Air Quality Assessment Protocol for Determining the Impact of Vehicle Emissions Arising From Development

The purpose of any air quality assessment is to quantify changes in pollutant concentrations and/or exposure to poor air quality at relevant receptors resulting from the proposed development. Impacts must be assessed in the context of relevant national and international objectives and targets and any local planning or other policies.

Assessment where Exposure may arise

Exposure may be identified where residential accommodation is proposed and there is likely to be exposure to concentrations above EU Limit Values.

Where no modelling data exists and relevant accommodation is proposed next to roads with an AADT (annual average daily traffic flow) of greater than 10,000, the developer may be required to undertake monitoring for a limited period to ascertain pollutant levels. On agreement with the local authority about the relevant parameters, a developer may refer to the Defra UK Ambient Air Quality Interactive Maps[1].

The Council, in considering policies on exposure, may give weight to the following mitigation measures:

- Can the residential building envelope be pushed back beyond the pollutant exceedence zone?

- Can the scheme be designed to place residential units at the rear of the development or on higher floors?

-Can vegetative barriers, including appropriate tree species, offer some degree of separation from the road?

- Can design of built forms avoid the creation of canyons, allowing a greater degree of pollutant dispersal?

- Mechanical ventilation should not automatically be seen as providing effective mitigation against exposure and should be scrutinised carefully, not only in terms of the acceptability of providing living conditions in what could be described as a hermetically sealed unit, but also in terms of the increase in energy requirements and maintenance that is incurred and the attendant secondary noise effects that can arise.

The assessment must take into account the cumulative air quality impacts of committed developments and schemes (i.e. proposals that have been granted planning permission at the time the assessment is undertaken). This ensures that 'with development' and 'without development' scenarios are represented as accurately as possible.

The assessment should involve the completion of an air quality modelling study, although from time to time specific pollutant monitoring may also be required. Modelling can be carried out once the information to be used has been agreed with the Local Authority.

[1] http://uk-air.defra.gov.uk/data/gis-mapping

Typically, this would include:

• Traffic data used for the assessment including the trip rates associated with the development, the frequency of the trips, the length and route of the trips and the nature and types of vehicles being used.

• Emission data source;

• Meteorological data source and representation of area;

• Baseline pollutant concentration including any monitoring undertaken;

• Background pollutant concentration;

• Choice of base year;

• Basis for NOx: NO2 calculations

Modelling should be carried out using a recognised local scale dispersion model to be agreed with the Local Authority prior to commencement of work. The study normally comprises four simple steps:

1. Assessment of the existing air quality situation in the study area for the baseline year and agreement of specific receptor points with the Local Authority prior to commencement. The model should be validated against council (or other) monitoring data which can usually be supplied on request.

2. Prediction of future air quality without the proposed development in place.

3. Prediction of future road transport emissions and air quality with the proposed development in place.

4. An assessment of the effect(s) the proposed development will have on road transport emissions air quality including the proposed mitigation measures.

The assessment will also need to include:

• The relevant details of the proposed development

• Details of the relevant air quality standards and objectives

• Details of the agreed assessment method

• An assessment where appropriate of construction related air quality impacts

• Details of the modelling software and its validation

• Results of the modelling exercise including uncertainties, errors, adjustments and verification

• A sensitivity test which assumes that there will be no reduction in traffic related emission factors from the baseline year

• Summary of the assessment results and air quality impacts arising

• Mitigation measures to be taken to protect air quality

For development schemes that have the potential for major detrimental impact on air quality, an assessment procedure is specified to evaluate the likely change in relevant concentrations and emissions arising from the scheme. As part of the assessment procedure the following formula can be used to quantify the pollution impact of a development and monetised using the pollutant damage costs (per tonne) specified by the Defra Inter-Governmental Department on Costs and Benefits (IGCB)[2].

Road Transport Emission Increase =

Σ[Estimated trip rate for 5 years x Emission rate per 10 km per vehicle type x Damage costs]

By establishing the damage costs arising from development scheme emission changes it is possible to assess the scale and kind of any additional mitigation or compensation that is required to make the scheme acceptable. A trip length of 10 km Has been used which is derived from the DfT National Travel Surveys[3] estimation of average trip length.

A table of the damage costs per tonne of air quality pollutants is provided in Annex 2 and Annex 3 summarises Emmission factors for different types of vehicle. An example of the Emissions Assessment Calculation is provided in Annex 4.

A suite of mitigation/compensation measures for major developments is provided in the table below:

Indicative measures for Mitigation and/or Compensation Required for Major Developments

- On-street EV recharging
- Contribution to low emission vehicle refuelling infrastructure
- Car clubs
- Low emission bus/mini-bus service provision
- Low emission waste collection services
- Bike/e-bike hire schemes
- Renewable fuel & energy generation projects
- Incentives for the take-up of low emission vehicle technologies and fuels
- Contributions to subsidised public transport for staff or residents
- Air Quality Monitoring programmes

[2] http://www.defra.gov.uk/environment/quality/air/air-quality/economic/damage/
[3] Extrapolated from The National Travel Survey :2011,Statistical Release, 13th December 2012
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/35738/nts2011-01.pdf

Annex 2 - IGCB Air Quality Damage Costs per Tonne, 2010 prices

		Sensitivities	
	Central Estimate (1)	**Low Central Range (2)**	**High Central Range (2)**
NO_X	**£955**	£744	£1,085
SO_X	**£1,633**	£1,320	£1,856
Ammonia	**£1,972**	£1,538	£2,241
PM Domestic	**£28,140**	£22,033	£31,978
PM Agriculture	**£9,703**	£7,598	£11,027
PM Waste	**£20,862**	£16,335	£23,708
PM Industry	**£25,229**	£19,753	£28,669
PM ESI	**£2,426**	£1,900	£2,757
PM Transport Average	**£48,517**	£37,987	£55,133
PM Transport Central London	**£221,726**	£173,601	£251,961
PM Transport Inner London	**£228,033**	£178,540	£259,129
PM Transport Outer London	**£148,949**	£116,621	£169,261
PM Transport Inner Conurbation	**£117,899**	£92,309	£133,975
PM Transport Outer Conurbation	**£73,261**	£57,362	£83,252
PM Transport Urban Big	**£87,332**	£68,377	£99,241
PM Transport Urban Large	**£70,351**	£55,081	£79,944
PM Transport Urban Medium	**£55,310**	£43,305	£62,853
PM Transport Urban Small	**£34,932**	£27,351	£39,696
PM Rural	**£15,041**	£11,776	£17,091

Annex 3 – Vehicle Emission Factors

Light Duty Diesel Vehicle Emission Factors per Euro Standard

Vehicle category	NOx Emission factor, g /veh-km	
	Diesel cars	Diesel LGVs
Euro 1	1.24	1.70
Euro 2	1.28	1.70
Euro 3	1.16	1.43
Euro 4	0.90	1.16
Euro 5	0.65	0.83
Euro 6	0.29	0.37

Heavy Duty Vehicle Emission Factors per Euro Standard (based on 2010 UK fleet)

Vehicle category	NOx Emission factor, g /veh-km		
	Buses and coaches	Rigid HGV	Articulated HGV
Pre Euro	**23.3**	**16.4**	**26.8**
Euro 1	**16.6**	**11.5**	**19.5**
Euro II	**18.5**	**12.7**	**21.4**
Euro III	**19.1**	**11.0**	**17.9**
Euro IV	**10.1**	**6.7**	**11.1**
Euro V EGR	**6.1**	**4.0**	**6.6**
Euro V SCR	**15.6**	**11.8**	**19.0**
Euro VI	**2.5**	**2.3**	**3.0**

Note – emissions at speed of 11 kph

Annex 4

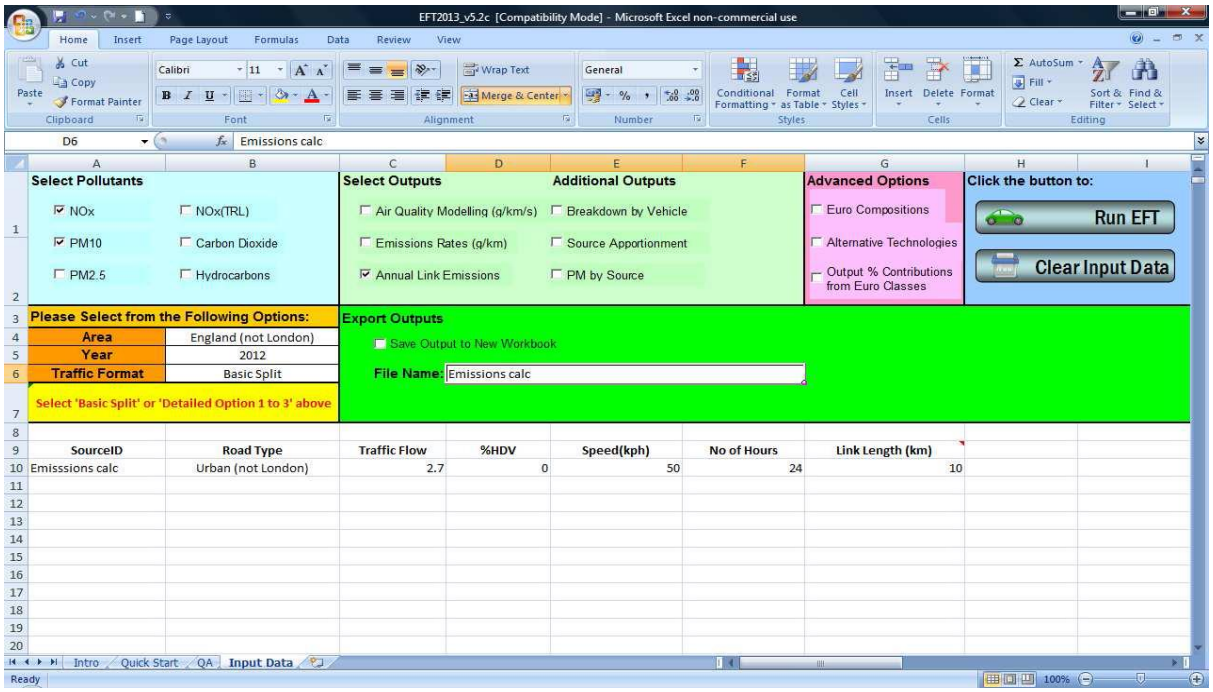
Example Emissions Assessment Calculation

The calculation utilises the current Emissions Factor Toolkit (EFT)* to determine the transport related emissions from a development proposal. If the proposal is to include alternative fuels or technology i.e. LPG, EV etc, then there are "advanced options" within the EFT to accommodate this.

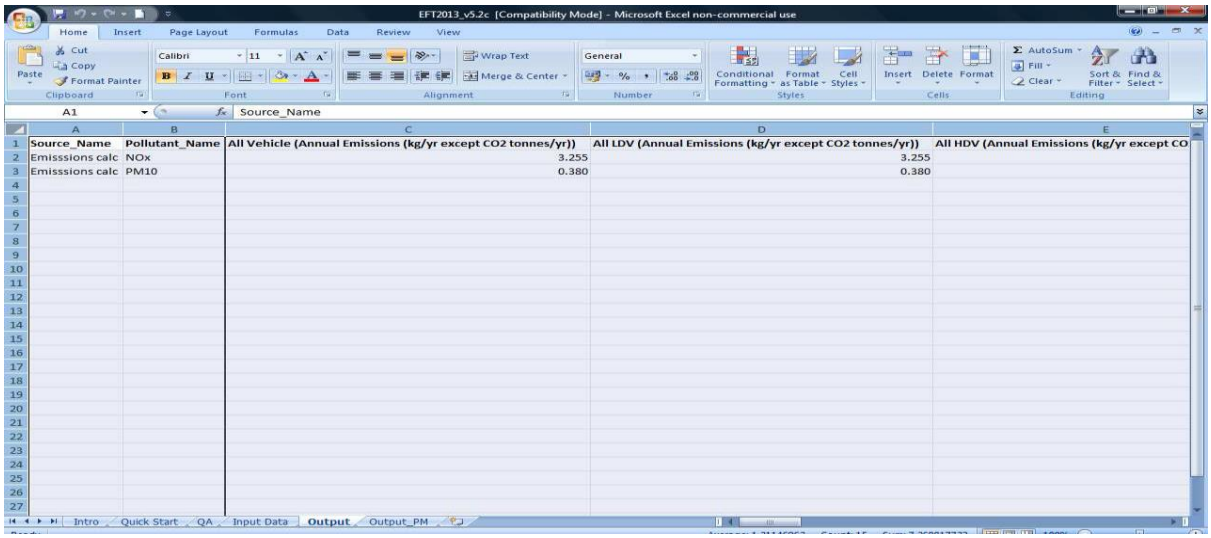
*http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft

A screen shot of the input and output pages are shown below:

Input Screen



Output Screen



The output is in kg of specified pollutant per year and requires converting to tonnes per year. This is then multiplied by the IGCB damage costs for the specified pollutant.

The following example demonstrates the calculation based on a development with 10 domestic properties[14].

EFT Input:

10 household (urban not London) (NOx and PM_{10})	
X	27 (trip/traffic ratio for 10 houses)
X	cars only (0% HGV)
X	50kph (avg. speed)
X	10km (NTS UK avg.)

EFT Output = 32.55kg/annum (NOX) & 3.795kg/annum (PM_{10})

=	0.0325tonnes/annum (NOX) & 0.003795tonnes/annum (PM_{10})
X	£955/tonne (NOx) + £48,517/tonne (PM_{10})
=	£31.08 = £184.15
X	5 (years)
=	£155.42 = £920.76
Total =	**£1,076**

Notes:

1. Trip Rates are sourced from the Transport Assessments and local authority where available.
2. Trip Length uses the National Travel Survey[15] - (UK average = 10km).
3. The IGCB damage costs are the central estimates (currently NOx = £955/tonne & PM_{10} transport average £48,517).

[14] Sussex Air Quality Partnership "Air Quality and Emission Mitigation Guidance for Sussex Authorities 2013"
[15] https://www.gov.uk/transport-statistics-notes-and-guidance-national-travel-survey