Air Quality Tracker Table

Version: 3

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Ref	Requirement	Approach
	<u>Air Quality model specification</u>	
	Model selection	
1.1.1	Details of air quality dispersion model to be used	RapidAir has been used for the study- this is Ricardo's proprietary modelling system developed for urban air pollution assessment. The model is based on convolution of an emissions grid with dispersion kernels derived from the USEPA AERMOD[1] model. The physical parameterisation (release height, initial plume depth and area source configuration) closely follows guidance provided by the USEPA in their statutory road transport dispersion modelling guidance[2]. AERMOD provides the algorithms which govern the dispersion of the emissions and is an accepted international model for road traffic studies (it is one of only two mandated models in the US and is widely used overseas for this application). The combination of an internationally recognised model code and careful parameterisation matching international best practice makes RapidAir fit for purpose for this study. The model produces high resolution concentration fields at the city scale (1 to 3m scale) so is ideal for spatially detailed compliance modelling.
1.1.2	Canyon effects included?	Yes. The model includes a canyon treatment based on the USEPA 'Stanford' model[3]. The canyon model algorithms are essentially the same as those recommended by the European Environment Agency for modelling canyons in compliance assessment[4]. Our model has terms to deal with canyon height, width, vehicle length, receptor height, emission strength, wind speed and direction (taken from the same met record as the main RapidAir model). Further details given in section 3 of the AQ2 methodology report.

[1] https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod
[2] https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses
[3] USEPA., Estimating Mobile Source Pollutants in Microscale Exposure Situations, EPA-460/3-81-021
[4] http://www.eea.europa.eu/publications/TEC11a/page014.html

1.1.3	Gradient effects included?	Further to the update/clarification of the gradient method in TG16 we confirm that we have applied the gradient impact to all pre Euro VI HGVs in the emissions processing step. In order to do this, we will carry out a GIS gradient analysis of our modelling domain to identify any road links with gradients greater 2.5%. The gradient adjustment will then be applied to the proportion pre Euro VI HGV movements on identified links.
	Air Quality model domain	
1.2.1	Please provide a map showing model domain in relation to exceedance locations identified in PCM model	See Figure 4 to 6 in AQ2 report for model domain in relation to all PCM links in the area.
1.2.2	Locally identified exceedance locations included?	Yes, the high resolution nature of RapidAir and its inclusion of street canyons will make the model outputs naturally align with hotspots/exceedance locations. See Figure 6 in AQ2 report for model domain and location of AQMAs
1.2.3	Domain includes displacement routes?	Yes. See description of model in main report and relationship between proposed traffic model and modelling domain in **Error! Reference source not found.** in AQ2 report
	Air Quality model receptor locations	
1.3.1	Details of receptor grid size	For the Southampton domain (which is reasonably small) we have set RapidAir to model down to 1m. The model can comfortably deal with about 500 million locations which provides for over 20,000 cells in the x and y axes. So we can model 20km x 20km at 1m resolution which covers the Southampton domain. The canyon model is set to the same resolution as the grid model so that they align perfectly spatially. See section 3 of AQ 2 report for further details
1.3.2	Details of receptors at monitoring site locations	Southampton has a wide network of monitoring locations comprising a mix of passive and active sampling. RapidAir run time is not sensitive to the number of receptors so all available monitoring locations will be included. See also Figure 7 in main report for location of monitoring sites in relation to modelling domain
1.3.3	Details of receptors at exceedance locations identified in PCM model (include distance from kerb and height above ground level)	For comparison with PCM model results, annual mean concentrations at the roadside exceedance locations identified in the PCM model can be extracted from the RapidAir dispersion model results and presented as a separate model output file. These receptor locations will be at a distance of 4m from the kerb and 2m height.

1.3.4	Details of receptors at locally identified exceedance locations, if any	Southampton has several AQMAs all of which contain numerous residential receptors. RapidAir, by virtue of its very high resolution outputs, will produce estimates for every single residential property in Southampton, so any receptors at exceedance locations will naturally be included. Also see Figure 6 for model domain and AQMAs. The modelling resolution provided by RapidAir will allow us to provide results in the AQMA areas at a distance of 4m from the kerb and 2m height.
1.3.5	Methods to be used to assign subset of receptors for AQD assessment requirements	Annex III of the AQD specifies that macroscale siting of sampling points should be representative of air quality for a street segment of no less than 100 m length at traffic-orientated sites. To provide results relevant to this requirement, for roadside locations where there is public access and the directive applies; road links with exceedances of the NO_2 annual mean objective stretching over link lengths of 100m or greater can be presented as a separate GIS layer of model results. Annex III of the AQD also specifies that microscale sampling should be at least 25 m from the edge of major junctions. When reporting model results relevant to compliance with the AQD, locations up to 25m from the edge of major junctions in the model domain will therefore be excluded.
	<u>Base Year modelling</u>	
	General	
2.1.1	Base year to be used	The modelling base year is 2015 in line with the latest traffic and air quality data and the base year of the proposed transport model.
2.1.2	Details of Meteorological data to be used	We have used surface meteorological data from Southampton Airport processed in house using our own meteorological data management system. Our RapidAir model also takes account of upper air data which is used to determine the strength of turbulent mixing in the lower atmosphere- we will derive this from the closest radiosonde site and process in the USEPA AERMET model. We will utilise data filling where necessary following USEPA guidance which sets out the preferred hierarchy of routines to account for gaps (persistence, interpolation, substitution). Our modelling will be supplied with full meteorological discussion and if required we can supply the computer code used to process the data and details of any data filling that was required.
	Traffic input data	
2.2.1	Source of traffic activity data	The key source of traffic data is the Sub-Regional Transport Model (SRTM) for Southampton, Portsmouth and South Hampshire. Details of this are provided in section 4 of the AQ2 report. The transport model data will be complemented by local traffic counts, ANPR data and traffic master data in the base year. This is described in detail in section 4 of the AQ2 report

2.2.2	Vehicle types explicitly included in air quality emissions and concentrations modelling	The core vehicle categories are cars, taxis, LGVs, rigid HGVs. Artic HGVs and buses. The standard Euro and technology categories will be used in line with COPERT 5. Details in section 4 of the AQ2 report.
2.2.3	Details of representation of road locations (achieved through use of a georeferenced transport model or another approach?)	See Figure 4 in AQ2 report for map of transport model road network. All modelling links are snapped to the OS ITN road network for the best spatial representation.
2.2.4	Source of vehicle fleet composition information (local/EFT)	Detailed fleet composition data are derived from an ANPR survey. This will be complemented by local count data and NAEI fleet data as necessary. We are still awaiting the final ANPR data to assess this in detail.
2.2.5	Source of vehicle speed information	Traffic speeds are taken from the traffic master data set for the base year and will be adjusted for future years in relation to changes in link travel times from the transport model. This is described in section 4.3 of the AQ2 report
	NOx/NO_2 emissions assumptions	
2.3.1	Source of emission factors for NOx	COPERT 5 data either in the form of an update EFT or with JAQU's agreement our in-house emission calculation tool RapidEms which is fully compatible with COPERT 5.
2.3.2	Source of primary NO_2 emission fractions (f-NO_2)	Defra f-NO2 fractions which we understand will be released in time to support this work. See also section 4.3 in the AQ2 report.
2.3.3	Details of method used to calculate projections for f-NO_2	See section 4.3 in AQ2 report
2.3.4	Details of methods to be used to calculate NO_2 concentrations from NOx concentrations	The Defra NOx:NO2 model has been used. See section 4.3 in AQ2 for details.
	Non-road transport modelling	
2.4.1	Details of modelling for non-road transport sources	Three key local background sources will be modelled explicitly: • Vessel and port activity at the port of Southampton • The Marchwood incinerator • The Marchwood power station Details of these are provided in section 4.4 and Appendix 1 of the AQ2 report.

	Measurement data for model calibration	
2.5.1	Details of the date, locations and type of monitoring data (automatic and/or diffusion tubes) used for the model calibration	Air quality monitoring data collected by Southampton City Council for 2015. See Figure 7 in AQ2 for location and type of monitoring points.
	<u>Projections modelling</u>	
	Baseline projections modelling	
3.1.1	Years to be modelled (to include 2020; please include explanation for any additional years)	Modelling years are: • 2019 – as an interim year between the base year and the implementation year of 2020. This year was chosen as it aligns with the first forecast year in the traffic model. • 2020 – CAZ implementation year See section 1.3 in AQ2 for full details.
3.1.2	Details of method for projected vehicle fleet composition	See section 4.3 for base year fleet data See section 5.1 for forecast fleet data
3.1.3	Details of method for projected vehicle activity	Future vehicle traffic will be derived from the transport model described in section 5.
3.1.4	Impact of RDE included?	This is included only in relation to the COPERT emissions data.
	With measures projections modelling	
3.2.1	Years to be modelled	2020 as described in section 1.3 in AQ2 report
3.2.2	Details of method for projected vehicle fleet composition	The fleet composition has been assessed separately for complaint and non-compliant vehicles. See section 5 in AQ2 report.
3.2.3	Details of method for projected vehicle activity	Projected vehicle traffic is done by the traffic model. Within the traffic model the vehicle matrices will be split between complaint and non-complaint vehicles so that the behaviours of these groups will be modelled separately. The details of this is provided in transport methodology report.