



## **Thurrock Flexible Generation Plant**

**Preliminary Environmental Information Report  
Appendix 12.5: Results of Other Scenarios Modelled**

**Date:** September 2018

**Environmental Impact Assessment**  
**Preliminary Environmental Information Report**

**Volume 6**  
**Appendix 12.5**

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## Summary

This appendix outlines the results of three scenarios that were modelled but not included in Volume 3, Chapter 12.

## Qualifications

This chapter has been prepared by Kathryn Barker, an associate member of the Institute of Air Quality Management and the Institution of Environmental Sciences.

It has been checked by Rosemary Challen, a Member of the Institution of Environmental Sciences and Member of the Institute of Air Quality Management (IAQM).

It has been reviewed by Fiona Prissall, a Chartered Environmentalist, Member of the Institution of Environmental Sciences and Member of the Institute of Air Quality Management (IAQM). Fiona is the IAQM committee secretary. Fiona was a member of the working groups that produced the IAQM 2014 'Guidance on the assessment of dust from demolition and construction' and the EPUK&IAQM 2017 'Land-use Planning & Development Control: Planning for Air Quality' guidance.

## 1. Introduction

1.1.1 Four different engine scenarios have been modelled:

1. 60 x 10.4 MW engines, each engine has its own stack (60 stacks)
2. 60 x 10.4 MW engines, aggregated stacks of five engines per stack (12 stacks)
3. 33 x 18.4 MW engines, each engine has its own stack (33 stacks)
4. 33 x 18.4 MW engines, aggregated stacks of 6 groups of five engines per stack and one group of three engines per stack (7 stacks).

1.1.2 The predicted concentrations were highest for Scenario 1 which are presented in the main chapter. The results for Scenarios 2, 3 and 4 are presented in this appendix.

## 1.2 Scenario 2: 60 x 10.4 MW engines, 5 engines per stack (12 Stacks)

### Stack Locations

1.2.1 Table 1.1 outlines the modelled stack locations for Scenario 2.

Table 1.1: Stack Locations for Scenario 2.

Engine Number	X (m)	Y (m)
1	566358	176621
2	566368	176655
3	566378	176690
4	566386	176688
5	566376	176652
6	566367	176619

Engine Number	X (m)	Y (m)
7	566393	176757
8	566403	176792
9	566412	176826
10	566424	176823
11	566414	176789
12	566404	176754

### Long-term Impacts

1.2.2 Table 1.2 summarise the long-term maximum Process Contribution (PC) and Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 1.2: Long-term Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 2.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	1.6	4	28.0	70	Negligible
2	Sandhurst Road	26.4	1.2	3	27.6	69	Negligible
3	School	34.7	0.7	2	35.4	88	Slight
4	Gateway Academy	29.6	0.2	0	29.7	74	Negligible
5	Gravel Pit Cottages	18.0	2.1	5	20.1	50	Negligible
6	Princess Margaret Rd	18.0	1.1	3	19.1	48	Negligible
7	Walnut Tree Farm	18.3	1.8	5	20.2	50	Negligible
8	The Green	18.3	0.6	1	18.9	47	Negligible
9	West Street	42.7	0.3	1	43.0	108	Moderate

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
10	Milton School	32.1	0.2	1	32.3	81	Negligible
11	Royal Pier Road	32.3	0.3	1	32.6	82	Negligible
12	West Tilbury Hall	18.3	0.6	2	19.0	47	Negligible
13	Cooper Shore	18.3	1.0	2	19.3	48	Negligible
14	R1	31.1	0.1	0	31.2	78	Negligible
15	R2	27.6	0.1	0	27.7	69	Negligible
16	R3	28.3	0.1	0	28.4	71	Negligible
17	R4	26.9	0.2	0	27.1	68	Negligible
18	R5	32.2	0.2	0	32.4	81	Negligible
19	R6	26.9	0.2	1	27.1	68	Negligible
20	R7	28.1	0.2	0	28.3	71	Negligible
21	R8	28.9	0.2	1	29.1	73	Negligible
22	R9	36.6	0.5	1	37.1	93	Negligible
23	R10	30.6	0.6	2	31.2	78	Slight
24	R11	26.6	0.6	1	27.2	68	Negligible
25	R12	26.1	0.6	1	26.7	67	Negligible
26	R13	26.4	1.1	3	27.5	69	Negligible
27	R14	26.8	0.9	2	27.7	69	Negligible
28	R15	23.6	1.6	4	25.2	63	Negligible
29	R16	25.8	0.7	2	26.5	66	Negligible
30	R17	26.2	0.6	2	26.8	67	Negligible
31	R18	24.1	0.1	0	24.2	61	Negligible
32	R19	31.6	0.7	2	32.3	81	Slight
33	R20	23.5	0.1	0	23.6	59	Negligible
34	R21	34.8	0.1	0	34.9	87	Negligible
35	R22	24.8	0.1	0	24.9	62	Negligible
36	R23	34.1	0.1	0	34.2	85	Negligible
37	R24	28.5	0.1	0	28.6	71	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
38	R25	33.8	0.2	1	34.0	85	Negligible
39	R26	22.6	0.1	0	22.7	57	Negligible
40	R27	24.5	0.2	0	24.7	62	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

1.2.3 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse'. The impact is 'moderate adverse' at one receptor only: West Street (receptor 9).

1.2.4 Predicted annual-mean  $\text{NO}_2$  at the facades of existing receptors are below the AQS objective for  $\text{NO}_2$  for all receptors except West Street (receptor 9). At West Street, the predicted  $\text{NO}_2$  concentration exceeds the AQS objective of  $40 \mu\text{g.m}^{-3}$  both with and without the development. The PEC with the development is 108% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. The table below shows the measured concentrations at GR13 in the last five years.

**Table 1.3: Annual-mean  $\text{NO}_2$  Concentrations at GR13.**

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40	37.5	42.7

1.2.5 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of  $42.7 \mu\text{g.m}^{-3}$  is a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related  $\text{NO}_2$  concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further. On that basis, if the AC at West Street is assumed to be  $37.5 \mu\text{g.m}^{-3}$  the PEC is 95% of the AQAL and, when the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'slight adverse'.

1.2.6 On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

### Short-term Impacts

1.2.7 Table 1.4 summarise the short-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

**Table 1.4: Short-term Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 2.**

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	28.2	14	81.1	41	Slight
2	Sandhurst Road	52.9	24.2	12	77.1	39	Slight
3	School	69.4	12.0	6	81.4	41	Negligible
4	Gateway Academy	59.2	11.3	6	70.4	35	Negligible
5	Gravel Pit Cottages	36.0	23.5	12	59.5	30	Slight
6	Princess Margaret Rd	36.0	14.2	7	50.2	25	Negligible
7	Walnut Tree Farm	36.7	35.7	18	72.3	36	Slight
8	The Green	36.7	24.3	12	60.9	30	Slight
9	West Street	85.4	11.6	6	97.0	49	Negligible
10	Milton School	64.2	11.5	6	75.7	38	Negligible
11	Royal Pier Road	64.6	12.0	6	76.7	38	Negligible
12	West Tilbury Hall	36.7	28.6	14	65.3	33	Slight
13	Cooper Shore	36.7	37.0	19	73.7	37	Slight
14	R1	62.2	4.1	2	66.3	33	Negligible
15	R2	55.2	4.3	2	59.5	30	Negligible
16	R3	56.6	5.6	3	62.2	31	Negligible
17	R4	53.8	7.3	4	61.1	31	Negligible
18	R5	64.4	7.5	4	71.9	36	Negligible
19	R6	53.8	9.0	4	62.8	31	Negligible
20	R7	56.2	8.5	4	64.7	32	Negligible
21	R8	57.8	9.4	5	67.2	34	Negligible
22	R9	73.2	11.5	6	84.7	42	Negligible

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
23	R10	61.2	12.1	6	73.3	37	Negligible
24	R11	53.2	13.1	7	66.3	33	Negligible
25	R12	52.2	13.7	7	65.9	33	Negligible
26	R13	52.8	22.9	11	75.7	38	Slight
27	R14	53.6	20.1	10	73.7	37	Negligible
28	R15	47.2	27.8	14	75.0	37	Slight
29	R16	51.6	15.9	8	67.5	34	Negligible
30	R17	52.4	15.0	8	67.4	34	Negligible
31	R18	48.2	6.2	3	54.4	27	Negligible
32	R19	63.2	12.3	6	75.5	38	Negligible
33	R20	47.0	5.7	3	52.7	26	Negligible
34	R21	69.6	5.7	3	75.3	38	Negligible
35	R22	49.6	3.9	2	53.5	27	Negligible
36	R23	68.2	3.5	2	71.7	36	Negligible
37	R24	57.0	4.3	2	61.3	31	Negligible
38	R25	67.6	7.2	4	74.8	37	Negligible
39	R26	45.2	4.7	2	49.9	25	Negligible
40	R27	49.0	8.2	4	57.2	29	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2. The AQAL is 200 µg.m<sup>-3</sup>.

1.2.8 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 19%. The EPUK&IAQM impact descriptor for an increase between 10 and 20% is 'slight adverse'. At all receptors the impact descriptor is "slight adverse" or "negligible". On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

### 1.3 Scenario3: 33 x 18.4 MW engines, each engine has its own stack (33 stacks)

#### Stack Locations

1.3.1 Table 1.5 outlines the modelled stack locations for Scenario 3.

Table 1.5: Stack Locations for Scenario 3.

Engine Number	X (m)	Y (m)
1	566405	176754
2	566389	176744
3	566393	176758
4	566397	176771
5	566401	176785
6	566405	176799
7	566409	176814
8	566412	176826
9	566416	176840
10	566428	176837
11	566424	176824
12	566421	176810
13	566417	176796
14	566413	176782

Engine Number	X (m)	Y (m)
15	566409	176768
16	566401	176740
17	566390	176701
18	566387	176688
19	566352	176608
20	566356	176622
21	566359	176635
22	566363	176649
23	566367	176663
24	566371	176677
25	566375	176691
26	566378	176704
27	566383	176674
28	566379	176660
29	566375	176646
30	566371	176631
31	566367	176618
32	566364	176604

Engine Number	X (m)	Y (m)
33	566430	176845

### Long-term Impacts

1.3.2 Table 1.6 summarise the long-term maximum Process Contribution (PC) and Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 1.6: Long-term Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 3.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	2.1	5	28.6	71	Negligible
2	Sandhurst Road	26.4	1.5	4	27.9	70	Negligible
3	School	34.7	0.8	2	35.5	89	Slight
4	Gateway Academy	29.6	0.3	1	29.8	75	Negligible
5	Gravel Pit Cottages	18.0	2.6	6	20.6	51	Slight
6	Princess Margaret Rd	18.0	1.4	4	19.4	49	Negligible
7	Walnut Tree Farm	18.3	2.6	7	20.9	52	Slight
8	The Green	18.3	0.8	2	19.1	48	Negligible
<b>9</b>	<b>West Street</b>	<b>42.7</b>	<b>0.4</b>	<b>1</b>	<b>43.1</b>	<b>108</b>	<b>Moderate</b>
10	Milton School	32.1	0.3	1	32.4	81	Negligible
11	Royal Pier Road	32.3	0.4	1	32.7	82	Negligible
12	West Tilbury Hall	18.3	0.9	2	19.2	48	Negligible
13	Cooper Shore	18.3	1.4	4	19.8	49	Negligible
14	R1	31.1	0.1	0	31.2	78	Negligible
15	R2	27.6	0.1	0	27.7	69	Negligible
16	R3	28.3	0.1	0	28.4	71	Negligible
17	R4	26.9	0.2	0	27.1	68	Negligible

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
18	R5	32.2	0.2	0	32.4	81	Negligible
19	R6	26.9	0.3	1	27.2	68	Negligible
20	R7	28.1	0.2	1	28.3	71	Negligible
21	R8	28.9	0.3	1	29.2	73	Negligible
22	R9	36.6	0.7	2	37.3	93	Slight
23	R10	30.6	0.8	2	31.4	78	Slight
24	R11	26.6	0.7	2	27.3	68	Negligible
25	R12	26.1	0.7	2	26.8	67	Negligible
26	R13	26.4	1.4	3	27.8	69	Negligible
27	R14	26.8	1.1	3	27.9	70	Negligible
28	R15	23.6	2.0	5	25.6	64	Negligible
29	R16	25.8	0.8	2	26.6	67	Negligible
30	R17	26.2	0.8	2	27.0	67	Negligible
31	R18	24.1	0.2	0	24.3	61	Negligible
32	R19	31.6	0.8	2	32.4	81	Slight
33	R20	23.5	0.1	0	23.6	59	Negligible
34	R21	34.8	0.1	0	34.9	87	Negligible
35	R22	24.8	0.1	0	24.9	62	Negligible
36	R23	34.1	0.1	0	34.2	85	Negligible
37	R24	28.5	0.1	0	28.6	72	Negligible
38	R25	33.8	0.3	1	34.1	85	Negligible
39	R26	22.6	0.1	0	22.7	57	Negligible
40	R27	24.5	0.2	1	24.7	62	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

1.3.3 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse'. There is one receptor where the impact is 'moderate adverse'; West Street (receptor 9).

1.3.4 Predicted annual-mean NO<sub>2</sub> at the facades of existing receptors are below the AQS objective for NO<sub>2</sub> for all but one receptor. At West Street (receptor 9) the predicted NO<sub>2</sub> concentration exceeds the AQS objective of 40 µg.m<sup>-3</sup> both with and without the development.

1.3.5 At West Street, the PEC is 108% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. The table below shows the measured concentrations at GR13 in the last five years.

Table 1.7: Annual-mean NO<sub>2</sub> Concentrations at GR13 (µg.m<sup>-3</sup>).

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40	37.5	42.7

1.3.6 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of 42.7 µg.m<sup>-3</sup> is a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO<sub>2</sub> concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further. On that basis, if the AC at West Street is assumed to be 37.5 µg.m<sup>-3</sup> the PEC is 95% of the AQAL and, when the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'slight adverse'.

1.3.1 On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

### Short-term Impacts

1.3.2 Table 1.8 summarise the short-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 1.8: Short-term Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 3.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	31.5	16	84.4	42	Slight
2	Sandhurst Road	52.9	27.0	13	79.9	40	Slight

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
3	School	69.4	17.0	8	86.4	43	Negligible
4	Gateway Academy	59.2	15.2	8	74.3	37	Negligible
5	Gravel Pit Cottages	36.0	26.9	13	63.0	31	Slight
6	Princess Margaret Rd	36.0	18.1	9	54.1	27	Negligible
7	Walnut Tree Farm	36.7	41.7	21	78.4	39	Moderate
8	The Green	36.7	27.3	14	64.0	32	Slight
9	West Street	85.4	15.1	8	100.5	50	Negligible
10	Milton School	64.2	14.5	7	78.7	39	Negligible
11	Royal Pier Road	64.6	15.3	8	79.9	40	Negligible
12	West Tilbury Hall	36.7	32.5	16	69.2	35	Slight
13	Cooper Shore	36.7	43.2	22	79.9	40	Moderate
14	R1	62.2	5.1	3	67.3	34	Negligible
15	R2	55.2	4.9	2	60.1	30	Negligible
16	R3	56.6	9.3	5	65.9	33	Negligible
17	R4	53.8	9.1	5	62.9	31	Negligible
18	R5	64.4	9.2	5	73.6	37	Negligible
19	R6	53.8	10.4	5	64.2	32	Negligible
20	R7	56.2	10.4	5	66.6	33	Negligible
21	R8	57.8	11.8	6	69.6	35	Negligible
22	R9	73.2	15.1	8	88.3	44	Negligible
23	R10	61.2	17.2	9	78.4	39	Negligible
24	R11	53.2	17.6	9	70.8	35	Negligible
25	R12	52.2	18.2	9	70.4	35	Negligible
26	R13	52.8	25.6	13	78.4	39	Slight
27	R14	53.6	23.2	12	76.8	38	Slight
28	R15	47.2	30.8	15	78.0	39	Slight
29	R16	51.6	19.6	10	71.2	36	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
30	R17	52.4	18.9	9	71.3	36	Negligible
31	R18	48.2	9.0	5	57.2	29	Negligible
32	R19	63.2	16.6	8	79.8	40	Negligible
33	R20	47.0	7.5	4	54.5	27	Negligible
34	R21	69.6	6.5	3	76.1	38	Negligible
35	R22	49.6	5.0	3	54.6	27	Negligible
36	R23	68.2	4.8	2	73.0	37	Negligible
37	R24	57.0	7.1	4	64.1	32	Negligible
38	R25	67.6	8.3	4	75.9	38	Negligible
39	R26	45.2	7.1	4	52.3	26	Negligible
40	R27	49.0	9.8	5	58.8	29	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

- 1.3.3 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 22%. The EPUK&IAQM impact descriptor for an increase between 20 and 50% is 'moderate adverse'. There are two receptors where the impact descriptor is 'moderate adverse'. As such, the impacts at these locations are considered to be potentially significant.
- 1.3.4 With reference to the impacts at these locations, the Environment Agency's on-line guidance referred to in turn by the EPUK&IAQM guidance states that where the PCs exceed 10% of the AQAL, the impacts are not considered significant if the PEC is below the AQAL. The Environment Agency's on-line guidance continues by stating that;  
"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."
- 1.3.5 For all receptors the PEC is less than half of the AQAL of  $200 \mu\text{g.m}^{-3}$ . On that basis and using professional judgement, the overall significance of effect is considered to be minor adverse.

## 1.4 Scenario 4: 33 x 18.4 MW engines, aggregated stacks of 6 groups of five engines per stack and one group of three engines per stack (7 stacks)

### Stack Locations

1.4.1 Table 1.9 outlines the modelled stack locations for Scenario 4.

**Table 1.9: Stack Locations for Scenario 4.**

Engine Number	X (m)	Y (m)
1	566406	176784
2	566421	176842
3	566415	176812
4	566398	176756
5	566380	176688
6	566374	176661
7	566365	176633

### Long-term Impacts

1.4.2 Table 1.10 summarise the long-term maximum Process Contribution (PC) and Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

**Table 1.10: Long-term Predicted  $\text{NO}_2$  Concentrations ( $\mu\text{g.m}^{-3}$ ) at Sensitive Receptors – Scenario 4.**

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	0.9	2	27.3	68	Negligible
2	Sandhurst Road	26.4	0.6	2	27.1	68	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
3	School	34.7	0.4	1	35.1	88	Negligible
4	Gateway Academy	29.6	0.1	0	29.6	74	Negligible
5	Gravel Pit Cottages	18.0	1.2	3	19.2	48	Negligible
6	Princess Margaret Rd	18.0	0.6	2	18.6	47	Negligible
7	Walnut Tree Farm	18.3	1.0	2	19.3	48	Negligible
8	The Green	18.3	0.3	1	18.6	47	Negligible
9	<b>West Street</b>	<b>42.7</b>	0.2	0	42.9	107	Negligible
10	Milton School	32.1	0.1	0	32.2	81	Negligible
11	Royal Pier Road	32.3	0.2	0	32.5	81	Negligible
12	West Tilbury Hall	18.3	0.3	1	18.7	47	Negligible
13	Cooper Shore	18.3	0.5	1	18.8	47	Negligible
14	R1	31.1	0.1	0	31.2	78	Negligible
15	R2	27.6	0.0	0	27.6	69	Negligible
16	R3	28.3	0.1	0	28.4	71	Negligible
17	R4	26.9	0.1	0	27.0	67	Negligible
18	R5	32.2	0.1	0	32.3	81	Negligible
19	R6	26.9	0.1	0	27.0	68	Negligible
20	R7	28.1	0.1	0	28.2	70	Negligible
21	R8	28.9	0.1	0	29.0	73	Negligible
22	R9	36.6	0.3	1	36.9	92	Negligible
23	R10	30.6	0.4	1	31.0	77	Negligible
24	R11	26.6	0.3	1	26.9	67	Negligible
25	R12	26.1	0.3	1	26.4	66	Negligible
26	R13	26.4	0.6	1	27.0	67	Negligible
27	R14	26.8	0.5	1	27.3	68	Negligible
28	R15	23.6	0.8	2	24.4	61	Negligible
29	R16	25.8	0.4	1	26.2	65	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
30	R17	26.2	0.3	1	26.5	66	Negligible
31	R18	24.1	0.1	0	24.2	60	Negligible
32	R19	31.6	0.4	1	32.0	80	Negligible
33	R20	23.5	0.1	0	23.6	59	Negligible
34	R21	34.8	0.1	0	34.9	87	Negligible
35	R22	24.8	0.0	0	24.8	62	Negligible
36	R23	34.1	0.0	0	34.1	85	Negligible
37	R24	28.5	0.0	0	28.5	71	Negligible
38	R25	33.8	0.1	0	33.9	85	Negligible
39	R26	22.6	0.0	0	22.6	57	Negligible
40	R27	24.5	0.1	0	24.6	61	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

1.4.3 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'negligible' for all receptors.

1.4.4 Predicted annual-mean NO<sub>2</sub> at the facades of existing receptors are below the AQS objective for NO<sub>2</sub> for all but one receptor. At West Street (receptor 9) the predicted NO<sub>2</sub> concentration exceeds the AQS objective of 40  $\mu\text{g.m}^{-3}$  both with and without the development.

1.4.1 On that basis and using professional judgement, the overall significance of effect is considered to be negligible.

### Short-term Impacts

1.4.2 Table 1.11 summarise the short-term maximum PC and PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

**Table 1.11: Short-term Predicted NO<sub>2</sub> Concentrations ( $\mu\text{g.m}^{-3}$ ) at Sensitive Receptors – Scenario 4.**

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	18.4	9	71.3	36	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
2	Sandhurst Road	52.9	15.9	8	68.8	34	Negligible
3	School	69.4	7.3	4	76.7	38	Negligible
4	Gateway Academy	59.2	6.6	3	65.7	33	Negligible
5	Gravel Pit Cottages	36.0	15.6	8	51.6	26	Negligible
6	Princess Margaret Rd	36.0	8.8	4	44.8	22	Negligible
7	Walnut Tree Farm	36.7	23.3	12	60.0	30	Slight
8	The Green	36.7	15.6	8	52.3	26	Negligible
9	West Street	85.4	6.7	3	92.0	46	Negligible
10	Milton School	64.2	6.8	3	71.0	35	Negligible
11	Royal Pier Road	64.6	7.0	3	71.6	36	Negligible
12	West Tilbury Hall	36.7	18.4	9	55.1	28	Negligible
13	Cooper Shore	36.7	23.2	12	59.9	30	Slight
14	R1	62.2	2.8	1	65.0	33	Negligible
15	R2	55.2	2.8	1	58.0	29	Negligible
16	R3	56.6	3.7	2	60.3	30	Negligible
17	R4	53.8	4.4	2	58.2	29	Negligible
18	R5	64.4	4.4	2	68.8	34	Negligible
19	R6	53.8	5.7	3	59.5	30	Negligible
20	R7	56.2	4.6	2	60.8	30	Negligible
21	R8	57.8	5.6	3	63.4	32	Negligible
22	R9	73.2	6.2	3	79.4	40	Negligible
23	R10	61.2	7.5	4	68.7	34	Negligible
24	R11	53.2	7.9	4	61.1	31	Negligible
25	R12	52.2	8.7	4	60.9	30	Negligible
26	R13	52.8	15.1	8	67.9	34	Negligible
27	R14	53.6	13.2	7	66.8	33	Negligible
28	R15	47.2	18.1	9	65.3	33	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
29	R16	51.6	10.1	5	61.7	31	Negligible
30	R17	52.4	9.5	5	61.9	31	Negligible
31	R18	48.2	3.9	2	52.1	26	Negligible
32	R19	63.2	7.3	4	70.5	35	Negligible
33	R20	47.0	3.8	2	50.8	25	Negligible
34	R21	69.6	3.8	2	73.4	37	Negligible
35	R22	49.6	2.6	1	52.2	26	Negligible
36	R23	68.2	2.3	1	70.5	35	Negligible
37	R24	57.0	2.5	1	59.5	30	Negligible
38	R25	67.6	4.5	2	72.1	36	Negligible
39	R26	45.2	2.4	1	47.6	24	Negligible
40	R27	49.0	4.6	2	53.6	27	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

1.4.3 The results show that the highest PC as a percentage of the AQAL at any discrete receptor is 12%. The EPUK&IAQM impact descriptor for an increase between 10 and 20% is 'slight adverse'. There are two receptors where the impact descriptor is 'slight adverse' and at all other receptors the impact descriptor is "negligible".

1.4.4 On that basis and using professional judgement, the overall significance of effect is considered to be negligible.

## 2. Cumulative Effects Assessment

### 2.1 Scenario 2: 60 x 10.4 MW engines, 5 engines per stack (12 Stacks)

#### Long-term Impacts

- 2.1.1 Table 2.1 summarises the long-term maximum Process Contribution (PC) and the Cumulative Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 2.1: Long-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors –Scenario 2.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	Thurrock Flexible Generation Plant PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Tilbury2 PC (µg.m <sup>-3</sup> )	Lower Thames Crossing PC (µg.m <sup>-3</sup> )	Tilbury Energy Centre PC (µg.m <sup>-3</sup> )	Tilbury Green Power PC (µg.m <sup>-3</sup> )	Cumulative PEC (µg.m <sup>-3</sup> )	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	1.6	4	0.6	-	0.04	-	28.7	72	Negligible
2	Sandhurst Road	26.4	1.2	3	3	-	0.05	-	30.7	77	Slight
3	School	34.7	0.7	2	0.9	-	0.13	-	37.4	93	Slight
4	Gateway Academy	29.6	0.2	0	-	1	0.03	-	30.8	77	Negligible
5	Gravel Pit Cottages	18.0	2.1	5	-	1	0.57	-	21.7	54	Negligible
6	Princess Margaret Rd	18.0	1.1	3	-	1	0.39	-	20.5	51	Negligible
7	Walnut Tree Farm	18.3	1.8	5	-	1	0.30	-	21.5	54	Negligible
8	The Green	18.3	0.6	1	-	1	0.14	-	20.0	50	Negligible
<b>9</b>	<b>West Street</b>	<b>42.7</b>	<b>0.3</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>0.15</b>	<b>1</b>	<b>44.2</b>	<b>110</b>	<b>Moderate</b>
10	Milton School	32.1	0.2	1	-	-	0.07	1	33.4	84	Negligible
11	Royal Pier Road	32.3	0.3	1	-	-	0.14	1	33.8	84	Negligible
12	West Tilbury Hall	18.3	0.6	2	-	1	0.15	-	20.1	50	Negligible
13	Cooper Shore	18.3	1.0	2	-	1	0.21	-	20.5	51	Negligible
14	R1	31.1	0.1	0	-	1	0.05	1	33.2	83	Negligible
15	R2	27.6	0.1	0	-	1	0.05	1	29.7	74	Negligible
16	R3	28.3	0.1	0	-	1	0.04	1	30.5	76	Negligible
17	R4	26.9	0.2	0	-	1	0.05	1	29.1	73	Negligible
18	R5	32.2	0.2	0	-	1	0.05	1	34.4	86	Negligible
19	R6	26.9	0.2	1	-	1	0.07	1	29.2	73	Negligible
20	R7	28.1	0.2	0	-	1	0.05	1	30.3	76	Negligible
21	R8	28.9	0.2	1	-	-	0.03	1	30.1	75	Negligible
22	R9	36.6	0.5	1	-	-	0.07	1	38.2	96	Slight
23	R10	30.6	0.6	2	-	-	0.17	1	32.4	81	Slight
24	R11	26.6	0.6	1	-	-	0.27	1	28.4	71	Negligible
25	R12	26.1	0.6	1	-	-	0.29	1	28.0	70	Negligible
26	R13	26.4	1.1	3	-	-	0.07	1	28.6	71	Negligible
27	R14	26.8	0.9	2	-	-	0.13	1	28.8	72	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	Thurrock Flexible Generation Plant PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Tilbury2 PC ( $\mu\text{g.m}^{-3}$ )	Lower Thames Crossing PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Energy Centre PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Green Power PC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC as % of AQAL	Impact Descriptor
28	R15	23.6	1.6	4	-	-	0.04	1	26.2	66	Negligible
29	R16	25.8	0.7	2	-	-	0.26	1	27.7	69	Negligible
30	R17	26.2	0.6	2	-	-	0.29	1	28.1	70	Negligible
31	R18	24.1	0.1	0	-	1	0.04	1	26.3	66	Negligible
32	R19	31.6	0.7	2	-	-	0.13	1	33.4	83	Slight
33	R20	23.5	0.1	0	-	1	0.05	1	25.7	64	Negligible
34	R21	34.8	0.1	0	-	1	0.05	1	37.0	92	Negligible
35	R22	24.8	0.1	0	-	1	0.05	1	26.9	67	Negligible
36	R23	34.1	0.1	0	-	1	0.05	1	36.2	91	Negligible
37	R24	28.5	0.1	0	-	1	0.04	1	30.6	77	Negligible
38	R25	33.8	0.2	1	-	-	0.12	1	35.2	88	Negligible
39	R26	22.6	0.1	0	-	1	0.04	1	24.7	62	Negligible
40	R27	24.5	0.2	0	-	1	0.05	1	26.7	67	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

- 2.1.2 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse'.
- 2.1.3 Predicted annual-mean NO<sub>2</sub> at the facades of existing receptors are below the AQS objective for NO<sub>2</sub> for all but one receptor. At West Street (receptor 9) the predicted NO<sub>2</sub> concentration exceeds the AQS objective of 40 µg.m<sup>-3</sup> both with and without the development.
- 2.1.4 At West Street, the cumulative impact descriptor is 'moderate adverse' and the cumulative PEC is 110% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. Table 2.2 below shows the measured concentrations at GR13 in the last five years.

**Table 2.2: Annual-mean NO<sub>2</sub> Concentrations at GR13 (µg.m<sup>-3</sup>).**

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40	37.5	42.7

- 2.1.5 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of 42.7 µg.m<sup>-3</sup> is a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO<sub>2</sub> concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further. On that basis, if the AC at West Street is assumed to be 37.5 µg.m<sup>-3</sup> the PEC is 97% of the AQAL and, when the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'slight adverse'.
- 2.1.6 As discussed in Volume 3, Chapter 12: Air Quality, other smaller cumulative developments will generate traffic which could increase concentrations of NO<sub>2</sub>.
- 2.1.7 There are five receptors where the Cumulative PEC as a percentage of the AQAL is greater than 90%; receptors 3, 9, 22, 34 and 36.

- 2.1.8 Volume 3, Chapter 12: Air Quality provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.
- 2.1.9 Similarly a number of maximum design parameters were assessed It should be noted that the results presented in this chapter are worst-case and based on a number of conservative assumptions. In reality, it is unlikely that **all** the maximum design parameters will be implemented.
- 2.1.10 On that basis and using professional judgement, the long-term cumulative impacts are not considered to be significant.

### Short-term Impacts

- 2.1.1 Table 2.3 summarises the short-term maximum PC and cumulative PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown. For the short-term Cumulative PEC, the Thurrock Flexible Generation Plant PC has been added to the Cumulative AC. The sum of the AC, Tilbury2 PC, Lower Thames Crossing PC, Tilbury Energy Centre PC and Tilbury Green Power PC which is then doubled to derive the Cumulative AC. multiplied by two. This follows the Environment Agency's on-line guidance which states that;

*"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."*

Table 2.3: Short-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 2.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Cumulative AC (µg.m <sup>-3</sup> )	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	28.2	14	54.2	82.3	41	Slight
2	Sandhurst Road	52.9	24.2	12	59.0	83.2	42	Slight
3	School	69.4	12.0	6	73.5	85.5	43	Negligible
4	Gateway Academy	59.2	11.3	6	61.3	72.5	36	Negligible
5	Gravel Pit Cottages	36.0	23.5	12	39.2	62.7	31	Slight
6	Princess Margaret Rd	36.0	14.2	7	38.8	53.0	26	Negligible
7	Walnut Tree Farm	36.7	35.7	18	39.3	74.9	37	Slight
8	The Green	36.7	24.3	12	38.9	63.2	32	Slight
9	West Street	85.4	11.6	6	87.7	99.3	50	Negligible
10	Milton School	64.2	11.5	6	66.3	77.9	39	Negligible
11	Royal Pier Road	64.6	12.0	6	66.9	78.9	39	Negligible
12	West Tilbury Hall	36.7	28.6	14	39.0	67.6	34	Slight
13	Cooper Shore	36.7	37.0	19	39.1	76.1	38	Slight
14	R1	62.2	4.1	2	100.8	70.6	35	Negligible
15	R2	55.2	4.3	2	61.4	63.6	32	Negligible
16	R3	56.6	5.6	3	66.5	67.1	34	Negligible
17	R4	53.8	7.3	4	82.6	66.2	33	Negligible
18	R5	64.4	7.5	4	64.3	76.6	38	Negligible
19	R6	53.8	9.0	4	64.0	67.1	34	Negligible
20	R7	56.2	8.5	4	85.9	70.4	35	Negligible
21	R8	57.8	9.4	5	83.9	70.9	35	Negligible
22	R9	73.2	11.5	6	86.2	90.7	45	Negligible
23	R10	61.2	12.1	6	88.6	84.5	42	Negligible
24	R11	53.2	13.1	7	65.1	72.2	36	Negligible
25	R12	52.2	13.7	7	65.1	71.9	36	Negligible
26	R13	52.8	22.9	11	61.0	83.9	42	Slight
27	R14	53.6	20.1	10	62.8	83.6	42	Negligible
28	R15	47.2	27.8	14	56.2	78.2	39	Slight
29	R16	51.6	15.9	8	65.2	73.6	37	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Cumulative AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
30	R17	52.4	15.0	8	65.9	74.2	37	Negligible
31	R18	48.2	6.2	3	66.1	58.9	29	Negligible
32	R19	63.2	12.3	6	73.5	79.6	40	Negligible
33	R20	47.0	5.7	3	65.9	57.0	29	Negligible
34	R21	69.6	5.7	3	66.8	80.4	40	Negligible
35	R22	49.6	3.9	2	108.2	57.6	29	Negligible
36	R23	68.2	3.5	2	66.0	76.0	38	Negligible
37	R24	57.0	4.3	2	72.1	65.6	33	Negligible
38	R25	67.6	7.2	4	62.1	77.2	39	Negligible
39	R26	45.2	4.7	2	71.9	54.0	27	Negligible
40	R27	49.0	8.2	4	84.9	61.8	31	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

2.1.2 For all receptors the cumulative PEC is less than half of the AQAL of  $200 \mu\text{g.m}^{-3}$ . This demonstrates that there is considerable headroom between the short-term AQAL and the PEC. On that basis and using professional judgement, the short-term cumulative effect is considered to be minor adverse.

## **2.2 Scenario 3: 33 x 18.4 MW engines, each engine has its own stack (33 stacks)**

### **Long-term Impacts**

2.2.1 Table 2.4 summarises the long-term maximum Process Contribution (PC) and the Cumulative Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 2.4: Long-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors –Scenario 3.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	Thurrock Flexible Generation Plant PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Tilbury2 PC (µg.m <sup>-3</sup> )	Lower Thames Crossing PC (µg.m <sup>-3</sup> )	Tilbury Energy Centre PC (µg.m <sup>-3</sup> )	Tilbury Green Power PC (µg.m <sup>-3</sup> )	Cumulative PEC (µg.m <sup>-3</sup> )	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	2.1	5	0.6	-	0.04	-	29.2	73	Negligible
2	Sandhurst Road	26.4	1.5	4	3	-	0.05	-	31.0	77	Slight
3	School	34.7	0.8	2	0.9	-	0.13	-	37.5	94	Slight
4	Gateway Academy	29.6	0.3	1	-	1	0.03	-	30.9	77	Negligible
5	Gravel Pit Cottages	18.0	2.6	6	-	1	0.57	-	22.1	55	Slight
6	Princess Margaret Rd	18.0	1.4	4	-	1	0.39	-	20.8	52	Negligible
7	Walnut Tree Farm	18.3	2.6	7	-	1	0.30	-	22.2	56	Slight
8	The Green	18.3	0.8	2	-	1	0.14	-	20.3	51	Negligible
<b>9</b>	<b>West Street</b>	<b>42.7</b>	<b>0.4</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>0.15</b>	<b>1</b>	<b>44.2</b>	<b>111</b>	<b>Moderate</b>
10	Milton School	32.1	0.3	1	-	-	0.07	1	33.5	84	Negligible
11	Royal Pier Road	32.3	0.4	1	-	-	0.14	1	33.8	85	Negligible
12	West Tilbury Hall	18.3	0.9	2	-	1	0.15	-	20.4	51	Negligible
13	Cooper Shore	18.3	1.4	4	-	1	0.21	-	21.0	52	Negligible
14	R1	31.1	0.1	0	-	1	0.05	1	33.3	83	Negligible
15	R2	27.6	0.1	0	-	1	0.05	1	29.7	74	Negligible
16	R3	28.3	0.1	0	-	1	0.04	1	30.5	76	Negligible
17	R4	26.9	0.2	0	-	1	0.05	1	29.1	73	Negligible
18	R5	32.2	0.2	0	-	1	0.05	1	34.5	86	Negligible
19	R6	26.9	0.3	1	-	1	0.07	1	29.2	73	Negligible
20	R7	28.1	0.2	1	-	1	0.05	1	30.4	76	Negligible
21	R8	28.9	0.3	1	-	-	0.03	1	30.2	76	Negligible
22	R9	36.6	0.7	2	-	-	0.07	1	38.3	96	<b>Moderate</b>
23	R10	30.6	0.8	2	-	-	0.17	1	32.5	81	Slight
24	R11	26.6	0.7	2	-	-	0.27	1	28.6	71	Negligible
25	R12	26.1	0.7	2	-	-	0.29	1	28.1	70	Negligible
26	R13	26.4	1.4	3	-	-	0.07	1	28.8	72	Negligible
27	R14	26.8	1.1	3	-	-	0.13	1	29.1	73	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	Thurrock Flexible Generation Plant PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Tilbury2 PC ( $\mu\text{g.m}^{-3}$ )	Lower Thames Crossing PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Energy Centre PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Green Power PC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC as % of AQAL	Impact Descriptor
28	R15	23.6	2.0	5	-	-	0.04	1	26.7	67	Negligible
29	R16	25.8	0.8	2	-	-	0.26	1	27.9	70	Negligible
30	R17	26.2	0.8	2	-	-	0.29	1	28.2	71	Negligible
31	R18	24.1	0.2	0	-	1	0.04	1	26.3	66	Negligible
32	R19	31.6	0.8	2	-	-	0.13	1	33.5	84	Slight
33	R20	23.5	0.1	0	-	1	0.05	1	25.7	64	Negligible
34	R21	34.8	0.1	0	-	1	0.05	1	37.0	92	Negligible
35	R22	24.8	0.1	0	-	1	0.05	1	26.9	67	Negligible
36	R23	34.1	0.1	0	-	1	0.05	1	36.2	91	Negligible
37	R24	28.5	0.1	0	-	1	0.04	1	30.6	77	Negligible
38	R25	33.8	0.3	1	-	-	0.12	1	35.2	88	Negligible
39	R26	22.6	0.1	0	-	1	0.04	1	24.7	62	Negligible
40	R27	24.5	0.2	1	-	1	0.05	1	26.8	67	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

- 2.2.2 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'moderate adverse'. There are two receptors where the cumulative impact is 'moderate adverse'. At West Street (receptor 9) and R9 (receptor 22) the cumulative impact descriptor is moderate adverse.
- 2.2.3 Predicted annual-mean NO<sub>2</sub> at the facades of existing receptors are below the AQS objective for NO<sub>2</sub> for all but one receptor. At West Street (receptor 9) the predicted NO<sub>2</sub> concentration exceeds the AQS objective of 40 µg.m<sup>-3</sup> both with and without the development.
- 2.2.4 With reference to the impacts at R9 (receptor 22), the Environment Agency's on-line guidance states that;  
*"You don't need to take further action if your assessment has shown that both of the following apply:  
Your proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is not BAT AEL  
... the resulting PECs won't exceed environmental standards"*
- 2.2.5 At R9, the PEC is 96% of the AQAL. This demonstrates that there is headroom between the AQAL and the PEC.
- 2.2.6 At West Street, the cumulative impact descriptor is 'moderate adverse' and the cumulative PEC is 111% of the AQAL. This is in large part due to the AC which itself exceeds the AQAL. The AC is based on the average measured concentrations between 2012 and 2016 at the nearest monitoring location, GR13. The table below shows the measured concentrations at GR13 in the last five years.

**Table 2.5: Annual-mean NO<sub>2</sub> Concentrations at GR13 (µg.m<sup>-3</sup>).**

	2012	2013	2014	2015	2016	Average
GR13	48.2	45.2	42.5	40	37.5	42.7

- 2.2.7 The results show that in the last five years at this location, measured concentrations have decreased every year. Therefore an AC of 42.7 µg.m<sup>-3</sup> is a conservative assumption and in reality the AC in the opening year is likely to be lower. This is in line with the view that background traffic-related NO<sub>2</sub> concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. The opening year of the proposed development is likely to be 2020 and so concentrations are expected to decrease even further. On that basis, if the AC at West Street is assumed to be 37.5 µg.m<sup>-3</sup> the PEC is 98% of the AQAL and, when the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'slight adverse'.
- 2.2.8 As discussed in Volume 6, Chapter 12: Air Quality, other smaller cumulative developments will generate traffic which could increase concentrations of NO<sub>2</sub>.
- 2.2.9 There are five receptors where the Cumulative PEC as a % of the AQAL is greater than 90%; receptors 3, 9, 22, 34 and 36.
- 2.2.10 Volume 6, Chapter 12: Air Quality provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.
- 2.2.11 Similarly a number of maximum design parameters were assessed It should be noted that the results presented in this chapter are worst-case and based on a number of conservative assumptions. In reality, it is unlikely that all the maximum design parameters will be implemented.
- 2.2.1 On that basis and using professional judgement, the overall significance of the long-term cumulative effect is considered to be minor adverse.

### Short-term Impacts

- 2.2.1 Table 2.6 summarises the short-term maximum PC and cumulative PEC values at the selected discrete sensitive receptors. The EPUK & IAQM impact descriptors are also shown. For the short-term Cumulative PEC, the Thurrock Flexible Generation Plant PC has been added to the Cumulative AC. The sum of the AC, Tilbury2 PC, Lower Thames Crossing PC, Tilbury Energy Centre PC and Tilbury Green Power PC which is then doubled to derive the Cumulative AC. multiplied by two. This follows the Environment Agency's on-line guidance which states that: *"When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration."*

Table 2.6: Short-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 3.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Cumulative AC (µg.m <sup>-3</sup> )	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	31.5	16	54.2	85.7	43	Slight
2	Sandhurst Road	52.9	27.0	13	59.0	86.0	43	Slight
3	School	69.4	17.0	8	73.5	90.4	45	Negligible
4	Gateway Academy	59.2	15.2	8	61.3	76.4	38	Negligible
5	Gravel Pit Cottages	36.0	26.9	13	39.2	66.1	33	Slight
6	Princess Margaret Rd	36.0	18.1	9	38.8	56.8	28	Negligible
7	Walnut Tree Farm	36.7	41.7	21	39.3	81.0	40	<b>Moderate</b>
8	The Green	36.7	27.3	14	38.9	66.2	33	Slight
9	West Street	85.4	15.1	8	87.7	102.8	51	Negligible
10	Milton School	64.2	14.5	7	66.3	80.8	40	Negligible
11	Royal Pier Road	64.6	15.3	8	66.9	82.2	41	Negligible
12	West Tilbury Hall	36.7	32.5	16	39.0	71.5	36	Slight
13	Cooper Shore	36.7	43.2	22	39.1	82.3	41	<b>Moderate</b>
14	R1	62.2	5.1	3	100.8	71.6	36	Negligible
15	R2	55.2	4.9	2	61.4	64.2	32	Negligible
16	R3	56.6	9.3	5	66.5	70.8	35	Negligible
17	R4	53.8	9.1	5	82.6	68.0	34	Negligible
18	R5	64.4	9.2	5	64.3	78.3	39	Negligible
19	R6	53.8	10.4	5	64.0	68.6	34	Negligible
20	R7	56.2	10.4	5	85.9	72.3	36	Negligible
21	R8	57.8	11.8	6	83.9	73.3	37	Negligible
22	R9	73.2	15.1	8	86.2	94.2	47	Negligible
23	R10	61.2	17.2	9	88.6	89.5	45	Negligible
24	R11	53.2	17.6	9	65.1	76.7	38	Negligible
25	R12	52.2	18.2	9	65.1	76.4	38	Negligible
26	R13	52.8	25.6	13	61.0	86.6	43	Slight
27	R14	53.6	23.2	12	62.8	86.6	43	Slight
28	R15	47.2	30.8	15	56.2	81.3	41	Slight
29	R16	51.6	19.6	10	65.2	77.3	39	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Cumulative AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
30	R17	52.4	18.9	9	65.9	78.1	39	Negligible
31	R18	48.2	9.0	5	66.1	61.7	31	Negligible
32	R19	63.2	16.6	8	73.5	83.9	42	Negligible
33	R20	47.0	7.5	4	65.9	58.8	29	Negligible
34	R21	69.6	6.5	3	66.8	81.1	41	Negligible
35	R22	49.6	5.0	3	108.2	58.7	29	Negligible
36	R23	68.2	4.8	2	66.0	77.3	39	Negligible
37	R24	57.0	7.1	4	72.1	68.4	34	Negligible
38	R25	67.6	8.3	4	62.1	78.3	39	Negligible
39	R26	45.2	7.1	4	71.9	56.4	28	Negligible
40	R27	49.0	9.8	5	84.9	63.5	32	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

- 2.2.2 For all receptors the cumulative PEC is less than 60% of the AQAL of  $200 \mu\text{g.m}^{-3}$ . This demonstrates that there is considerable headroom between the short-term AQAL and the PEC. On that basis and using professional judgement, the short-term cumulative effect is considered to be minor adverse.

### **2.3 Scenario 4: 33 x 18.4 MW engines, aggregated stacks of 6 groups of five engines per stack and one group of three engines per stack (7 stacks)**

#### **Long-term Impacts**

- 2.3.1 Table 2.7 summarises the long-term maximum Process Contribution (PC) and the Cumulative Predicted Environmental Concentrations (PEC) values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown.

Table 2.7: Long-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors –Scenario 4.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	Thurrock Flexible Generation Plant PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Tilbury2 PC (µg.m <sup>-3</sup> )	Lower Thames Crossing PC (µg.m <sup>-3</sup> )	Tilbury Energy Centre PC (µg.m <sup>-3</sup> )	Tilbury Green Power PC (µg.m <sup>-3</sup> )	Cumulative PEC (µg.m <sup>-3</sup> )	Cumulative PEC as % of AQAL	Impact Descriptor
1	Fort Road	26.4	0.9	2	0.6	-	0.04	-	27.9	70	Negligible
2	Sandhurst Road	26.4	0.6	2	3	-	0.05	-	30.1	75	Slight
3	School	34.7	0.4	1	0.9	-	0.13	-	37.1	93	Negligible
4	Gateway Academy	29.6	0.1	0	-	1	0.03	-	30.7	77	Negligible
5	Gravel Pit Cottages	18.0	1.2	3	-	1	0.57	-	20.8	52	Negligible
6	Princess Margaret Rd	18.0	0.6	2	-	1	0.39	-	20.0	50	Negligible
7	Walnut Tree Farm	18.3	1.0	2	-	1	0.30	-	20.6	52	Negligible
8	The Green	18.3	0.3	1	-	1	0.14	-	19.8	49	Negligible
<b>9</b>	<b>West Street</b>	<b>42.7</b>	0.2	0	-	-	<b>0.15</b>	<b>1</b>	44.0	110	Negligible
10	Milton School	32.1	0.1	0	-	-	0.07	1	33.3	83	Negligible
11	Royal Pier Road	32.3	0.2	0	-	-	0.14	1	33.6	84	Negligible
12	West Tilbury Hall	18.3	0.3	1	-	1	0.15	-	19.8	50	Negligible
13	Cooper Shore	18.3	0.5	1	-	1	0.21	-	20.0	50	Negligible
14	R1	31.1	0.1	0	-	1	0.05	1	33.2	83	Negligible
15	R2	27.6	0.0	0	-	1	0.05	1	29.7	74	Negligible
16	R3	28.3	0.1	0	-	1	0.04	1	30.4	76	Negligible
17	R4	26.9	0.1	0	-	1	0.05	1	29.0	73	Negligible
18	R5	32.2	0.1	0	-	1	0.05	1	34.3	86	Negligible
19	R6	26.9	0.1	0	-	1	0.07	1	29.1	73	Negligible
20	R7	28.1	0.1	0	-	1	0.05	1	30.2	76	Negligible
21	R8	28.9	0.1	0	-	-	0.03	1	30.1	75	Negligible
22	R9	36.6	0.3	1	-	-	0.07	1	38.0	95	Slight
23	R10	30.6	0.4	1	-	-	0.17	1	32.1	80	Negligible
24	R11	26.6	0.3	1	-	-	0.27	1	28.2	70	Negligible
25	R12	26.1	0.3	1	-	-	0.29	1	27.7	69	Negligible
26	R13	26.4	0.6	1	-	-	0.07	1	28.1	70	Negligible
27	R14	26.8	0.5	1	-	-	0.13	1	28.4	71	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	Thurrock Flexible Generation Plant PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Tilbury2 PC ( $\mu\text{g.m}^{-3}$ )	Lower Thames Crossing PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Energy Centre PC ( $\mu\text{g.m}^{-3}$ )	Tilbury Green Power PC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC as % of AQAL	Impact Descriptor
28	R15	23.6	0.8	2	-	-	0.04	1	25.5	64	Negligible
29	R16	25.8	0.4	1	-	-	0.26	1	27.4	69	Negligible
30	R17	26.2	0.3	1	-	-	0.29	1	27.8	70	Negligible
31	R18	24.1	0.1	0	-	1	0.04	1	26.2	66	Negligible
32	R19	31.6	0.4	1	-	-	0.13	1	33.1	83	Negligible
33	R20	23.5	0.1	0	-	1	0.05	1	25.6	64	Negligible
34	R21	34.8	0.1	0	-	1	0.05	1	36.9	92	Negligible
35	R22	24.8	0.0	0	-	1	0.05	1	26.9	67	Negligible
36	R23	34.1	0.0	0	-	1	0.05	1	36.2	90	Negligible
37	R24	28.5	0.0	0	-	1	0.04	1	30.6	76	Negligible
38	R25	33.8	0.1	0	-	-	0.12	1	35.1	88	Negligible
39	R26	22.6	0.0	0	-	1	0.04	1	24.7	62	Negligible
40	R27	24.5	0.1	0	-	1	0.05	1	26.6	67	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.

- 2.3.2 When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible' to 'slight adverse'.
- 2.3.3 Predicted annual-mean NO<sub>2</sub> at the facades of existing receptors are below the AQS objective for NO<sub>2</sub> for all but one receptor. At West Street (receptor 9) the predicted NO<sub>2</sub> concentration exceeds the AQS objective of 40 µg.m<sup>-3</sup>, both with and without the development.
- 2.3.4 On that basis and using professional judgement, the overall significance of the long-term cumulative effect is considered to be negligible.

### Short-term Impacts

- 2.3.5 Table 2.8 summarises the short-term maximum PC and cumulative PEC values at the selected discrete sensitive receptors. The EPUK&IAQM impact descriptors are also shown. For the short-term Cumulative PEC, the Thurrock FGP PC has been added to the Cumulative AC. The sum of the AC, Tilbury2 PC, LTC PC, TEC PC and TGP PC which is then doubled to derive the Cumulative AC. multiplied by two. This follows the Environment Agency's on-line guidance which states that: "*When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration.*"
- 2.3.6 For all receptors the cumulative PEC is less than half of the AQAL of 200 µg.m<sup>-3</sup>. This demonstrates that there is considerable headroom between the short-term AQAL and the PEC. On that basis and using professional judgement, the short-term cumulative effect is considered to be negligible.

Table 2.8: Short-term Cumulative Predicted NO<sub>2</sub> Concentrations (µg.m<sup>-3</sup>) at Sensitive Receptors – Scenario 4.

Receptor ID	Receptor Name	AC (µg.m <sup>-3</sup> )*	PC (µg.m <sup>-3</sup> )	PC as % of AQAL	Cumulative AC (µg.m <sup>-3</sup> )	PEC (µg.m <sup>-3</sup> )	PEC as % of AQAL	Impact Descriptor
1	Fort Road	52.9	18.4	9	54.2	72.6	36	Negligible
2	Sandhurst Road	52.9	15.9	8	59.0	74.9	37	Negligible
3	School	69.4	7.3	4	73.5	80.8	40	Negligible
4	Gateway Academy	59.2	6.6	3	61.3	67.8	34	Negligible
5	Gravel Pit Cottages	36.0	15.6	8	39.2	54.8	27	Negligible
6	Princess Margaret Rd	36.0	8.8	4	38.8	47.6	24	Negligible
7	Walnut Tree Farm	36.7	23.3	12	39.3	62.6	31	Slight
8	The Green	36.7	15.6	8	38.9	54.6	27	Negligible
9	West Street	85.4	6.7	3	87.7	94.3	47	Negligible
10	Milton School	64.2	6.8	3	66.3	73.1	37	Negligible
11	Royal Pier Road	64.6	7.0	3	66.9	73.9	37	Negligible
12	West Tilbury Hall	36.7	18.4	9	39.0	57.4	29	Negligible
13	Cooper Shore	36.7	23.2	12	39.1	62.3	31	Slight
14	R1	62.2	2.8	1	100.8	69.3	35	Negligible
15	R2	55.2	2.8	1	61.4	62.1	31	Negligible
16	R3	56.6	3.7	2	66.5	65.2	33	Negligible
17	R4	53.8	4.4	2	82.6	63.3	32	Negligible
18	R5	64.4	4.4	2	64.3	73.5	37	Negligible
19	R6	53.8	5.7	3	64.0	63.8	32	Negligible
20	R7	56.2	4.6	2	85.9	66.5	33	Negligible
21	R8	57.8	5.6	3	83.9	67.0	34	Negligible
22	R9	73.2	6.2	3	86.2	85.3	43	Negligible
23	R10	61.2	7.5	4	88.6	79.8	40	Negligible
24	R11	53.2	7.9	4	65.1	67.0	34	Negligible
25	R12	52.2	8.7	4	65.1	66.9	33	Negligible
26	R13	52.8	15.1	8	61.0	76.1	38	Negligible
27	R14	53.6	13.2	7	62.8	76.6	38	Negligible
28	R15	47.2	18.1	9	56.2	68.6	34	Negligible
29	R16	51.6	10.1	5	65.2	67.9	34	Negligible

Receptor ID	Receptor Name	AC ( $\mu\text{g.m}^{-3}$ )*	PC ( $\mu\text{g.m}^{-3}$ )	PC as % of AQAL	Cumulative AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC as % of AQAL	Impact Descriptor
30	R17	52.4	9.5	5	65.9	68.7	34	Negligible
31	R18	48.2	3.9	2	66.1	56.5	28	Negligible
32	R19	63.2	7.3	4	73.5	74.6	37	Negligible
33	R20	47.0	3.8	2	65.9	55.1	28	Negligible
34	R21	69.6	3.8	2	66.8	78.5	39	Negligible
35	R22	49.6	2.6	1	108.2	56.3	28	Negligible
36	R23	68.2	2.3	1	66.0	74.8	37	Negligible
37	R24	57.0	2.5	1	72.1	63.7	32	Negligible
38	R25	67.6	4.5	2	62.1	74.6	37	Negligible
39	R26	45.2	2.4	1	71.9	51.7	26	Negligible
40	R27	49.0	4.6	2	84.9	58.2	29	Negligible

\*For receptors R1 to R27, the AC includes the PC from Tilbury2.