

# Sea Link

## Volume 9: Examination Submissions

Document 9.6.4 Appendix D Sensitivity analysis for the Kent and Suffolk air quality modelling to account for the updated Emission Factor Toolkit

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# Contents

<b>Executive Summary</b>	<b>1</b>
Ex1.1 Introduction	1
Ex1.2 Conclusion	1
<b>1. Methodology</b>	<b>2</b>
<b>2. Suffolk Results</b>	<b>3</b>
2.1 NO <sub>2</sub> Results Comparison	3
2.2 PM <sub>10</sub> Results Comparison	4
2.3 PM <sub>2.5</sub> Results Comparison	6
<b>3. Kent Results</b>	<b>9</b>
3.1 NO <sub>2</sub> Results Comparison	9
3.2 PM <sub>10</sub> Results Comparison	10
3.3 PM <sub>2.5</sub> Results Comparison	12
<b>4. Conclusion</b>	<b>14</b>
Table 2.1 Original (Based on EFT V12.1) Modelled Annual Mean NO <sub>2</sub> Concentrations	3
Table 2.2 Updated (Based on EFT V13.1) Modelled Annual Mean NO <sub>2</sub> Concentrations	4
Table 2.3 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean NO <sub>2</sub> Results	4
Table 2.4 Original (Based on EFT V12.1) Modelled Annual Mean PM <sub>10</sub> Concentrations	5
Table 2.5 Updated (Based on EFT V13.1) Modelled Annual Mean PM <sub>10</sub> Concentrations	5
Table 2.6 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM <sub>10</sub> Results	6
Table 2.7 Original (Based on EFT V12.1) Modelled Annual Mean PM <sub>2.5</sub> Concentrations	7
Table 2.8 Updated (Based on EFT V13.1) Modelled Annual Mean PM <sub>2.5</sub> Concentrations	7
Table 2.9 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM <sub>2.5</sub> Results	8
Table 3.1 Original (Based on EFT V12.1) Modelled Annual Mean NO <sub>2</sub> Concentrations	9
Table 3.2 Updated (Based on EFT V13.1) Modelled Annual Mean NO <sub>2</sub> Concentrations	10
Table 3.3 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean NO <sub>2</sub> Results	10
Table 3.4 Original (Based on EFT V12.1) Modelled Annual Mean PM <sub>10</sub> Concentrations	11
Table 3.5 Updated (Based on EFT V13.1) Modelled Annual Mean PM <sub>10</sub> Concentrations	11
Table 3.6 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM <sub>10</sub> Results	12
Table 3.7 Original (Based on EFT V12.1) Modelled Annual Mean PM <sub>2.5</sub> Concentrations	12
Table 3.8 Updated (Based on EFT V13.1) Modelled Annual Mean PM <sub>2.5</sub> Concentrations	13
Table 3.9 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM <sub>2.5</sub> Results	13

# Executive Summary

## Ex1.1 Introduction

- Ex1.1.1 The Examining Authority (ExA) has requested that a sensitivity analysis for the Kent and Suffolk air quality modelling is conducted to account for an updated Emission Factor Toolkit (EFT). This document presents the results of the sensitivity test and the impact on nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) predicted concentrations for both the Kent and Suffolk Proposed Projects.
- Ex1.1.2 The sensitivity test demonstrates there is generally a very small increase in NO<sub>2</sub> predicted concentrations in the Do-Minimum (DM) and Do-Something (DS) scenarios with a maximum increase of 1µg/m<sup>3</sup> across both the Kent and Suffolk Proposed Projects. The change in PM<sub>10</sub> and PM<sub>2.5</sub> predicted concentrations as a result of the updated EFT is negligible at all receptors, for each scenario across both the Kent and Suffolk Proposed Projects.

## Ex1.2 Conclusion

- Ex1.2.1 The updated EFT does not affect either the Proposed Project's ability to comply with any Air Quality Strategy (AQS) objectives or limit values, and therefore the outcome of the original report remains unchanged.



# 1. Methodology

- 1.1.1 The EFT is used to predict emission rates from sources (in this case road sources) based on vehicle counts, road type, percentage of Heavy Duty Vehicles (HDVs) and the assessment year. As a result, the emission rates for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> have been re-calculated and the ADMS-roads models have been updated for the base year (BY), Do-Minimum (DM) and Do-Something (DS) scenarios. The following parameters remain the same as the initial assessment for both the Kent and Suffolk Proposed Projects
- Road geometry and road widths;
  - Meteorological parameters; and
  - Sensitive human and ecological receptor locations
- 1.1.2 The change in emissions rates impacts the verification factor used to adjust modelling results based on a comparison of modelled and monitored results. This has been reflected in the results.

## 2. Suffolk Results

### 2.1 NO<sub>2</sub> Results Comparison

- 2.1.1 Table 2.1 presents the original NO<sub>2</sub> results based on EFT V12.1, Table 2.2 presents the updated NO<sub>2</sub> results based on EFT V13.1, and Table 2.3 presents the change between the two sets of results. Table 2.3 demonstrates that there is a small increase in predicted concentrations in the DM and DS scenarios. The largest increase is at receptors R1 and R4 with a 1µg/m<sup>3</sup> increase.
- 2.1.2 Table 2.2 demonstrates that the updated predicted NO<sub>2</sub> concentrations still indicate that there are no predicted exceedances of the annual mean NO<sub>2</sub> AQS objective of 40µg/m<sup>3</sup> at any of the modelled receptors. Likewise, it remains that exceedances of the 1-hour mean NO<sub>2</sub> AQS objective are unlikely to occur as the annual mean is less than 60µg/m<sup>3</sup>. Therefore, as with the original assessment, the change in annual mean NO<sub>2</sub> concentrations at all receptors is negligible (not significant).

**Table 2.1 Original (Based on EFT V12.1) Modelled Annual Mean NO<sub>2</sub> Concentrations**

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	19.7	13.2	13.4	0.2
R2	9.8	7.2	7.2	0.0
R3	16.2	11.0	11.2	0.2
R4	18.6	12.5	12.6	0.1
R5	11.9	8.4	8.5	0.1
R6	13.9	9.6	9.7	0.1

Table 2.2 Updated (Based on EFT V13.1) Modelled Annual Mean NO<sub>2</sub> Concentrations

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	19.7	14.2	14.4	0.2
R2	9.8	7.5	7.6	0.1
R3	16.2	11.8	12.0	0.2
R4	18.6	13.4	13.6	0.2
R5	11.9	8.9	9.0	0.1
R6	13.9	10.2	10.3	0.1

Table 2.3 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean NO<sub>2</sub> Results

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	0.0 (-0.1%)	1.0 (7.7%)	1.0 (7.8%)
R2	0.0 (0.1%)	0.3 (3.9%)	0.4 (4.9%)
R3	0.0 (-0.1%)	0.8 (7.3%)	0.8 (6.8%)
R4	0.0 (0.2%)	0.9 (7.4%)	1.0 (8.1%)
R5	0.0 (0.2%)	0.4 (5.4%)	0.4 (5.3%)
R6	0.0 (-0.1%)	0.6 (5.9%)	0.6 (6.2%)

2.2 PM<sub>10</sub> Results Comparison

- 2.2.1 Table 2.4 presents the original PM<sub>10</sub> results based on EFT V12.1, Table 2.5 presents the updated PM<sub>10</sub> results based on EFT V13.1, and Table 2.6 presents the change between the two sets of results. Table 2.6 demonstrates that there is a negligible change in PM10 concentrations at all modelled receptors between the original and updated results.
- 2.2.2 Table 2.5 demonstrates that the updated predicted PM<sub>10</sub> concentrations still indicate that there are no predicted exceedances of the annual mean PM<sub>10</sub> AQS objective of 40µg/m<sup>3</sup> at any of the modelled receptors. Likewise, it remains that exceedances of the

24-hour mean PM<sub>10</sub> AQS objective are unlikely to occur as the annual mean is less than 32µg/m<sup>3</sup>. Therefore, as with the original assessment, the change in annual mean PM<sub>10</sub> concentrations at all receptors is negligible (not significant).

**Table 2.4 Original (Based on EFT V12.1) Modelled Annual Mean PM<sub>10</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	16.0	15.6	15.8	0.2
R2	12.5	12.0	12.1	0.1
R3	14.7	14.3	14.4	0.1
R4	15.9	15.5	15.6	0.1
R5	13.5	13.1	13.1	0.0
R6	14.2	13.8	13.8	0.0

**Table 2.5 Updated (Based on EFT V13.1) Modelled Annual Mean PM<sub>10</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	16.0	15.6	15.7	0.1
R2	12.5	12.0	12.1	0.1
R3	14.7	14.2	14.3	0.1
R4	15.9	15.5	15.6	0.1
R5	13.5	13.1	13.1	0.0
R6	14.2	13.7	13.8	0.1



**Table 2.6 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM<sub>10</sub> Results**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	0.0 (0.1%)	0.0 (-0.3%)	-0.1 (-0.7%)
R2	0.0 (-0.2%)	0.0 (0.2%)	0.0 (-0.4%)
R3	0.0 (-0.1%)	-0.1 (-0.4%)	-0.1 (-0.4%)
R4	0.0 (0.2%)	0.0 (-0.3%)	0.0 (-0.1%)
R5	0.0 (0.1%)	0.0 (-0.4%)	0.0 (0.1%)
R6	0.0 (0%)	-0.1 (-0.5%)	0.0 (0.1%)

**2.3 PM<sub>2.5</sub> Results Comparison**

- 2.3.1

Table 2.7 presents the original PM<sub>2.5</sub> results based on EFT V12.1, Table 2.8 presents the updated PM<sub>2.5</sub> results based on the EFT V13.1, and Table 2.9 presents the change between the two sets of results. Table 2.9 demonstrates that there is a negligible change in PM<sub>2.5</sub> concentrations at all modelled receptors between the original and updated results.
- 2.3.2

Table 2.8 demonstrates that the updated predicted PM<sub>2.5</sub> concentrations still indicate that there are no predicted exceedances of the annual mean PM<sub>2.5</sub> limit value of 20µg/m<sup>3</sup> at any of the modelled receptors. Therefore, as with the original assessment, the change in annual mean PM<sub>2.5</sub> concentrations at all receptors is negligible (not significant).

**Table 2.7 Original (Based on EFT V12.1) Modelled Annual Mean PM<sub>2.5</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>2.5</sub> Concentration (µg/m³)			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	8.4	8.0	8.1	0.1
R2	6.5	6.1	6.1	0.0
R3	7.7	7.3	7.3	0.0
R4	8.2	7.8	7.8	0.0
R5	6.9	6.5	6.5	0.0
R6	7.2	6.8	6.9	0.1

**Table 2.8 Updated (Based on EFT V13.1) Modelled Annual Mean PM<sub>2.5</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>2.5</sub> Concentration (µg/m³)			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	8.4	8.0	8.1	0.1
R2	6.5	6.1	6.1	0.0
R3	7.7	7.3	7.3	0.0
R4	8.2	7.8	7.8	0.0
R5	6.9	6.5	6.5	0.0
R6	7.2	6.8	6.9	0.1

**Table 2.9 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM<sub>2.5</sub> Results**

Receptor ID	Annual Mean PM <sub>2.5</sub> Concentration (µg/m³)		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	0.0 (-0.1%)	0.0 (-0.4%)	0.0 (-0.6%)
R2	0.0 (-0.2%)	0.0 (0%)	0.0 (0.3%)
R3	0.0 (-0.3%)	0.0 (-0.3%)	0.0 (0.5%)
R4	0.0 (-0.4%)	0.0 (-0.6%)	0.0 (0.3%)
R5	0.0 (-0.3%)	0.0 (-0.3%)	0.0 (0.2%)
R6	0.0 (0.6%)	0.0 (0.6%)	0.0 (-0.3%)

# 3. Kent Results

## 3.1 NO<sub>2</sub> Results Comparison

- 3.1.1

Table 3.1 presents the original NO<sub>2</sub> results, Table 3.2 presents the updated NO<sub>2</sub> results based on the EFT V13.1 and Table 3.3 presents the change between the two sets of results. Table 3.3 demonstrates that there is a small increase in predicted concentrations in the DM and DS scenarios. The largest increase in the DM and DS is at receptor R1 with a 0.3µg/m<sup>3</sup> increase.
- 3.1.2

Table 3.2 demonstrates that the updated predicted NO<sub>2</sub> concentrations still indicate that there are no predicted exceedances of the annual mean NO<sub>2</sub> AQS objective of 40µg/m<sup>3</sup> at any of the modelled receptors. Likewise, it remains that exceedances of the 1-hour mean NO<sub>2</sub> AQS objective are unlikely to occur as the annual mean is less than 60µg/m<sup>3</sup>. Therefore, as with the original assessment, the change in annual mean NO<sub>2</sub> concentrations at all receptors is negligible (not significant).

**Table 3.1 Original (Based on EFT V12.1) Modelled Annual Mean NO<sub>2</sub> Concentrations**

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	14.6	9.0	9.0	0.0
R2	10.2	7.0	7.1	0.1
R3	11.3	7.6	7.6	0.0
R4	10.7	7.3	7.3	0.0
R5	11.5	7.7	7.7	0.0

**Table 3.2 Updated (Based on EFT V13.1) Modelled Annual Mean NO<sub>2</sub> Concentrations**

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	14.5	9.3	9.3	0.0
R2	10.2	7.1	7.2	0.1
R3	11.3	7.7	7.7	0.0
R4	10.6	7.4	7.4	0.0
R5	11.5	7.8	7.8	0.0

**Table 3.3 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean NO<sub>2</sub> Results**

Receptor ID	Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	-0.1 (-0.7%)	0.3 (3.3%)	0.3 (3.3%)
R2	0.0 (0%)	0.1 (1.4%)	0.1 (1.4%)
R3	0.0 (0%)	0.1 (1.3%)	0.1 (1.3%)
R4	-0.1 (-0.9%)	0.1 (1.4%)	0.1 (1.4%)
R5	0.0 (0%)	0.1 (1.3%)	0.1 (1.3%)

## 3.2 PM<sub>10</sub> Results Comparison

- 3.2.1 Table 3.4 presents the original PM<sub>10</sub> results based on EFT V12.1, Table 3.5 presents the updated PM<sub>10</sub> results based on the EFT V13.1, and Table 3.6 presents the change between the two sets of results. Table 3.6 demonstrates that there is a negligible change in PM<sub>10</sub> concentrations at all modelled receptors between the original and updated results.
- 3.2.2 Table 3.5 demonstrates that the updated predicted PM<sub>10</sub> concentrations still indicate that there are no predicted exceedances of the annual mean PM<sub>10</sub> AQS objective of 40µg/m<sup>3</sup> at any of the modelled receptors. Likewise, it remains that exceedances of the 24-hour mean PM<sub>10</sub> AQS objective are unlikely to occur as the annual mean is less than

32µg/m<sup>3</sup>. Therefore, as with the original assessment, the change in annual mean NO<sub>2</sub> concentrations at all receptors is negligible (not significant).

**Table 3.4 Original (Based on EFT V12.1) Modelled Annual Mean PM<sub>10</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	12.7	12.2	12.2	0.0
R2	12.1	11.5	11.6	0.1
R3	11.3	10.7	10.8	0.1
R4	11.1	10.5	10.6	0.1
R5	11.5	11.0	11.0	0.0

**Table 3.5 Updated (Based on EFT V13.1) Modelled Annual Mean PM<sub>10</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	12.7	12.1	12.1	0.0
R2	12.1	11.5	11.5	0.0
R3	11.3	10.7	10.7	0.0
R4	11.1	10.5	10.5	0.0
R5	11.5	10.9	10.9	0.0



**Table 3.6 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM<sub>10</sub> Results**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m <sup>3</sup> )		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	0.0 (0%)	-0.1 (-0.8%)	-0.1 (-0.8%)
R2	0.0 (0%)	0.0 (0%)	-0.1 (-0.9%)
R3	0.0 (0%)	0.0 (0%)	-0.1 (-0.9%)
R4	0.0 (0%)	0.0 (0%)	-0.1 (-0.9%)
R5	0.0 (0%)	-0.1 (-0.9%)	-0.1 (-0.9%)

**3.3 PM2.5 Results Comparison**

- 3.3.1

Table 3.7 presents the original PM<sub>2.5</sub> results based on EFT V12.1, Table 3.8 presents the updated PM<sub>2.5</sub> results based on the EFT V13.1, and Table 3.9 presents the change between the two sets of results. Table 3.9 demonstrates that there is a negligible change in PM<sub>2.5</sub> concentrations at all modelled receptors between the original and updated results.
- 3.3.2

Table 3.8 demonstrates that the updated predicted PM<sub>2.5</sub> concentrations still indicate that there are no predicted exceedances of the annual mean PM<sub>2.5</sub> limit value of 20µg/m<sup>3</sup> at any of the modelled receptors. Therefore, as with the original assessment, the change in annual mean PM<sub>2.5</sub> concentrations at all receptors is negligible (not significant).

**Table 3.7 Original (Based on EFT V12.1) Modelled Annual Mean PM<sub>2.5</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>2.5</sub> Concentration (µg/m <sup>3</sup> )			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	6.5	5.9	6.0	0.1
R2	6.1	5.6	5.6	0.0
R3	6.2	5.6	5.6	0.0
R4	6.0	5.5	5.5	0.0
R5	6.3	5.8	5.8	0.0

**Table 3.8 Updated (Based on EFT V13.1) Modelled Annual Mean PM<sub>2.5</sub> Concentrations**

Receptor ID	Annual Mean PM <sub>2.5</sub> Concentration (µg/m³)			
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)	Change
R1	6.5	5.9	5.9	0.0
R2	6.1	5.6	5.6	0.0
R3	6.1	5.6	5.6	0.0
R4	6.0	5.5	5.5	0.0
R5	6.2	5.7	5.7	0.0

**Table 3.9 Change in concentrations between the Original (V12.1) and Updated (V13.1) Modelled Annual Mean PM<sub>2.5</sub> Results**

Receptor ID	Annual Mean PM <sub>10</sub> Concentration (µg/m³)		
	Base Year (2023)	Do-Nothing (2028)	Do-Something (2028)
R1	0.0 (0%)	0.0 (0%)	-0.1 (-1.7%)
R2	0.0 (0%)	0.0 (0%)	0.0 (0%)
R3	-0.1 (-1.6%)	0.0 (0%)	0.0 (0%)
R4	0.0 (0%)	0.0 (0%)	0.0 (0%)
R5	-0.1 (-1.6%)	-0.1 (-1.7%)	-0.1 (-1.7%)

## 4. Conclusion

- 4.1.1 To account for the release of EFT V13.1, the emission rates from road sources relating to both the Suffolk and Kent Onshore Schemes have been recalculated and the ADMS dispersion models have been re-run for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. The results show that as a result of the updated EFT, there is generally a small increase in predicted NO<sub>2</sub> concentrations under the DM and DS scenarios, however, the change for PM<sub>10</sub> and PM<sub>2.5</sub> is negligible across all scenarios, for both the Kent and the Suffolk Onshore Schemes. It can therefore be confirmed that the assessment findings as presented in **6.2.2.8 Part 2 Suffolk Chapter 8 Air Quality [APP-055]** and **6.2.3.8 Part 3 Kent Chapter 8 Air Quality [APP-068]** are not sensitive to the change from EFT V12.1 to EFT V13.1, and that all effects remain negligible (not significant).

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