 16.21558	At 175m: 15.95412	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 20.84631	At 70m: 17.26881	At 115m: 16.28399	At 175m: 15.97982	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	1610.985	1689.15	1232.384	1898.54	Total route assess PM ₁₀ (I): 6431.058377
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	1667.705	1709.613	1237.583	1901.599	Total route assess PM ₁₀ (II): 6516.499733
Net total route assessment for PM ₁₀ (II-I)					85.44135605

PM₁₀, ROUTE 3.	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Route name: Newton Rd through Kingskerswell					
Properties (amin)	253	353	322	302	1230
Properties (asome)	253	353	322	302	1230
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 19.74466	At 70m: 16.94766	At 115m: 16.17769	At 175m: 15.93988	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 21.01526	At 70m: 17.31807	At 115m: 16.30029	At 175m: 15.98595	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	4995.4	5982.523	5209.216	4813.844	Total route assess PM ₁₀ (I): 21000.98261
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	5316.861	6113.277	5248.694	4827.757	Total route assess PM ₁₀ (II): 21506.58946
Net total route assessment for PM ₁₀ (II-I)					505.6068478

PM₁₀, ROUTE 4.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Rd (South of Kingskerswell)	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	1	0	0	0	1
Properties (asome)	1	0	0	0	1
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 19.93916	At 70m: 17.00436	At 115m: 16.19646	At 175m: 15.94693	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (besome)	At 20m: 20.19868	At 70m: 17.08001	At 115m: 16.2215	At 175m: 15.95634	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	19.93916	0	0	0	Total route assess PM ₁₀ (I): 19.93916196
<i>Do-something</i> PM ₁₀ assessment (c = asome*besome)	20.19868	0	0	0	Total route assess PM ₁₀ (II): 20.19868399
Net total route assessment for PM₁₀ (II-I)					0.259522031

PM₁₀, ROUTE 5.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Riviera Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	4	8	15	27
Properties (asome)	0	4	8	15	27
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 21.51278	At 70m: 17.4631	At 115m: 16.3483	At 175m: 16.00399	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (besome)	At 20m: 19.68255	At 70m: 16.92955	At 115m: 16.1717	At 175m: 15.93763	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	0	69.85242	130.7864	240.0598	Total route assess PM ₁₀ (I): 440.6986521
<i>Do-something</i> PM ₁₀ assessment (c = asome*besome)	0	67.71819	129.3736	239.0644	Total route assess PM ₁₀ (II): 436.1561943
Net total route assessment for PM₁₀ (II-I)					-4.542457729

PM₁₀, ROUTE 6.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Hanelin Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	2	4	5	10	21
Properties (asome)	2	4	5	10	21
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 20.13421	At 70m: 17.06122	At 115m: 16.21528	At 175m: 15.95401	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (besome)	At 20m: 19.53757	At 70m: 16.88728	At 115m: 16.15771	At 175m: 15.93237	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	40.26842	68.24487	81.07639	159.5401	Total route assess PM ₁₀ (I): 349.1297328
<i>Do-something</i> PM ₁₀ assessment (c = asome*besome)	39.07514	67.54913	80.78853	159.3237	Total route assess PM ₁₀ (II): 346.736532
Net total route assessment for PM₁₀ (II-I)					-2.393200825

PM₁₀, ROUTE 7.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	31	71	99	206
Properties (asome)	5	31	71	99	206
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 15.79674	At 70m: 15.79674	At 115m: 15.79674	At 175m: 15.79674	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (besome)	At 20m: 15.79674	At 70m: 15.79674	At 115m: 15.79674	At 175m: 15.79674	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	78.9837	489.699	1121.569	1563.877	Total route assess PM ₁₀ (I): 3254.128605
<i>Do-something</i> PM ₁₀ assessment (c = asome*besome)	78.9837	489.699	1121.569	1563.877	Total route assess PM ₁₀ (II): 3254.128605
Net total route assessment for PM₁₀ (II-I)					0

PM₁₀, ROUTE 8.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass alongside T...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	0	0	1	1
Properties (asome)	0	0	0	1	1
PM ₁₀ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 16.54097	At 70m: 16.02264	At 115m: 15.92058	At 175m: 15.79674	N/A
PM ₁₀ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 16.58759	At 70m: 16.03679	At 115m: 15.92834	At 175m: 15.79674	N/A
<i>Do-minimum</i> PM ₁₀ assessment (c = amin*bmin)	0	0	0	15.79674	Total route assess PM ₁₀ (I): 15.7967408
<i>Do-something</i> PM ₁₀ assessment (c = asome*bsome)	0	0	0	15.79674	Total route assess PM ₁₀ (II): 15.7967408
Net total route assessment for PM₁₀ (II-I)					0

NO₂, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m	50-100m	100-150m	150-200m	0-200m
	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Total properties across all routes (min)	346	534	560	637	2077
Total properties across all routes (some)	346	534	560	637	2077
<i>Do-minimum</i> NO ₂ assessment across all routes	8499.29	6419.57	4549.15	4417.17	Total assessment NO ₂ (I): 23885.18
<i>Do-something</i> NO ₂ assessment across all routes	9508.06	6963.54	4740.25	4492.47	Total assessment NO ₂ (II): 25704.32
Net total assessment for NO₂, all routes (II-I)					1819.14
<i>Number of properties with an improvement</i>					48
<i>Number of properties with no change</i>					148
<i>Number of properties with a deterioration</i>					1823

NO₂, ROUTE 1.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Besigheim Way A380 (Scheme end t...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	43	78	91	217
Properties (asome)	5	43	78	91	217
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 33.19	At 70m: 15.24	At 115m: 9.32	At 175m: 7.41	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 37.29	At 70m: 16.86	At 115m: 9.91	At 175m: 7.63	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	165.95	655.32	726.96	674.31	Total route assess NO ₂ (I): 2222.54
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	186.45	724.98	772.98	694.33	Total route assess NO ₂ (II): 2378.74
Net total route assessment for NO₂ (II-I)					156.2

NO₂, ROUTE 2.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Road (Penn Inn to Kingske...	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	80	99	76	119	374
Properties (asome)	80	99	76	119	374
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 25.68	At 70m: 12.44	At 115m: 8.34	At 175m: 7.03	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsome)	At 20m: 27.61	At 70m: 13.14	At 115m: 8.58	At 175m: 7.12	N/A
<i>Do-minimum</i> NO ₂ assessment (c = amin*bmin)	2054.4	1231.56	633.84	836.57	Total route assess NO ₂ (I): 4756.37
<i>Do-something</i> NO ₂ assessment (c = asome*bsome)	2208.8	1300.86	652.08	847.28	Total route assess NO ₂ (II): 5009.02
Net total route assessment for NO₂ (II-I)					252.65

NO₂, ROUTE 3.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Newton Rd through Kingskerswell	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	253	353	322	302	1230
Properties (asome)	253	353	322	302	1230
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 24.41	At 70m: 12	At 115m: 8.18	At 175m: 6.97	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 27.71	At 70m: 13.17	At 115m: 8.59	At 175m: 7.13	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	6175.73	4236	2633.96	2104.94	Total route assess NO ₂ (I): 15150.63
<i>Do-something</i> NO ₂ assessment (<i>c = asome*bsume</i>)	7010.63	4649.01	2765.98	2153.26	Total route assess NO ₂ (II): 16578.88
Net total route assessment for NO ₂ (II-I)					1428.25

NO₂, ROUTE 4.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Torquay Rd (South of Kingskerswell)	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	1	0	0	0	1
Properties (asome)	1	0	0	0	1
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 25.28	At 70m: 12.3	At 115m: 8.29	At 175m: 7.01	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 26.65	At 70m: 12.79	At 115m: 8.46	At 175m: 7.08	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	25.28	0	0	0	Total route assess NO ₂ (I): 25.28
<i>Do-something</i> NO ₂ assessment (<i>c = asome*bsume</i>)	26.65	0	0	0	Total route assess NO ₂ (II): 26.65
Net total route assessment for NO ₂ (II-I)					1.37

NO₂, ROUTE 5.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Riviera Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	4	8	15	27
Properties (asome)	0	4	8	15	27
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 30.61	At 70m: 14.25	At 115m: 8.97	At 175m: 7.27	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 26.26	At 70m: 12.65	At 115m: 8.41	At 175m: 7.06	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	0	57	71.76	109.05	Total route assess NO ₂ (I): 237.81
<i>Do-something</i> NO ₂ assessment (<i>c = asome*bsume</i>)	0	50.6	67.28	105.9	Total route assess NO ₂ (II): 223.78
Net total route assessment for NO ₂ (II-I)					-14.03

NO₂, ROUTE 6.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Hanelin Way	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	2	4	5	10	21
Properties (asome)	2	4	5	10	21
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 23.39	At 70m: 11.64	At 115m: 8.06	At 175m: 6.93	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (bsume)	At 20m: 22.19	At 70m: 11.24	At 115m: 7.92	At 175m: 6.87	N/A
<i>Do-minimum</i> NO ₂ assessment (<i>c = amin*bmin</i>)	46.78	46.56	40.3	69.3	Total route assess NO ₂ (I): 202.94
<i>Do-something</i> NO ₂ assessment (<i>c = asome*bsume</i>)	44.38	44.96	39.6	68.7	Total route assess NO ₂ (II): 197.64
Net total route assessment for NO ₂ (II-I)					-5.3

NO₂, ROUTE 7.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	5	31	71	99	206
Properties (asome)	5	31	71	99	206
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 6.23	At 70m: 6.23	At 115m: 6.23	At 175m: 6.23	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (b _{some})	At 20m: 6.23	At 70m: 6.23	At 115m: 6.23	At 175m: 6.23	N/A
<i>Do-minimum</i> NO ₂ assessment ($c = amin * bmin$)	31.15	193.13	442.33	616.77	Total route assess NO ₂ (I): 1283.38
<i>Do-something</i> NO ₂ assessment ($c = asome * bsome$)	31.15	193.13	442.33	616.77	Total route assess NO ₂ (II): 1283.38
Net total route assessment for NO ₂ (II-I)					0

NO₂, ROUTE 8.	0-50m	50-100m	100-150m	150-200m	0-200m
Route name: Kingskerswell bypass alongside To	(i)	(ii)	(iii)	(iv)	(v=i+ii+iii+iv)
Properties (amin)	0	0	0	1	1
Properties (asome)	0	0	0	1	1
NO ₂ concentration at average point within band for <i>do-minimum</i> (bmin)	At 20m: 10.03	At 70m: 7.4	At 115m: 6.88	At 175m: 6.23	N/A
NO ₂ concentration at average point within band for <i>do-something</i> (b _{some})	At 20m: 10.33	At 70m: 7.5	At 115m: 6.93	At 175m: 6.23	N/A
<i>Do-minimum</i> NO ₂ assessment ($c = amin * bmin$)	0	0	0	6.23	Total route assess NO ₂ (I): 6.23
<i>Do-something</i> NO ₂ assessment ($c = asome * bsome$)	0	0	0	6.23	Total route assess NO ₂ (II): 6.23
Net total route assessment for NO ₂ (II-I)					0

Worksheet 1: Regional Air Quality - Strategy and Plan Level

Option Name: South Devon Link Road Alternative Scheme					
Present Year: 2008			Future Year: 2013		
Tonnes per year					
	Do-Minimum		Do-Something	Do-Something compared with	
	Present	Future	Future	Present Do-Min	Future Do-Min
	A	B	C	D=C-A	E=C-B
NO _x	310	233	237	-73	4
PM ₁₀	10.7	8.0	8.2	-2.5	0.2

APPRAISAL- Greenhouse Gases

Proposal Name: South Devon Link Road (Alternative Scheme)

Current Year of Appraisal: 2008

Proposal Opening year: 2013

Project (Road/Rail or Road and Rail): Road

Overall Assessment Score:

Net Present Value of Carbon Emissions of Proposal (£):

-466,000

(60 Year Period)

*positive value reflects a net benefit (i.e. carbon emissions reduction)

Quantitative Assessment:

Change in Carbon Emissions over 60 year appraisal period (tonnes):

14,589

(between 'with scheme' and 'without scheme' scenarios)

Change in Carbon Emissions in Opening year (tonnes):

204

(between 'with scheme' and 'without scheme' scenarios)

Qualitative Comments:

The scheme results in an increase in carbon emissions in all years.

Sensitivity Analysis:

Description:

Upper Estimate Net Present Value of Carbon Emissions of Proposal (£):

-778,000

Lower Estimate Net Present Value of Carbon Emissions of Proposal (£):

-310,000

Data Sources:

Data from TUBA May 2009

APPENDIX AQ 7 ALLIANCE OPTION

ANNEX 1: ASSESSMENT OF IMPACTS

1 Introduction

1.1 An alternative proposal has been put forward by the Kingskerswell Alliance (**DCC/A/4**), which essentially allows for online improvements through Kingskerswell and a tunnel under Penn Inn roundabout. The majority of the scheme has 3 lanes of traffic, with the central lane operating a tidal flow system.

1.2 An assessment of the impacts of this Alliance Option has been undertaken using the same methodology as that used to assess the Published Scheme:

- Local air quality impacts are assessed in the opening year and the design year using a combination of detailed modelling in the vicinity of the Kingskerswell AQMA and the DMRB Screening Method outside this area.
- Regional air quality impacts are modelled using the DMRB Screening Method and, for carbon dioxide, using the outputs from the TUBA model.
- An appraisal of the local air quality and greenhouse gas impacts of the scheme is undertaken using the WebTAG methodology.
- The impacts during construction are assessed qualitatively

2 Local Air Quality

2.1 The local air quality impacts of the Alliance Option are discussed in this chapter with reference to nitrogen dioxide concentrations. The full set of model results at the specified receptors are provided in **Appendix AQ 5**. As is the case with the Published Scheme, concentrations of all other pollutants, carbon monoxide, benzene, 1,3-

butadiene and PM₁₀, are well within the air quality objectives in both the with scheme and without scheme scenarios, and the impacts of the Alliance Option on these pollutants is considered negligible.

Overall Change in Exposure

2.2 The assessment of the change in exposure to pollution within the detailed study area shows that, with the Alliance Option, there is a net increase in overall exposure (**Table AQ 7.1**). The net total assessment score for nitrogen dioxide is positive, and 48 properties experience an improvement in air quality whereas 1819 properties experience a deterioration.

Option	Net Total Assessment for NO ₂	No of properties with an improvement in NO ₂ exposure	No of properties with a deterioration in NO ₂ exposure
Alliance Option	1819	48	1823
Published Scheme	-3932	1262	757

2.3 The net increase in exposure is a direct result of increased traffic flows along the heavily populated existing route of the A380, where more than 1800 properties are adversely affected. With the Published Scheme, traffic levels through Kingskerswell are reduced and an improvement in air quality is seen at approximately 1250 properties.

2.4 With the Alliance Option, a reduction in exposure is seen on Riviera Way and Hamelin Way in the vicinity of the Kerswell Gardens

Roundabout to the south of Kingskerswell. This is due to reduced congestion on these routes with the operation of the Alliance Option.

Detailed Study Area Selected Receptors

- 2.5 The verified detailed model predictions of nitrogen dioxide for the selected receptors in the baseline (2008) and opening year (2013) with the Alliance Option and without the Scheme (Do Minimum) are provided in **Diagram AQ 7.1**. **Diagram AQ 7.2** shows the change in pollutant concentrations with the Alliance Option and, for comparison, the change in pollutant concentrations with the Published Scheme.
- 2.6 By the opening year, the concentrations of annual mean nitrogen dioxide are predicted to be well within the air quality objectives at all residential properties in the study area in the Do Minimum scenario. With the Alliance Option, concentrations increase at receptors along the existing A380 (Receptors 1 to 17), but are generally within the objective with the notable exception of Aller Cottages. At Aller Cottages, nitrogen dioxide concentrations increase by more than 10ug/m³ and exceed the objective. At Old Halfway House, concentrations are within the objective with the Alliance Option but are at significant risk of exceeding the objective. At Aller Farmhouse and Coventry Cottage, exceedences were modelled in the Baseline but concentrations are predicted to decrease to within the objective whether or not the Alliance Option is in operation.
- 2.7 **Diagram AQ 7.2** shows that, as described above, with the Alliance Option roadside pollutant concentrations generally increase in the

opening year. This is due to an increase in traffic flow on the A380 through Kingskerswell. The small decrease in concentrations at some receptors close to the route of the Published Scheme (Receptors 19 to 21) is related to a slight decrease in traffic using minor roads to avoid congestion on the A380 in Kingskerswell. The improvement in air quality is not considered significant due to the low magnitude of the impact.

Wider Study Area Selected Receptors

- 2.8 **Diagrams AQ 7.3** and **AQ 7.4** show the verified nitrogen dioxide concentrations from the DMRB Screening Method for selected receptors outside the detailed study area for the opening year.
- 2.9 For receptors outside the detailed modelling study area, the predicted annual mean concentrations of nitrogen dioxide in the scheme opening year (2013) are lower than those in the baseline year (2008) whether or not the Alliance Option is in operation, and all are within the air quality objective of $40\mu\text{g}/\text{m}^3$ except 45 Torquay Road.
- 2.10 At 45 Torquay Road, concentrations decrease substantially between the baseline and the opening year, but remain slightly above the air quality objective. At this receptor, the impact of the Alliance Option is a negligible increase in pollutant concentrations.
- 2.11 At a number of receptors e.g. Sun Tor, Barton Hill Road, pollutant concentrations decrease markedly ($>8\mu\text{g}/\text{m}^3$) with the Scheme. This is due to a substantial decrease in flow along nearby routes as traffic opts

to use the upgraded route through Kingskerswell rather than local roads. The improvement in air quality along these routes with the Alliance Option is slightly less than that predicted with the Published Scheme.

- 2.12 By 2028, concentrations of all pollutants, including nitrogen dioxide, are predicted to be within the air quality objectives, including Torquay Road. Concentrations in Kingskerswell increase with the operation of the Alliance Option, but do not exceed the objective by 2028.

3 Regional Air Quality

- 3.1 **Table AQ 7.2** shows the results of the DMRB Regional Impact Assessment for predicted changes in emissions of carbon dioxide (CO₂) and trans-boundary pollutants.

- 3.2 The table shows that, in the opening year, 2013, the Alliance Option results in an overall increase in vehicle emissions. For hydrocarbons and carbon monoxide, the increase is less than 1% of the total emissions and is considered to be negligible on both the local and national scale. For nitrogen oxides, PM₁₀ and carbon dioxide, the local increase in emissions is less than 4% of the total emissions from traffic in the study area. This is due to an increase in vehicle-kilometres travelled within the study area.

- 3.3 Similarly, in the design year, 2028, the Alliance Option results in an overall local increase in vehicle emissions, by up to 7%, due to an increase in vehicle-kilometres travelled. On the national scale, the

impacts of the Alliance Option on emissions are negligible, with the maximum increase in emissions being less than 0.01% of UK emissions from road traffic in 2006.

3.4 Overall, total emissions of nitrogen oxides and particulate matter are predicted to decrease over time as cleaner vehicles enter the fleet. Therefore, total emissions are lower than the baseline emissions in both the Do Minimum and Alliance Option scenarios. However, as described above, the Alliance Option results in a local increase in emissions.

3.5 Local emissions of carbon dioxide increase over time. The Alliance Option is predicted to result in an increase in emissions of up to 5% of the Do Minimum emissions. The Published Scheme is predicted to result in an increase of up to 10% of the Do Minimum emissions.

3.6 **Table AQ 7.3** shows the opening year and design year emissions from the TUBA model. As was the case for the Published Scheme, the Alliance Option results in an increase in carbon emissions on a regional scale. However, in relation to emissions on the regional scale, both the local and regional increase in carbon emissions are less than 1% of the total carbon emissions with the Alliance Option.

4 Construction Impacts

4.1 Due to the significant earthworks required for the construction of a tunnel, construction of the Alliance Option is considered to be a significant risk in relation to potential dust nuisance. The appropriate

mitigation methods are as outlined for the Published Scheme in **Appendix AQ 1, Annex 5**.

4.2 The primary receptors for dust impacts will be the properties in the vicinity of Penn Inn, extending north and south of the roundabout. There are a number of properties within 25m of the proposed route of these regions. Through Kingskerswell itself, the Alliance Option will have low dust generation potential since no significant earthworks will be required. Properties on the western edge of Kingskerswell, impacted by the construction of the Published Scheme, will be unaffected by the Alliance Option.

4.3 The locations of stockpiles of excavated material or haulage routes have not been identified. However, the potential exists for a significant, but temporary, increase in heavy duty vehicles travelling through the Kingskerswell AQMA leading to a temporary worsening of air quality prior to the operation of the scheme.

5 TAG Appraisal Results

Local Air Quality

5.2 **Table AQ 7.4** provides a summary of the results of the WebTAG assessment for local air quality. The worksheets are provided in **Appendix AQ 6**. The total assessment values for both NO₂ and PM₁₀ are positive. This indicates an overall increase in pollution exposure and therefore an adverse effect on the community as a whole.

Greenhouse Gases

5.3 **Table AQ 7.5** shows the results of the WebTAG assessment for greenhouse gases. The assessment shows a net increase in carbon emissions over the appraisal period of 14,589 tonnes, including an increase in the Scheme opening year of 204 tonnes.

5.4 The increase in carbon over the 60 years represents less than 0.1% of the total emissions in the Do Minimum scenario on all trips considered in the TUBA model. In reality, this is considered to be a neutral impact.

6 Summary

6.1 The DMRB air quality assessment and TAG appraisal for the Option proposed by the Kingskerswell Alliance have shown that the Alliance Option has a net adverse impact on both local and regional air quality.

6.2 The model results indicate an overall increase in exposure to pollution, primarily due to an increase in traffic on Newton Road / Torquay Road through Kingskerswell. This is in contrast to the Published Scheme, for which a net reduction in exposure to pollution is predicted.

6.3 Furthermore, the Alliance Option results in a new exceedence of the air quality objective for nitrogen dioxide, at Aller Cottages, and significantly increased risk of exceedence of the air quality objective at Old Halfway House. In the Do Minimum scenario, these properties experience pollution levels well within the air quality objective. The Alliance Option is therefore considered to have an adverse impact on the Kingskerswell AQMA. In contrast, the Published Scheme has a beneficial impact on the majority of properties currently within the Kingskerswell AQMA.

6.4 In terms of regional air quality, the TAG appraisal shows that there is a slight adverse impact on emissions of regional pollutants and greenhouse gases. However, on a regional scale, the impact of the Alliance Option on total emissions from road traffic is considered to be neutral.

ANNEX 2: TABLES AND DIAGRAMS

Table AQ 7.1: Summary of the quantitative results of the local air quality WebTAG assessment for the Alliance Option

Net total Assessment for PM ₁₀	Net Total Assessment for NO ₂	No of properties with an improvement		No of properties with no change		No of properties with a deterioration	
		PM ₁₀	NO ₂	PM ₁₀	NO ₂	PM ₁₀	NO ₂
668	1819	48	48	148	148	1823	1823

Table AQ 7.2: Predicted total emissions of pollutants (tonnes/year), from DMRB Screening Method for study area for the Alliance Option. Data for UK from National Atmospheric Emissions Inventory

Pollutant	Carbon Monoxide	THC	Nitrogen Oxides	PM ₁₀	Carbon Dioxide (As C)
UK Total Road Traffic Emissions 2006	975,000	100,000	510,000	32,000	32,940,000
2008	552	68.7	310	10.7	32,282
2013 DM	541	66.1	233	8.0	32,823
2013 DS	543	66.1	237	8.2	33,321
2013 (DS – DM)	2	0.01	4	0.3	498
2013 % change with DS	0.3%	0.0%	1.7%	3.2%	1.5%
2013 Change as % of 2006 UK Total Road Traffic Emissions	0.0002%	0.0000%	0.001%	0.001%	0.002%
2028 DM	649	77.8	215	8.1	36,264
2028 DS	670	80.0	225	8.6	38,020
2028 (DS – DM)	22	2.2	9	0.5	1,757
2028 % change with DS	3.4%	2.9%	4.2%	6.2%	4.8%
2028 Change as % of 2006 UK Total Road Traffic Emissions	0.002%	0.002%	0.002%	0.002%	0.005%

Notes:

- 1 PM₁₀ emissions for road transport are for combustion of fuel
DM = Do Minimum, DS = Do Scheme

Table AQ 7.3: Predicted emissions of carbon dioxide (tonnes C/year), from TUBA, for the Alliance Option. Data for UK from National Atmospheric Emissions Inventory

Pollutant	Carbon Dioxide (As C)
UK Total Road Traffic Emissions 2006	32,940,000
2013 DM	210,038
2013 DS	210,242
2013 (DS – DM)	204
2013 % change with DS	0.10%
2013 Change as % of 2006 UK Total Road Traffic Emissions	0.001%
2028 DM	250,226
2028 DS	250,477
2028 (DS – DM)	251
2028 % change with DS	0.10%
2028 Change as % of 2006 UK Total Road Traffic Emissions	0.001%

Table AQ 7.4: Summary of the local air quality WebTAG assessment for the Alliance Option

Local Air Quality	Quantitative Measure	Assessment Score
<p>Net increase in exposure due to a significant increase in concentrations along the A380 from Penn Inn through Kingskerswell.</p> <p>Maximum deterioration in air quality at 20m is 4.1µg/m³ NO₂, 3.0µg/m³ PM₁₀ (off Besigheim Way, northern end of Scheme). Maximum improvement in air quality at 20m is 4.4µg/m³ NO₂, 1.8µg/m³ PM₁₀ (Riviera Way). Changes are due to an increase in traffic on the A380 north of Kerswell Gardens, and a reduction in traffic on Riviera Way.</p> <p>Scheme has an adverse impact on pollution concentrations in the Kingskerswell AQMA.</p>	<p>PM₁₀: 48 properties experience an improvement in air quality, 1,823 properties experience a deterioration, 148 properties experience no change in air quality</p> <p>NO₂: 48 properties experience an improvement in air quality, 1,823 properties experience a deterioration, 148 properties experience no change in air quality</p>	<p>PM₁₀: 668</p> <p>NO₂: 1819</p>

Table AQ 7.5: Summary of the greenhouse gases WebTAG assessment for the Alliance Option

Greenhouse Gases	Quantitative Measure	Assessment Score
<p>Net increase in carbon emissions over the 60 year period and in the opening year.</p> <p>The increase is due to an increase in the vehicle kilometres travelled by car. Emissions from light goods vehicles and heavy duty vehicles show a slight decrease in carbon emissions.</p>	<p>Change in carbon over 60 years: 14,589 tonnes</p> <p>Change in carbon in opening year: 204 tonnes</p>	<p>-£466,000</p>

Diagram AQ 7.1: Modelled baseline (2008) and opening year (2013) annual mean nitrogen dioxide ($\mu\text{g}/\text{m}^3$) with the Alliance Option for the detailed study area. The data are verified results from the detailed dispersion modelling.

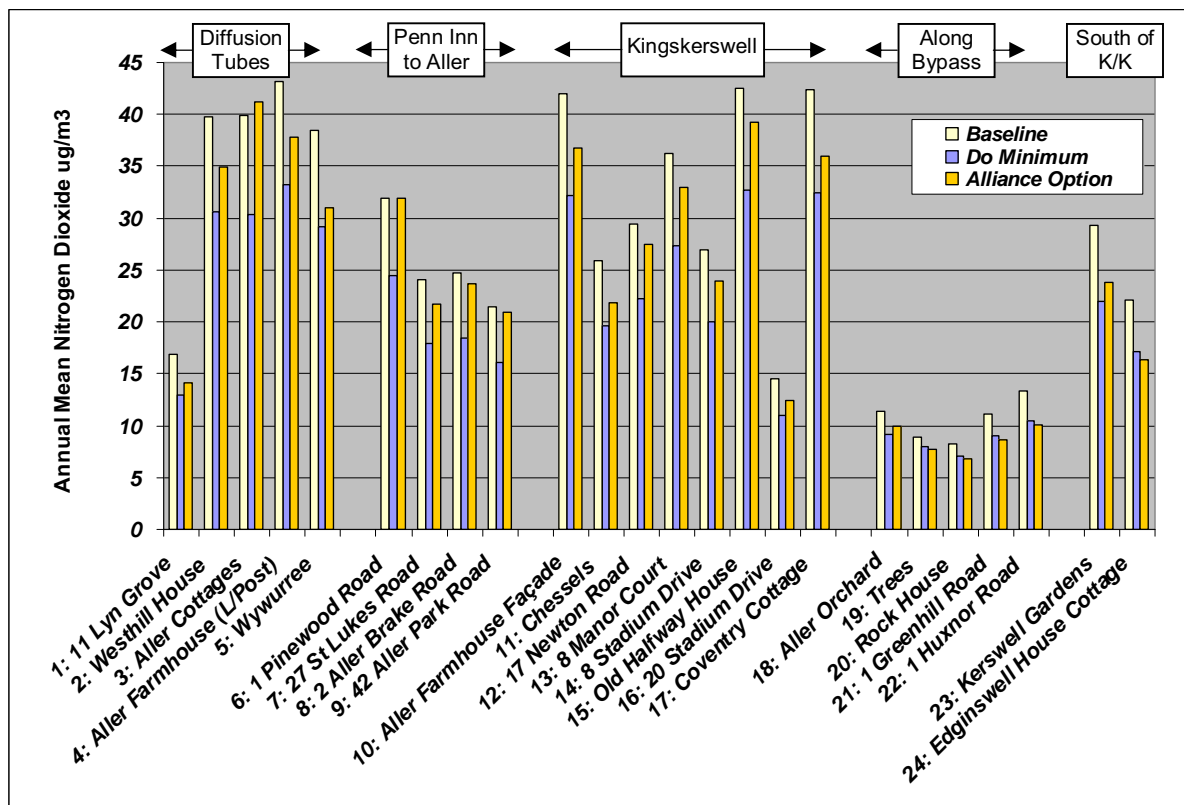


Diagram AQ 7.2: Modelled change annual mean nitrogen dioxide ($\mu\text{g}/\text{m}^3$) with the operation of the Alliance Option in the opening year (2013) for the detailed study area. An increase in pollution with the Alliance Option is shown as a positive value. The data are derived from the verified results from the detailed dispersion modelling. Results for the Published Scheme are also shown.

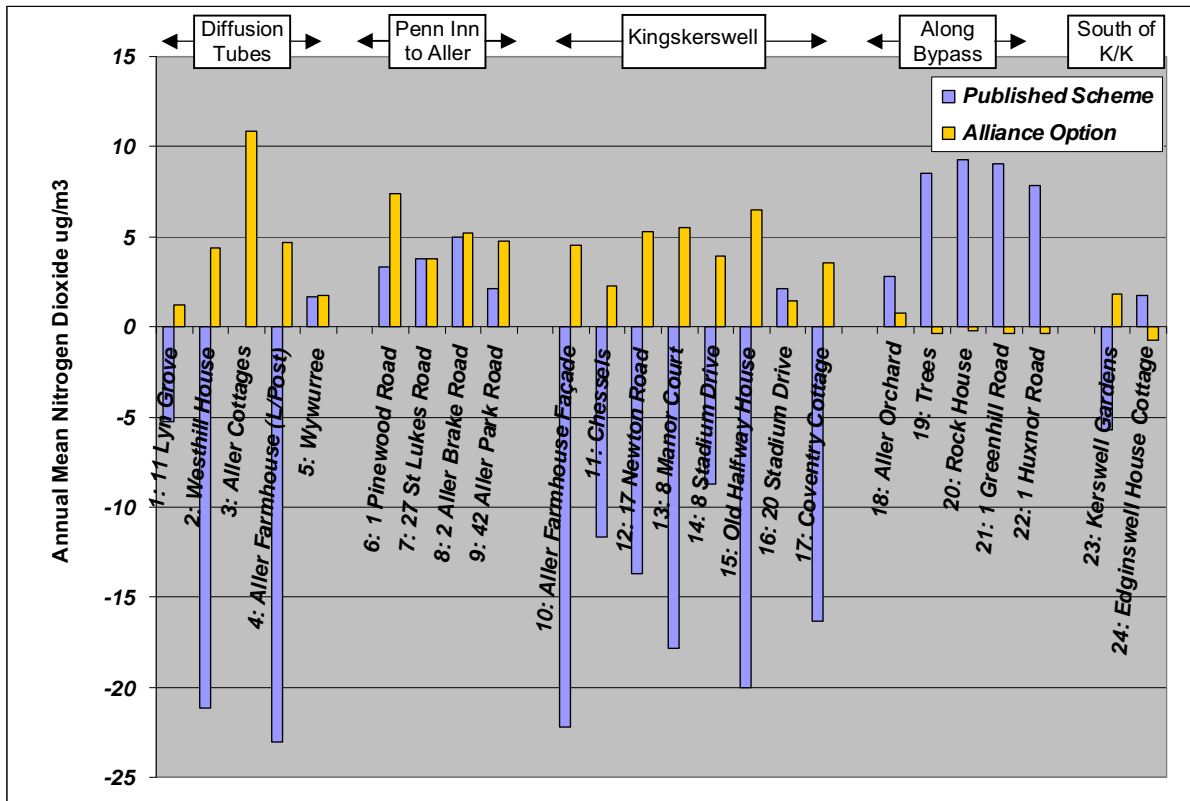


Diagram AQ 7.3: Modelled baseline (2008) and opening year (2013) annual mean nitrogen dioxide ($\mu\text{g}/\text{m}^3$) for the Alliance Option for the wider study area. The data are verified results from the DMRB Screening Method modelling.

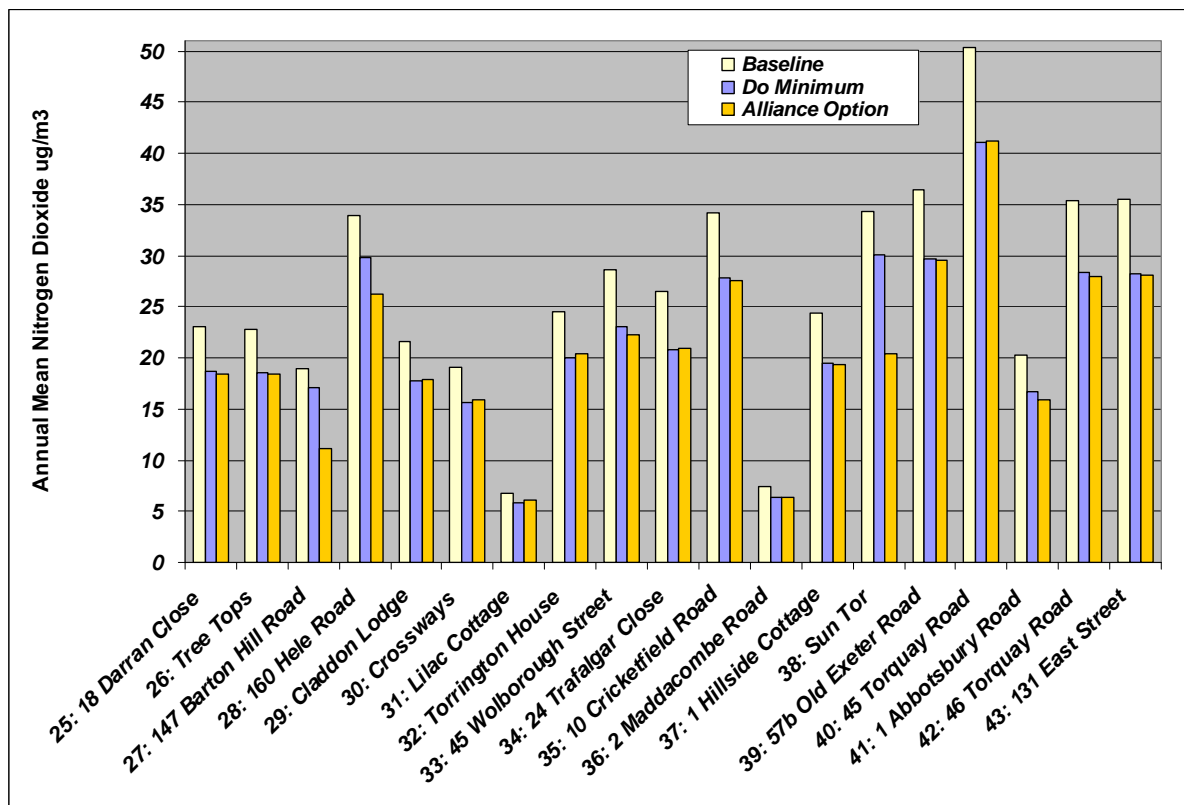


Diagram AQ 7.4: Modelled change annual mean nitrogen dioxide ($\mu\text{g}/\text{m}^3$) with the operation of the Alliance Option in the opening year (2013) for the wider study area. An increase in pollution with the Alliance Option is shown as a positive value. The data are derived from the verified results from the DMRB Screening Method modelling.

