Air Quality CONSULTANTS

Air Quality Technical Note:
Evaluation of Impact of Wealden Mitigation Strategy

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Experts in air quality
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Document Control

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1 Introduction

1.1 This note reviews the potential effectiveness of measures proposed within Wealden District Council's (WDC's) Interim Air Quality Mitigation Strategy[1]. It considers the likely effect that measures to reduce the impact of emissions from vehicle traffic would have. The report has been completed by Air Quality Consultants Ltd. on behalf of WDC.

1.2 The Ashdown Forest Air Quality Modelling and Monitoring report[2] explains that the critical levels and/or critical loads are predicted to be exceeded across the entire Ashdown Forest Special Area of Conservation (SAC) in 2028 in all of the emissions scenarios considered. Alongside roads, the magnitude of exceedences are predicted to be large. Critical level and/or critical load exceedences are also predicted for both Lewes Downs[3] and Pevensey Levels[4]. The Mitigation Strategy is not, on its own, intended to bring about achievement of the critical levels and critical loads. The purpose of the Mitigation Strategy is to mitigate the effects of the Wealden Local Plan (WLP) on these three ecological sites. This note is structured around answering the following questions:

- what level of improvement is required?
- what level of improvement is potentially achievable?
- are the measures contained in the mitigation strategy appropriate?
- what is the evidence that mitigation measures affect air quality? and
- can there be certainty that the mitigation will deliver the required improvements?

1.3 In order to answer these questions, this note draws on information from individual case studies, published guidance and evidence-based reports.

1 Air Quality Mitigation – Interim Mitigation Strategy Tariff Guidance for residential dwellings – Draft 7th September 2018.

2 Ashdown Forest SAC Air Quality Monitoring and Modelling. Air Quality Consultants Ltd. August 2018

3 Air Quality Input for Habitats Regulations Assessment: Lewes Downs SAC. Air Quality Consultants Ltd. August 2018

4 Air Quality Input for Habitats Regulations Assessment: Pevensey Levels. Air Quality Consultants Ltd. August 2018

2 What Level of Improvement is required?

2.1 Table 1 summarises the predicted changes in Annual Average Daily Traffic (AADT) flows caused by the WLP in 2028 on roads within or adjacent to Ashdown Forest. Table 2 shows the same results for Lewes Downs and Pevensey Levels.

2.2 For Ashdown Forest, the increase in traffic caused by the WLP is predicted to be different on different roads; ranging from a 12.9% increase on the A22 to a 0.1% increase on Legsheath Lane. In order to consider the average improvement required, it is convenient to refer to the calculated NOx emissions. In practice, and all other factors being equal, a given percentage reduction in traffic will result in the same percentage reduction in local traffic emissions. The total increase in NOx and NH_3 emissions from the road network in Table 1 is 7.2%[5,6]. The Ashdown Forest air quality modelling[2] also includes a large number of roads which are some distance outside of the Ashdown Forest SAC. The total increase in NOx and NH_3 emissions across these roads is also 7.2%. Thus, in order to remove the effect of the WLP on NOx and NH_3 emissions, an area-wide reduction in traffic emissions of 7.2% would be required, with larger improvements (i.e. up to 12.9%) on some roads.

2.3 Link-specific increases in traffic predicted for Lewes Downs range from 5.3% to 7.1% while for Pevensey Levels they range from 3.1% to 28.4%; with this higher value relating to a relatively minor road. The total predicted increases in NOx and NH_3 emissions from the modelled roads in Table 2 are 4.8% for Lewes Downs and 4.7% for Pevensey Levels[7].

2.4 In addition to the quantified impacts of changes to traffic flows within the Ashdown Forest Traffic Model area, the WLP is also expected to increase traffic flows on roads which are not included in this model. gta civils has analysed the traffic assumptions which fed into the Ashdown Forest Traffic Model, which include trip-generation statistics and origin-destination distances. These data suggest that the WLP will generate an additional 660,910 light duty vehicle (LDV)[8] vehicle-kilometres per day in 2028, which is equivalent to a 20% increase in total LDV traffic generation when compared with 2028 without the WLP. Much of this traffic is distant from Ashdown Forest, Lewes Downs and Pevensey Levels and is thus not included within the air quality assessments [2,3,4].

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5 A characteristic of the emissions model used in these studies is that the same percentage increase applies to both NOx and NH_3 emissions.

6 The modelled increase caused by the WLP relates entirely to LDVs but the 7.2% statistic takes account of all vehicle types (i.e. the modelled increase as a percentage of total emissions from all vehicle types). If the change is expressed only in terms of baseline LDV emissions, then it becomes 9.5%.

7 When expressed in terms of baseline LDV emissions only, these changes become 5.5% and 6.1%.

8 i.e. cars and vans.

2.5 Non-traffic emissions may also be increased by additional development (for example, from domestic gas boilers within new dwellings). The air quality impacts of these changes have not been quantified, as they will mostly be well away from the SACs. However, they will contribute to wider-scale air quality conditions, i.e. the background concentrations and depositions across the SAC, and could also be mitigated.

Table 1: Predicted AADT Flows (veh/day) in 2028 Without and With the Wealden Local Plan on Roads Within and Adjacent to Ashdown Forest [a]

Road	Without WLP [b]	With WLP	% increase [c]
A26	19,332	20,602	6.6% (6.9%)
A22	14,238	15,877	11.5% (12.3%)
	12,379	13,980	12.9% (13.8%)
A275	5,618	5,696	1.4% (1.5%)
B2026	6,418	6,844	6.6% (6.7%)
	5,636	5,925	5.1% (5.3%)
	1,925	2,099	9.0% (9.3%)
	4,799	5,203	8.4% (8.6%)
B2188	2,155	2,177	1.0% (1.0%)
Crowborough Rd	4,106	4,271	4.0% (4.2%)
New Rd	6,529	6,940	6.3% (6.6%)
Coleman's Hatch Rd	2,373	2,404	1.3% (1.3%)
Kidd's Hill	1,876	2,106	12.3% (12.4%)
Shepherds Hill	3,089	3,132	1.4% (1.4%)
Priory Rd	1,858	1,859	0.1% (0.2%)
Hindleap Lane	6,835	6,904	1.0% (1.0%)
Legsheath Lane	848	849	0.1% (0.2%)
Plawhatch Lane	7,085	7,136	0.7% (0.7%)

[a] Derived from Tables 5.6 and 5.7 of the Ashdown Forest Air Quality Monitoring and Modelling Report [2].

[b] Data Without WLP include Amended Tempro Growth to 2028.

c Numbers in parentheses represent the predicted change expressed as a percentage of the Without WLP LDV flows only (i.e. discounting heavy duty vehicles). This is because the evidence for 'soft' measures described in Section 3 is specific to LDVs.

Table 2: Predicted AADT Flows (veh/day) in 2028 Without and With the Wealden Local Plan on Roads Within and Adjacent to Lewes Downs and Pevensey Levels [a,b]

Road	Without WLP [b]	With WLP	% increase [c]
Lewes Downs			
A26 North of Earwig	12,935	13,850	7.1% (7.3%)
A26 South of Earwig	13,801	14,538	5.3% (5.6%)
B2192	27,550	29,240	6.1% (6.4%)
Pevensey Levels			
A259 Pevensey Levels	22,300	23,217	4.1% (4.3%)
A259 West of Roundabout	15,832	16,509	4.3% (4.4%)
A259 Towards E'bourne	12,936	14,575	12.7% (12.8%)
A27 North of Pevensey	18,403	18,969	3.1% (3.2%)
B2191	6,339	8,139	28.4% (28.9%)

a Derived from Table A2.1 of the Lewes Downs[3] and Pevensey Levels [4] Reports.

b Data Without WLP include Amended Tempro Growth to 2028.

c Numbers in parentheses represent the predicted change expressed as a percentage of the Without WLP LDV flows only (i.e. discounting heavy duty vehicles). This is because the evidence for 'soft' measures described in Section 3 is specific to LDVs.

3 What Level of Improvement is Potentially Achievable?

3.1 The Interim Mitigation Strategy[9] includes measures under five headings; 'strategy/policy', 'monitoring', 'communication plan', 'investigation and delivery of mitigation measures', and 'strategic long-term'.

3.2 The Strategy/Policy and Communication Plan would contribute to reducing overall vehicle emissions and background concentrations across the district. Many of the interventions described as 'soft measures' have been selected on the basis that they are highly deliverable using current policy and funding mechanisms.

3.3 A number of UK studies have been carried out to determine the influence of 'soft' measures on car journeys. A report published by the DfT[10] reviewed the evidence for impact of various measures such as travel plans, information and marketing campaigns both in isolation and as a combined package. These demonstrated a range of reductions in vehicle km. Based on this evidence, the authors of the DfT report concluded that a package of 'low intensity' interventions would reduce traffic by 2%, whilst a package of 'high intensity' projects would lead to an 11% reduction.

3.4 The conclusions of the 2004 DfT report were used to inform the large-scale Smarter Choice Programmes carried out in the three Sustainable Travel Towns. Post-project appraisal of these schemes confirmed 5-7% reductions in car driver mileage during the 4-year appraisal period, for the journeys that were considered in the study[11]. This evaluation took into account both pre- and post-implementation traffic and household survey data.

3.5 These studies confirm that 'soft' measures can have a measureable impact upon vehicle km driven. The 2-11%[10] and 5-7%[11] recorded reductions compare well with the 6-10% improvements (expressed in terms of LDV traffic only) required to mitigate the spatially-averaged effects of the WLP on traffic in the areas surrounding Ashdown Forest, Lewes Downs and Pevensey Levels, but are less than the 20% WLP-related growth for Wealden as a whole. They are also slightly smaller than some of the required reductions on individual roads.

3.6 The DfT reference studies are relatively old and were not carried out within Wealden, and so the same measures may have a greater or a smaller effect on car mileage within Wealden in the future. Furthermore, these measures would not be targeted at specific roads, and so may or may not deliver the entire required improvements in all locations. These types of measures do, however, clearly have the potential to deliver at least a large fraction of the required improvements.

9 Air Quality Mitigation – Interim Mitigation Strategy Tariff Guidance for residential dwellings – Draft 7th September 2018.

10 Smarter Choices - Changing the Way we Travel DfT, 2004.

11 The Effects of Smarter Choice Programmes DfT, 2010.

3.7 The Interim Mitigation Strategy also includes further measures which have the potential to have appreciable and direct effects. Many of these fall under the heading of 'investigation and delivery of mitigation measures'. Thus, at the present time, it is not possible to say how, when and where these could be implemented, or the scale of reductions that could be achieved. However, it seems entirely possible that direct targeted measures *could* deliver appreciable localised reductions in traffic volumes and/or traffic emissions.

4 Are the Measures Contained in the Mitigation Strategy Appropriate?

4.1 At the present time, the measures contained in the Interim Mitigation Strategy seem to be appropriate, but it is not currently possible to determine the optimum measures, or suite of measures, for the duration of the WLP period. Technology, the ease of uptake of that technology, as well as societal factors, are likely to change over the WLP period and this may mean that measures not currently included may become appropriate over time. Conversely, measures which are currently contained within the strategy may become, or be shown to be, inappropriate.

4.2 It is thus considered important for the Mitigation Strategy to be a ‘live’ document that can be updated by WDC as and when appropriate. One additional area that might be considered for inclusion in the Mitigation Strategy relates to emissions from energy plant (e.g. boilers, CHP plant etc.) in new developments. Appendix A2 provides an example of how emissions from energy plant are treated in London.

4.3 The Interim Mitigation Strategy includes a heading of ‘monitoring’. On its own, this will not improve air quality. However, as explained in Section 6, monitoring is essential to ensure adequate delivery of the air quality improvements.

5 What is the Evidence that Mitigation Measures Affect Air Quality?

5.1 The DfT studies described in Paragraphs 3.3 and 3.4 identified a change in 'activity data' (i.e. driver trips) and did not focus on the resultant change in air quality. In practice, it is extremely difficult to demonstrate that any measure has had an effect on air quality because it is never possible to know with certainty what the air quality conditions would be without that measure. Air quality conditions change over time as a result of a large number of separate factors and these changes tend to confound analyses of cause and effect. The examples described below illustrate the barriers to evaluating the success of measures upon air quality. They are provided not to suggest that air quality interventions are futile. All other things being equal, a reduction in emission will have a commensurate effect on concentrations. The examples are presented to illustrate the difficulty in testing the effect of an individual mitigation measure; and thus in being certain of its effectiveness. The focus of these examples is on air quality in relation to human health, since this has been the topic of most research.

Local Air Quality Management

5.2 Since 1997 each local authority in the UK has been required to review and assess air quality in its area. Where exceedances of the air quality objectives are identified, they are required to declare an Air Quality Management Area (AQMA) and develop an Air Quality Action Plan (AQAP) to implement measures that will work towards meeting the objectives. This process is known as Local Air Quality Management (LAQM).

5.3 Over 700 AQMAs have been declared to date, the majority of which are as a result of traffic emissions. Most AQMAs now have associated AQAPs, which are generally a package of measures that target reducing both traffic flows and emissions, similar to the Interim Mitigation Strategy.

5.4 Local authorities are required to evaluate the impact of measures, both pre-implementation (within the AQAP) and post-implementation within Annual Status Reports (ASRs). However, very few have been able to quantify the success of measures. As a result, in relation to '*evaluating the benefits of transport measures*' the Defra Policy Guidance[12] merely states that:

" The evidence for the impact of traffic related air pollution on human health is wellfounded, but it is not always easy to assess the outcomes (impacts) associated with individual transport measures, due in part to the cross-cutting nature of pollution sources and the multiple benefits that may arise from any given action. For instance, a behaviour change campaign may both avoid trips and shift

12 Local Air Quality Management Policy Guidance (PG16). Defra, 2016.

the mode of transport (e.g. from car to public transport). This in turn will have an impact by reducing traffic levels and congestion, and so reduce vehicle emissions."

5.5 The guidance then goes on to refer to separate abatement cost guidance[13] for valuing the impacts of changes in air quality to derive 'damage costs' based on the change in emissions, rather than concentrations. The damage costs approach allows evaluation of the benefits of schemes in terms of £ per tonne of pollutant reduced, thus removing the number of steps in the modelling chain. This removes many of the confounding factors, such as meteorology and NOx:NO_2 conversion.

5.6 Local authority ASRs report maximum concentrations at the time an AQMA was declared and at present. This provides information on how pollutant concentrations have changed over time but there is no way of quantifying with any certainty how much of the change has been a result of measures within the AQAP.

London Low Emission Zone

5.7 The London Low Emission Zone was created in 2008. It targeted PM emissions from heavy duty vehicles and was implemented in phases. Significant resources were available to evaluate the success of the project. This included:

- information from ANPR cameras providing information on vehicle number/type/age;
- emissions estimates based on vehicle flow and euro class within the London Atmospheric Emissions Inventory;
- a number of long-term roadside and background monitors measuring concentrations; and
- data analysis methods developed to control for the effects of meteorology and focus on traffic derived pollution.

5.8 In spite of the resources available, very few of the locations studied showed a change in primary PM_{10} concentration that was bigger than the confidence interval of the assessment model[14].

5.9 Differences were detected in trends in inner and outer London, which were found to be as a result of a subsequent policy intervention. Thus demonstrating the influence of unknown confounding factors when trying to evaluate the impact of a mitigation strategy at the outset. In addition, there was no way of determining what would have happened to concentrations if the LEZ had not been implemented.

13 Valuing impacts on air quality: Updates in valuing changes in emissions of Oxides of Nitrogen (NOx) and concentrations of Nitrogen Dioxide (NO_2). Defra, 2015.

14 The impact of the congestion charging scheme on air quality in London. Part 1. Emissions modeling and analysis of air pollution measurements. Kelly, F. et al., 2011.

Bus Measures on Putney High Street

5.10 Buses using Putney High Street were retrofitted with Selective Catalytic Reduction (SCR) systems to reduce NOx emissions in summer 2013. Long-term automatic monitoring data are available for 2 sites; one adjacent to the kerbside and one at a roadside building façade. Data from these sites, pre- and post-retrofitting have been analysed in detail[15, 16].

5.11 Monitoring data were adjusted to remove the effect of meteorology before analysis. This demonstrated that there was a drop in daily NOx and NO_2 concentrations around the time that the measure was introduced. However, after a few months, concentrations increased nearer to pre-intervention levels, as shown in Figure 1. No explanation has been identified for this increase.

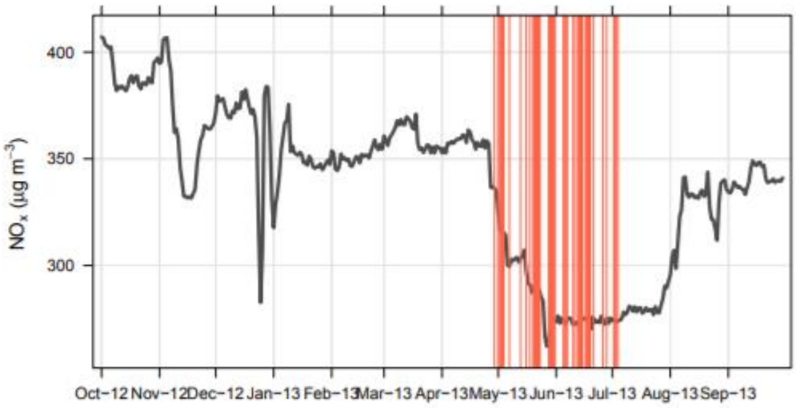

Figure 1: Ambient concentrations of NOx at the Putney High Street LAQN site. The black line shows the meteorologically normalised NOx concentrations. The vertical lines show the dates when the SCRT system was fixed on individual buses. (Reproduced from Figure 7[16])

5.12 The report[16] states that:

"*It should be noted that in these types of analysis various changes in concentration can be observed that are not always possible to explain. This situation is not surprising because there is usually only a limited amount of meta data available that can help identify different changes e.g. information on roadworks, local changes that might affect traffic flow or fleet composition, instrument problems not identified in the QA-QC procedures.*"

5.13 Further analysis of trends on the Putney High Street monitors compared with other roadside sites in London, give "*support to the idea that there were much greater reductions in NO_2 concentrations at Putney High Street than most other roadside sites in London.*"

15 Impacts of the bus retrofit programme. Carslaw, D 2014.

16 Analysis of the 2013 vehicle emission remote sensing campaigns data. Priestman 2015.

5.14 This is an example that demonstrates the difficulties associated with quantification of impacts, even when implementing a measure that would be expected to have a very direct impact upon the monitoring location. Concentrations after an intervention may be no lower than those before the intervention, but this does not necessarily mean that the intervention has had no effect, since there is usually no way of knowing what the concentration would have been if the intervention had not been implemented.

6 Can there be Certainty that the Proposed Mitigation will deliver the Required Improvements?

6.1 Section 3 of this note explained that the measures being proposed by WDC have the potential to deliver benefits of the scale required on the roads close to the designated habitats. Furthermore, Section 4 of this note explained that the Mitigation Strategy can be updated over time to include other measures should this be necessary or appropriate. It is not currently possible to demonstrate whether any specific subset of measures will deliver the required benefits. Indeed, Section 4 of this note showed why absolute certainty is virtually never possible when predicting the effects of air quality mitigation.

6.2 The Mitigation Strategy provides WDC with a mechanism to deliver air quality benefits. Furthermore, the measures contained within the Interim Strategy have the *potential* to mitigate the effect of the WLP. This is not to suggest that achieving this level of mitigation will be easy or straightforward. Achieving the required level of improvement is likely to be challenging. Certainty that the effects of the WLP will be adequately mitigated can only, at this time, be provided by WDC's commitment to ensuring that this is the case; which raises the question of how WDC can do this.

6.3 WDC is committed to ongoing air quality monitoring but, as explained in Section 5 of this note, the monitoring will not, on its own, demonstrate the effect of the mitigation measures. Instead, the monitoring will show the combined effect of a host of factors; including the mitigation measures, the WLP, in-combination developments, fleet-renewal, and meteorology. This information will be highly valuable, but it will not, on its own, allow the mitigation strategy to be 'fine-tuned'.

6.4 A simple view might be that if air quality conditions deteriorate then additional mitigation should be implemented. However, it is quite possible that the unmitigated WLP would retard, or remove, improvements which might otherwise have occurred. Thus, such a simple approach to interpreting the air quality measurements may not be appropriate. WDC could seek to set 'air quality indicators' whereby certain levels of improvement need to be achieved, but it is difficult to see how this could be justifiably tied to mitigating the effects of the WLP.

6.5 It would be most sensible for mitigation delivery to make use of different strands of information. In particular, activity data should be collected and analysed, e.g. traffic flows and vehicle types. Where appropriate, the impacts of mitigation measures should be calculated using a predictive model. This modelling could then be verified against the measurements being collected by WDC. Over the longer term (five years or more), the air quality measurements will provide a clearer picture of overall air quality trends and thus allow WDC to see whether air quality is improving and, if so, the rate of improvement.

7 Glossary

AQC	Air Quality Consultants
AQMA	Air Quality Management Area
ATC	Automatic Traffic Counter
Defra	Department for Environment, Food and Rural Affairs
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
EU	European Union
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
SAC	Special Area of Conservation
SCR	Selective Catalytic Reduction
WDC	Wealden District Council

8 Appendices

A1 Professional Experience

Prof. Duncan Laxen, BSc (Hons) MSc PhD MIEnvSc FIAQM

Prof Laxen is an Associate of Air Quality Consultants, a company which he founded in 1993. He has over forty years' experience in environmental sciences and has been a member of Defra's Air Quality Expert Group and the Department of Health's Committee on the Medical Effects of Air Pollution. He has been involved in major studies of air quality, including nitrogen dioxide, lead, dust, acid rain, PM_{10}, $PM_{2.5}$ and ozone and was responsible for setting up the UK's urban air quality monitoring network. Prof Laxen has been responsible for appraisals of all local authorities' air quality Review & Assessment reports and for providing guidance and support to local authorities carrying out their local air quality management duties. He has carried out air quality assessments for power stations; road schemes; ports; airports; railways; mineral and landfill sites; and residential/commercial developments. He has also been involved in numerous investigations into industrial emissions; ambient air quality; indoor air quality; nuisance dust and transport emissions. Prof Laxen has prepared specialist reviews on air quality topics and contributed to the development of air quality management in the UK. He has been an expert witness at numerous Public Inquiries, published over 70 scientific papers and given numerous presentations at conferences. He is a Fellow of the Institute of Air Quality Management.

Dr Ben Marner, BSc (Hons) PhD CSci MIEnvSc MIAQM

Dr Marner is a Technical Director with AQC and has twenty years' experience in the field of air quality. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has been an expert witness at several public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has extensive experience of using detailed dispersion models, as well as contributing to the development of modelling best practices. Dr Marner has arranged and overseen air quality monitoring surveys, as well as contributing to Defra guidance on harmonising monitoring methods. He has been responsible for air quality review and assessments on behalf of numerous local authorities. He has also developed methods to predict nitrogen deposition fluxes on behalf of the Environment Agency, provided support and advice to the UK Government's air quality review and assessment helpdesk, Transport Scotland, Transport for London, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. Dr Marner is a member of Defra's Network of Evidence Experts and a member of Defra's Air Quality Expert Group.

Penny Wilson, BSc (Hons) CSci MIEnvSc MIAQM

Ms Wilson is an Associate Director with AQC, with more than seventeen years' relevant experience in the field of air quality. She has been responsible for air quality assessments of a wide range of development projects, covering retail, housing, roads, ports, railways and airports. She has also prepared air quality review and assessment reports and air quality action plans for local authorities and appraised local authority assessments and air quality grant applications on behalf of the UK governments. Ms Wilson has arranged air quality and dust monitoring programmes and carried out dust and odour assessments. She has provided expert witness services for planning appeals and is Member of the Institute of Air Quality Management and a Chartered Scientist.

Full CVs are available at www.aqconsultants.co.uk.

A2 Possible Approach for Calculating Building Emissions from New Development

A2.1 The Greater London Authority's (GLA's) Supplementary Planning Guidance (SPG) on Sustainable Design and Construction[17] and its accompanying Air Quality Neutral methodology report[18] (AQC, 2014), provide an approach to assessing whether a development is "air quality neutral". The approach includes a requirement to compare the expected emissions from the building energy use against defined emissions benchmarks for buildings in London. In this context, 'building emissions' refers to all expected emissions from on-site combustion, including domestic gas boilers etc.

A2.2 The building emissions benchmarks for NOx that are used to determine air quality neutrality in London are set out in Table A2.1. They are intended to represent an average across the existing London building stock. In practice, they were derived from the Croydon Development Emissions Tool, calibrated against data from the London Atmospheric Emissions Inventory. Thus, while the values relate to London and not to Wealden, the values are not so precise as to make applying them outside of London wholly inappropriate.

A2.3 The air quality neutral assessment approach involves a simple calculation of the expected emissions from new development and the comparison of these emissions against the benchmarks in Table A2.1. In practice, as a result of modern building standards and improved plant efficiency, building emissions from new developments are usually lower than the benchmarks.

A2.4 The GLA's current guidance does not specify what should be done when emissions exceed the benchmark.

A2.5 If the position taken by WDC is that all new building emissions require mitigation, and a mechanism is in place to provide that mitigation, then the GLA approach could potentially be helpful in that it provides a simple way to calculate the additional NOx emissions associated with new development. Developers could potentially either calculate development-specific NOx emissions (as is done in London) or avoid these calculations by reverting to the worst-case values in Table A2.1. This provides a calculation method but not a direct solution to mitigation; although it might encourage developers to lower their emissions.

A2.6 It should be noted that building emissions from new development in Wealden will add to background concentrations across the UK and thus increase the risk of impacts over a wide area. The specific impacts of these new building emissions on Ashdown Forest, Lewes Downs, and Pevensey Levels have not been quantified. To illustrate the scale of effect that these emissions

[17] https://www.london.gov.uk/sites/default/files/gla_migrate_files_destination/Sustainable%20Design%20%26%20Construction%20SPG.pdf

[18] http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/GLA-AQ-Neutral-Policy-Final-Report-April-2014.pdf.aspx

might have, Figure A2.1 shows how much the "Domestic, institutional and commercial space heating" component is predicted, by Defra, to contribute to its background NOx concentration maps in 2015[19]. The Ashdown Forest Air Quality Monitoring and Modelling Report[2] predicted that the background NOx concentration over the SAC was 10.4 $\mu g/m^3$, while the background NO_2 concentration was 7.9 $\mu g/m^3$. Thus, the *total existing* domestic, institutional and commercial emission sources which are not included in the "rural" component of the background maps are predicted to contribute *up to* 7.5% of these concentrations (i.e. 0.6 and 0.8 $\mu g/m^3$ of NO_2 and NOx respectively(10.4 $\mu g/m^3$ x 0.075 and 7.9 $\mu g/m^3$ x 0.075)). These contributions, of existing domestic sources, to concentrations in the SAC are relatively small when compared with the contribution of road traffic at roadside locations, but have a greater influence at background locations.

Table A2.1: Building Emissions Benchmarks (g/m^2 of Gross Internal Floor Area)

Land Use Class	NOx	PM_{10}
Class A1	22.6	1.29
Class A3 - A5	75.2	4.32
Class A2 and Class B1	30.8	1.77
Class B2 - B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C2	68.5	5.97
Class C3	26.2	2.28
D1 (a)	43.0	2.47
D1 (b)	75.0	4.30
Class D1 (c -h)	31.0	1.78
Class D2 (a-d)	90.3	5.18
Class D2 (e)	284	16.3

19 These maps are described and referenced within the Ashdown Forest Air Quality Monitoring and Modelling Report[2]

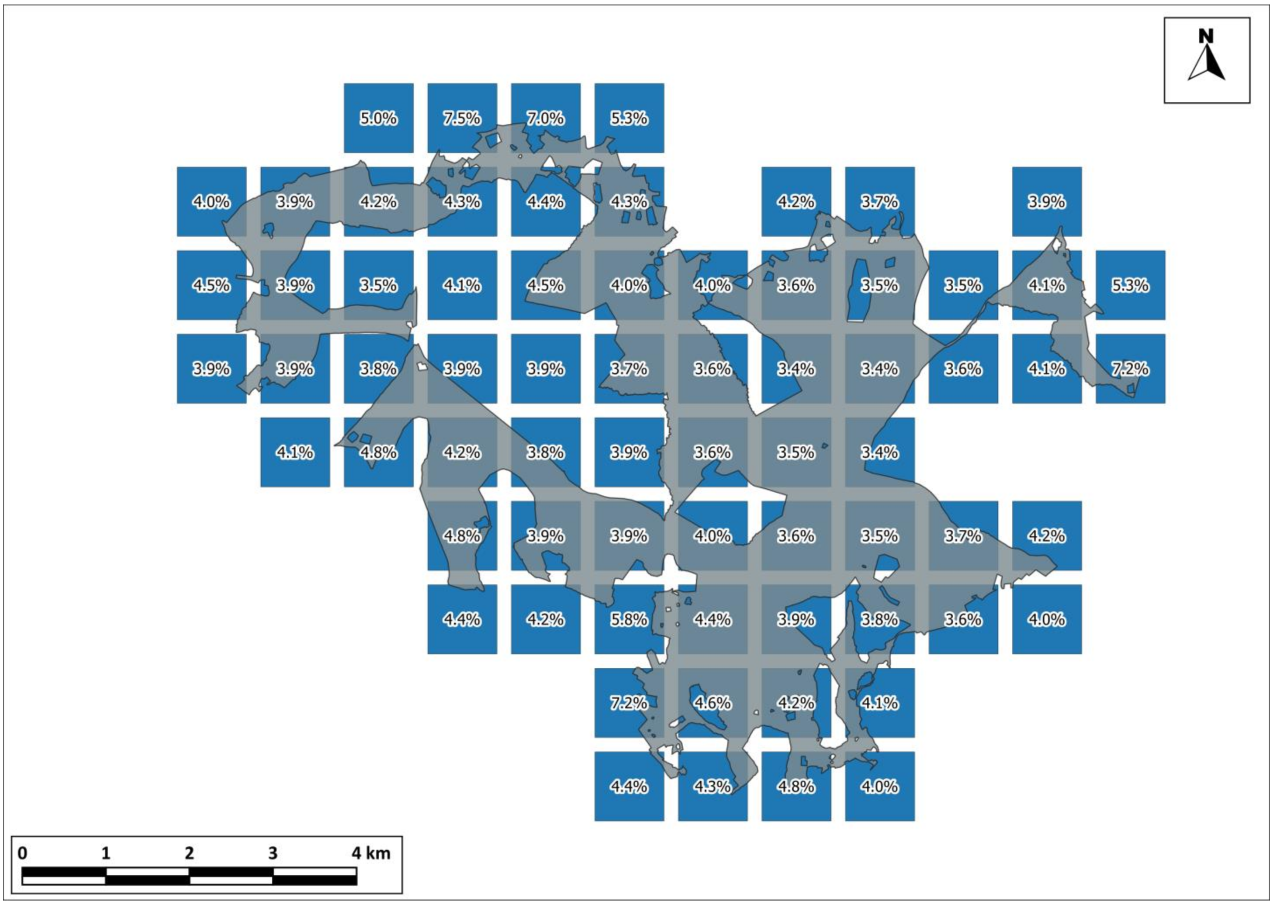

Figure A2.1: % of Defra's Predicted Background NOx Concentrations Attributed to Domestic, Institutional and Commercial Emissions over Ashdown Forest SAC in 2015 (Showing Defra's 1km x 1km background map grids and Ashdown Forest SAC).