

Appendix A12.4

Sensitivity Analysis

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- A12.4.1 The dispersion modelling assessment reported in Chapter 12: Air Quality is based on a method that utilises the contribution to total pollutant levels from projected background pollutant concentrations and the contribution from local sources. The contribution from local road traffic is calculated using vehicle emission rate data projected for the Department for Transport (DfT). There is currently some uncertainty in the drop-off in background pollutant concentrations and vehicle emission rates projected by Defra and the DfT for future years. To take this uncertainty into account, a sensitivity analysis has been undertaken with the prediction of future baseline and construction phase scenarios modelled using background pollutant data and vehicle emission rates for 2013. The scenarios included within the sensitivity analysis are:
- baseline sensitivity scenario, as the future baseline 2017 scenario but with background contributions fixed at 2013 values and emission rates fixed at 2013 values; and
 - with construction sensitivity scenario, as the construction 2017 scenario but with background contributions fixed at 2013 values and emission rates fixed at 2013 values.
- A12.4.2 The 2013 background pollutant concentration data used in this sensitivity analysis is listed in Table A12.13.
- A12.4.3 The predicted baseline and construction phase pollutant concentrations using 2013 background pollutant data and vehicle emission rates are provided in Table A12.14 and A12.15. The change in predicted pollutant concentrations from baseline to construction phase is shown in Table A12.16.

Table A12.13: Annual Mean Background Pollutant Concentrations (2013)

Receptor	NO ₂ Conc. (µg/m ³)	PM ₁₀ Conc. (µg/m ³)	PM _{2.5} Conc. (µg/m ³)
R1	45.8	23.2	16.3
R2	45.8	23.2	16.3
R3	45.8	23.2	16.3
R4	45.8	23.2	16.3
R5	45.8	23.2	16.3
R6	45.8	23.2	16.3
R7	45.8	23.2	16.3
R8	45.8	23.2	16.3
R9	41.6	22.3	15.7
R10	41.6	22.3	15.7
R11	45.8	23.2	16.3
R12	44.3	23.0	16.2
R13	44.3	23.0	16.2
R14	45.8	23.2	16.3
R15	45.8	23.2	16.3

Table A12.14: Air Quality Statistics Predicted at Receptors for the Future Baseline Sensitivity Analysis Scenario

Receptor	Annual Mean NO ₂ Conc. (µg/m ³)	Annual Mean PM ₁₀ Conc. (µg/m ³)	Annual Mean PM _{2.5} Conc. (µg/m ³)	Exceedances of the 24-hr PM ₁₀ Objective (Days)
R1	55.2	24.3	17.1	11
R2	58.4	24.7	17.3	12
R3	81.5	27.2	19.1	19
R4	58.0	24.8	17.4	12
R5	59.2	24.9	17.5	13
R6	60.3	25.1	17.6	13
R7	61.0	25.1	17.6	13
R8	77.6	28.0	19.5	21
R9	65.2	25.6	17.8	14
R10	49.6	23.2	16.3	9
R11	54.4	24.2	17.0	11
R12	50.5	23.7	16.7	10
R13	61.7	24.9	17.5	13
R14	63.6	25.7	17.9	15
R15	90.4	31.1	21.4	32
Air Quality Objective value	40µg/m³	40µg/m³	25µg/m³	35 days

Table A12.15: Air Quality Statistics Predicted at Receptors for the Construction Sensitivity Analysis Scenario

Receptor	Annual Mean NO ₂ Conc. (µg/m ³)	Annual Mean PM ₁₀ Conc. (µg/m ³)	Annual Mean PM _{2.5} Conc. (µg/m ³)	Exceedances of the 24-hr PM ₁₀ Objective (Days)
R1	56.1	24.4	17.1	12
R2	60.0	24.8	17.4	12
R3	88.6	28.1	19.7	21
R4	59.2	24.9	17.5	13
R5	60.5	25.0	17.6	13
R6	60.6	25.1	17.7	13
R7	62.0	25.2	17.7	13
R8	78.2	28.1	19.5	22
R9	65.7	25.7	17.9	15
R10	49.9	23.3	16.3	9
R11	54.8	24.3	17.0	11
R12	50.7	23.7	16.7	10
R13	62.1	24.9	17.6	13
R14	65.5	25.9	18.1	15
R15	93.5	31.6	21.8	34
Air Quality Objective value	40µg/m³	40µg/m³	25µg/m³	35 days

A12.4.4 Table A12.14 and Table A12.15 show that for the sensitivity test scenarios, annual mean concentrations of NO₂ will be above the air quality objective value of 40 µg/m³. At all of the receptors, the contribution to total annual mean NO₂ pollutant concentrations from background sources is above the objective value. The contribution from background sources is greater than the predicted contribution from local road traffic emissions at all receptors.

A12.4.5 Annual mean concentrations of PM₁₀ and PM_{2.5} are well below the air quality objective values for those pollutants. The dominant source of particulate matter at all receptors is the contribution from background sources.

A12.4.6 The change in predicted pollutant concentrations from baseline to construction phase is shown in Table A12.16.

Table A12.16: Change in Air Quality Statistics Predicted at Receptors between the Baseline and with Construction Sensitivity Scenarios

Receptor	Annual Mean NO ₂ Conc. (µg/m ³)	Annual Mean PM ₁₀ Conc. (µg/m ³)	Annual Mean PM _{2.5} Conc. (µg/m ³)	Exceedances of the 24-hr PM ₁₀ Objective (Days)
R1	+0.9 (s)	+0.1 (i)	<+0.1 (i)	+1 (s)
R2	+1.6 (s)	+0.1 (i)	+0.1 (i)	<+1 (i)
R3	+7.1 (l)	+0.9 (s)	+0.6 (s)	+2 (m)
R4	+1.2 (s)	+0.1 (i)	+0.1 (i)	+1 (s)
R5	+1.3 (s)	+0.1 (i)	+0.1 (i)	<+1 (i)
R6	+0.3 (i)	<+0.1 (i)	+0.1 (i)	<+1 (i)
R7	+1.0 (s)	+0.1 (i)	+0.1 (i)	<+1 (i)
R8	+0.6 (s)	+0.1 (i)	<+0.1 (i)	+1 (s)
R9	+0.5 (s)	+0.1 (i)	+0.1 (i)	+1 (s)
R10	+0.3 (i)	+0.1 (i)	<+0.1 (i)	<+1 (i)
R11	+0.4 (s)	+0.1 (i)	<+0.1 (i)	<+1 (i)
R12	+0.2 (i)	<+0.1 (i)	<+0.1 (i)	<+1 (i)
R13	+0.4 (s)	<+0.1 (i)	+0.1 (i)	<+1 (i)
R14	+1.9 (s)	+0.2 (i)	+0.2 (i)	<+1 (i)
R15	+3.1 (m)	+0.5 (s)	+0.4 (s)	+2 (m)

Magnitude of change descriptor – (i): Imperceptible; (s): Small; (m) Medium; (l): Large

- A12.4.7 The annual mean concentrations of PM₁₀ and PM_{2.5} and the 24 hour mean concentrations of PM₁₀ for the two sensitivity analysis scenarios are predicted to be below the respective air quality objective values.
- A12.4.8 In the main assessment the annual mean concentrations of NO₂ are above the objective value at receptors across the study area. The same pattern is observed for the predicted values in the sensitivity analysis scenarios. However, the hourly objective value for NO₂ is only at risk of exceedance at receptors located adjacent to the busier roads in the study area, and is achieved elsewhere.
- A12.4.9 For the sensitivity analysis scenarios, the use of vehicle emission rates at 2013 levels results in a higher contribution of background traffic sources and local traffic sources, relative to rates at 2017 levels. The relative increase in the background contribution being slightly greater than the increase in the predicted local traffic emissions contribution. This translates into a marked increase in the contribution from background sources, in absolute concentration terms, between the construction scenario and construction sensitivity scenario. For example, on Cannon Street (R3), the local road contribution increases from 6.0 to 7.1 µg/m³ (+1.1 µg/m³) and the background

contribution increase from 40.2 to 45.8 $\mu\text{g}/\text{m}^3$ (+5.6 $\mu\text{g}/\text{m}^3$). The use of 2013 background concentration data and emission rate data would have a less marked affect on the predicted impacts of the scheme at all other receptors.

- A12.4.10 The sensitivity analysis has confirmed that the use of alternative values for the background pollutant concentrations and vehicle emission rates would not materially affect the conclusions of the main assessment.