



Review of Air Quality Assessment: SEMMMS

September 2014



Experts in air quality
management & assessment

Document Control

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1 Introduction

- 1.1 This report sets out a review of the air quality evidence presented to the South East Manchester Multi Model Strategy (SEMMS) CPO/side road orders inquiry. The review has been carried out by Air Quality Consultants Ltd on behalf of Poynton Against Unnecessary Link-roads to the Airport (PAULA).
- 1.2 Specifically, this review covers the adequacy of the air quality assessment, in particular in relation to its consideration of the air quality impacts upon the Disley AQMA. It is based on the following documents:
- the Air Quality chapter and associated appendices and figures, of the “Environmental Statement for the A6 to Manchester Airport Relief Road” produced by Mouchel, October 2013;
 - “A Proof of Evidence relating to the Air Quality aspect of the A6 to Manchester Airport Relief Road” produced by Paul Colclough of Mouchel, on behalf of Stockport MBC, Manchester CC and Cheshire East BC, 4th September 2014; and
 - additional information procured by PAULA via a Freedom of Information request, 21st August 2014.
- 1.3 The A6 to Manchester Airport Relief Road (A6MARR) has received planning permission, but subject to a planning condition requiring mitigation measures (see Appendix A1) that will cover, amongst other locations, Disley Village Centre.

2 Review of Air Quality Assessment

Air Quality Chapter of the Environmental Statement

2.1 The approach to the air quality assessment and methodology used appear to be generally acceptable and in-line with current best practice for a non-trunk road. However, there is insufficient information provided to ascertain whether the described approach has been applied correctly. Specific items are discussed below.

Monitoring Data

2.2 In relation to monitoring data included in the air quality chapter, there is insufficient information provided on;

- the diffusion tube bias adjustment factor applied to the scheme specific monitoring data, and how this was derived;
- the exact locations of the monitoring sites included in the scheme specific monitoring survey; and
- whether the 10 months of monitoring were adjusted to an equivalent annual mean.

2.3 Without this information it is not possible to determine whether appropriate QA/QC has been applied to the monitoring data used to verify the air quality model on which the assessment is based.

Model Inputs

2.4 There is insufficient information provided on the following model inputs:

- traffic flows, proportions HGVs and speeds for each section of road, for each scenario;
- whether any sections of road have been modelled as 'street canyons'; and
- the specific adjustments applied to background concentrations (to which the modelled road contribution is added) and the data used to derive these.

2.5 It is not possible to determine whether the air quality model has been set up appropriately without this information.

Model Verification

2.6 In relation to verification of the model results, there is no information supplied on:

- the specific monitoring sites used to verify the model results;
- the method used to derive verification factors, applied to the model results; and

- the verification factors applied to model results for specific areas.

2.7 Without this information it is not possible to ascertain the performance of the model in Disley, to determine whether model results represent a reasonable reflection of measured concentrations in the area.

Results

2.8 The level of detail of results provided is not sufficient to determine the impacts at specific locations. Some further information for three specific receptors has been supplied following a Freedom of Information request by PAULA¹. The implications of this for the Disley AQMA are discussed in Section 3.

Disley Air Quality Action Plan

2.9 The Disley AQMA is mentioned in the ES. However, there is no reference to the Disley Air Quality Action Plan. Whilst this has not been finalised, a draft version was available from June 2013². Priority measures identified in the Action Plan include “DIS1 - ensure that A6 corridor is managed as part of the SEMMS scheme” and “DIS 2 Improved rail facilities (linked with DS1).”

2.10 Most importantly, the Disley Action Plan is not mentioned in the Evaluation of Significant Local Air Quality Effects (Table 8-20 of the ES).

EU Directive Compliance (IAN175/13)

2.11 The Highways Agency’s Interim Advice Notes (IAN) accompanying the DMRB do not strictly apply to non-trunk road schemes. Whilst, strict compliance with this approach is not necessary, as the scheme is not a trunk road, deviations from the approach outlined in these notes may highlight deficiencies in the assessment.

2.12 The Compliance Risk Assessment presented in Table 8-19 considers the impact of the scheme on compliance with the EU Directive. It considers the impact separately in the two zones/agglomerations used for reporting compliance with the Directive to the EU. These are:

- UK0033 North West and Merseyside zone
- UK0003 Greater Manchester Urban Area agglomeration

2.13 Disley falls within the North West and Merseyside zone (UK0033), whereas the majority of the improvements identified as a result of the scheme are within the Greater Manchester Urban Area agglomeration (UK0003). In Table 8-19 it is acknowledged that the scheme does increase the

¹ 21st August 2014

² Disley Air Quality Action Plan Draft 03 06 13, obtained from Cheshire East Borough Council

road length that exceeds the EU LV (question D) in zone UK0033. However, it does not consider the effectiveness of the AQAP, which is a requirement where the answer to question D is “yes”.

- 2.14 It should be noted that the IAN175/13 on which the Compliance Risk Assessment is based has been withdrawn, with “a new version pending”; this is not currently available from the DfT website.

Compliance with IAN174/13 (Significance of Effects)

- 2.15 IAN174/13 specifically states that, “*modelled results and the assessment of changes in pollutant concentrations between without and with scheme scenarios should be **reported to 1 decimal place**. 24 hour mean PM_{10} concentrations results should be rounded to the nearest whole day*” (emphasis added by HA). As noted above, predicted concentrations with and without the scheme at specific receptors have not been reported. This is a clear deficiency of the assessment.
- 2.16 IAN174/13 notes that “*the significance of the change is greater, the higher above the air quality thresholds the changes are predicted to occur. Where it is predicted that the short term NO_2 and / or PM_{10} thresholds are exceeded, then more significance should be attributed to these effects.*” The ES fails to identify the concentrations exceed the thresholds in Disley and that there is a risk of the short-term nitrogen dioxide objective being exceeded. The implications of this are discussed in Section 3.
- 2.17 Overall, the approach to the assessment and conclusions presented in the ES are generally in accordance with the required methodology. However, the missing information outlined above make it difficult to ascertain whether the calculations on which the assessment is based have been carried out correctly. The assessment also fails to identify the scale of the impacts in Disley, which is discussed further in Section 3.

Paul Colclough Proof of Evidence

- 2.18 The proof of evidence (PoE) sets out two main issues:
- the impact of the proposed mitigation measures on air quality in Disley; and
 - the effect of changes in air quality guidance and vehicle emission factors since the ES was published.

Impact of Changes to DMRB IAN170/12

- 2.19 The Highways Agency has published a revised approach to estimating pollutant concentrations in future years in its Interim Advice Note (IAN) 170/12v3. This has been published following revisions to vehicle emission factors for new Euro VI (cars/light duty) and Euro 6 (heavy duty) vehicles.
- 2.20 The PoE acknowledges that the approach used in the ES to estimate future year concentrations was overly conservative. The PoE therefore reconsiders the number of people likely to be

exposed to concentrations above the objective in the Disley AQMA, both with and without the scheme, using the revised approach.

- 2.21 As expected, the revised approach indicates that fewer people would be exposed to concentrations above the objective, both with and without the scheme. However, based on the updated analysis, the scheme would cause 5 additional properties to be exposed to concentrations above the objective, compared with the 3 additional properties presented in the ES.

Impact of Changes to Vehicle Emission Factors

- 2.22 The exercise described above has been repeated again using new vehicle emission factors published since the ES was published. These are generally more conservative than those previously used, i.e. lead to slightly higher concentrations being predicted in future years.
- 2.23 When the results using the revised emission factors are combined with the revised Highways Agency approach, even fewer properties in Disley are predicted to be subject to exceedences of the objective. However, using this approach the scheme is expected to lead to an additional 11 properties exposed to concentrations above the objective.
- 2.24 A summary of the numbers of properties anticipated to be subject to exceedences of the annual mean nitrogen dioxide objectives in Disley is provide in Table 1.

Table 1: Modelled Annual Mean Nitrogen Dioxide Objective Exceedences in Disley

Method ^{a b}	Number properties where annual mean nitrogen dioxide objective exceeded		
	Without Scheme	With Scheme	Change
ES (old EFT, old IAN analysis)	85	88	3
Proof of Evidence – without mitigation (new EFT, new IAN analysis)	66	77	11
Proof of Evidence – with mitigation (new EFT, new IAN analysis)	66	78	12

^a “Old” EFT = v5.2, “New” EFT = v6.0.1

^b “Old” IAN analysis = IAN170/12, “New” IAN analysis = IAN170/12v3

Impact of Mitigation

- 2.25 The PoE considers the impact of traffic speed on predicted numbers of exceedences in combination with the “enhanced mitigation traffic flows”. It considers the impact of introducing a speed constraint along the A6 corridor, which would make the route through Disley less attractive and constrain growth.

- 2.26 Whilst, as with the ES, full details of the model inputs and results are not provided, this analysis appears to be based on the following assumption:
- traffic growth as a result of the scheme through Disley would be 11-16%, rather than 30% assumed in the ES; and
 - the traffic speed through Disley would reduce from 41 kph to 26 kph, with enhanced mitigation.
- 2.27 The PoE correctly acknowledges that the reduction in speed would lead to an increase in emissions per vehicle which would counteract the reduction in total vehicle flows, leading to higher concentrations than would be predicted without mitigation. This suggests that the mitigation currently proposed is not appropriate to alleviate the impacts of the proposed scheme and would actually make air quality worse in Disley.
- 2.28 From the information provided, it is difficult to ascertain what the real impacts of the proposed mitigation measures described in the PoE would be. The modelling presented in the PoE appears to be based on a simplistic assumption that the average speed throughout Disley would reduce from 41 kph (25 mph) to 26 kph (16mph). It is not made clear how the mitigation package will lead to reductions in traffic flow and speed within Disley, especially as the speed limit is already 30 mph (50kph) in Disley. In reality, traffic speeds, and hence emissions, will vary through the village, with the highest emissions occurring where vehicles are accelerating, particularly when travelling up hill.
- 2.29 The above highlights the need for any mitigation measures to not only reduce total traffic flows through the village, but also minimise congestion and allow smooth driving conditions, particularly where residential properties are located close to the road. The use of micro-simulation traffic modelling coupled with air quality modelling would be a useful way to test the changes brought about by different mitigation measures.

3 Key Issues

Scale of Impact in Disley

- 3.1 The most important issue to consider is the scale of the impact of the scheme in Disley, which is underrepresented in the ES. At The Crescent, annual mean nitrogen dioxide concentrations of 50-60 $\mu\text{g}/\text{m}^3$ have consistently been measured at the façade of residential properties and the scheme is expected to increase concentrations by more than 4 $\mu\text{g}/\text{m}^3$. These concentrations are already significantly above the air quality objective of 40 $\mu\text{g}/\text{m}^3$ and the increase expected as a result of the scheme is substantial.
- 3.2 The model results presented in the ES indicate that concentrations would exceed the objective at locations outside the AQMA, and therefore the AQMA would need to be extended.
- 3.3 With the scheme in place, annual mean concentrations at The Crescent are likely to increase above 60 $\mu\text{g}/\text{m}^3$. Defra considers that where annual mean concentrations exceed 60 $\mu\text{g}/\text{m}^3$, there is a risk that the 1-hour nitrogen dioxide objective would also be exceeded.
- 3.4 Whilst it is acknowledged that elsewhere there would be reductions in nitrogen dioxide concentrations, it is not clear from the information presented in the ES, whether the concentrations at these locations are as high as those in Disley.

EU Limit Value Compliance

- 3.5 Overall, more people would be subject to improvements, than a deterioration as a result of the scheme. However, the majority of the improvements are in one EU Compliance Zone (Greater Manchester), whereas the deteriorations occur in another (North West and Merseyside). Therefore there is an overall disbenefit in the North West and Merseyside compliance zone.
- 3.6 There are differences between where and how the UK air quality objectives and EU Limit Values apply. It is important to note that although exceedences of the UK air quality objective are measured in Disley, it is not identified in the Defra reporting as a location where the EU Limit Value is being exceeded. This is not unusual and occurs in many similar situations across the UK. However, there are numerous other locations identified in the North West and Merseyside compliance zone where the Limit Value is being exceeded. As Disley is not considered a location where the EU Limit Value is being breached, the scheme does not delay compliance of the zone with the EU Limit Values.

Mitigation

- 3.7 The Environmental Statement has not considered the impact of the scheme on the Disley Air Quality Action Plan. Due to the location of residential properties and the topography of the area,

possible measures to achieve compliance with the air quality objectives are limited and the objectives are not likely to be achieved, even with the Action Plan in place.

- 3.8 “A package of mitigation measures (intended to restrain, alleviate and manage traffic flow increases.....)” is required as a Condition of the Planning Permission. The Condition goes on to state that, “such scheme shall include details of and a methodology and timetable for delivery of the measures, a programme for review, surveys and monitoring of the impact of the measures and if required reappraisal of an addition to the agreed package of measures.” (the full condition is reproduced in Appendix A1).
- 3.9 The currently proposed mitigation measures have not been demonstrated to lead to a reduction in air quality impacts of the scheme. In fact, it appears that the currently proposed “enhanced mitigation measures” package could actually increase the air quality impacts.
- 3.10 Due to the topography of the area, it is unlikely that any local mitigation measures are available that would reduce concentrations in Disley to below the air quality objectives. The mitigation measures need to achieve some or all of the following in Disley, in order to actually mitigate the impacts of the scheme:
- reduce traffic flows;
 - smooth driving conditions; and
 - reduce emissions (queuing and acceleration), adjacent to sensitive receptors, particularly those in The Crescent, Market Street and Buxton Road.
- 3.11 One possible measure could be to co-ordinate traffic signals through Disley to avoid queuing adjacent to the most affected receptors. This would need to include the proposed signals at the Redhouse Lane junction, associated with a development in the area.
- 3.12 Contrary to the model results, introducing a 20mph zone could reduce emissions, as such zones tend to lead to smoother driving conditions, although this would need to be investigated further.
- 3.13 A “shared space” at Market Street, could be considered, although it would be important to take into consideration the type of vehicles, such as quarry lorries, using the A6.

4 Summary and Conclusions

- 4.1 The approach taken to assess the air quality impacts of SEMMMS appears to be in accordance with guidance. However, insufficient information is provided in the ES to determine whether the calculations have been carried out correctly. In addition, the ES fails to acknowledge the scale of the impact on the Disley AQMA and the Disley Air Quality Action Plan.
- 4.2 In Disley, the scheme would lead to:
- a substantial adverse impact on nitrogen dioxide concentrations, where the air quality objectives are already being exceeded by a substantial margin;
 - possible extension of the AQMA; and
 - exceedences of the 1-hour objective, which is not currently exceeded.
- 4.3 The majority of the benefits of the scheme fall within the Greater Manchester EU compliance agglomeration, whereas the disbenefits would occur in the North West and Merseyside zone.
- 4.4 A robust package of mitigation measures is a Condition of the planning permission. It is essential that these are carefully considered to ensure that they will mitigate, rather than exacerbate the impacts off the scheme. The assessment presented in the PoE of Paul Colclough demonstrates that the mitigation package developed to date does not address the air quality problem in Disley, and it therefore cannot be considered appropriate to discharge the planning condition.

5 Glossary

AQMA Air Quality Management Area

Defra Department for Environment, Food and Rural Affairs

DfT Department for Transport

EFT Emissions Factor Toolkit

Exceedence 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

HDV Heavy Duty Vehicles (> 3.5 tonnes)

LDV Light Duty Vehicles (<3.5 tonnes)

µg/m³ Microgrammes per cubic metre

NO Nitric oxide

NO₂ Nitrogen dioxide

NO_x Nitrogen oxides (taken to be NO₂ + 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

PM₁₀ Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter

PM_{2.5} Small airborne particles less than 2.5 micrometres in aerodynamic diameter

Standards A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

A1 Appendix Cheshire East Planning Condition

Cheshire East Council Decision Notice (13/4355M), Condition 8

“Prior to the development hereby approved being brought into use a scheme detailing a package of mitigation measures (intended to restrain, alleviate and manage traffic flow increases at locations identified and to levels indicated through enhanced mitigation as shown in table 9.3a and figures 9.6 and 9.7 in the submitted Transport Assessment) has been submitted to and agreed in writing with the Local Planning Authority. Such scheme shall include details of and a methodology and timetable for delivery of the measures, a programme for review, surveys and monitoring of the impact of the measures and if required reappraisal of an addition to the agreed package of measures. The new sections of road shall not be brought into use until the measures have been implemented in accordance with the approved details unless the prior written consent of the Local Planning Authority has been obtained. (Note: this includes mitigation measures for, but not limited to, Disley Village Centre, the A6 corridor, Clifford Road Poynton and B5358 Station Road / Dean Road Handforth .Where this condition requires approval or consent by the Local Planning Authority those matters shall be referred to the Council’s Strategic Planning Board).

Reason: In the interests of highway safety, air quality and to safeguard amenity. To comply with policies T1 and DC3 of the Macclesfield Borough Local Plan.”

A2 Professional Experience

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

Prof Laxen is the Managing Director 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, PM10, PM2.5 and ozone and was responsible for setting up 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 and published over 70 scientific papers and given numerous presentations at conferences.

Penny Wilson, BSc (Hons) CSci MIEEnvSc MIAQM

Ms Wilson is a Principal Consultant with AQC, with more than ten 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 on behalf of the UK governments. Ms Wilson has analysed and interpreted air quality data from the national air quality network and new local authority monitoring, as well as from monitoring of dust. She has also arranged monitoring programmes for PM10, sulphur dioxide and nitrogen dioxide. Ms Wilson has provided expert witness services for planning appeals.

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