



## **Thurrock Flexible Generation Plant**

**Environmental Statement Volume 6  
Appendix 12.2: Baseline Air Quality Conditions**

**Date:** October 2019

**Environmental Impact Assessment**

**Environmental Statement**

**Volume 6**

**Appendix 12.2**

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## Summary

This Appendix summarises the results of local air quality monitoring and provides a justification for the baseline concentrations used in the assessment.

## Qualifications

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

It has been checked and reviewed by Fiona Prismall, a Chartered Environmentalist, Member of the Institution of Environmental Sciences and Fellow of the 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’, the Environmental Protection UK & IAQM 2017 ‘Land-use Planning & Development Control: Planning for Air Quality’ guidance and the IAQM 2019 ‘A guide to the assessment of air quality impacts on designated nature conservation sites’.

# 1. Baseline Air Quality Conditions

## 1.1 Introduction

1.1.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance (2014) and Environmental Protection UK (EPUK) / Institute of Air Quality Management (IAQM) (2017) guidance highlight public information from DEFRA (2017) and local monitoring studies as potential sources of information on background air quality. Local Air Quality Management Technical Guidance (LAQM.TG16) (DEFRA, 2016) recommends that DEFRA mapped concentration estimates are used to inform background concentrations in air quality modelling and states that:

*“Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality”.*

1.1.2 For this assessment, the background air quality has been characterised by drawing on information from the following sources:

- Defra maps (Defra, 2017), which show estimated pollutant concentrations across the UK in 1 km grid squares;
- Published results of local authority Review and Assessment studies of air quality, including local monitoring and modelling studies;
- The results of the Tilbury 2 Air Quality Assessment (Tilbury2 Project Team, 2017); and
- The results of the RPS project specific nitrogen dioxide (NO<sub>2</sub>) monitoring study.

1.1.3 Details of the RPS project specific NO<sub>2</sub> monitoring study are provided in Annex A.

1.1.4 A detailed description of how the baseline air quality has been derived for the study area is summarised in the following paragraphs.

## 1.2 Review and Assessment Process

1.2.1 The air quality assessment study area lies within two local authorities; Thurrock Council (TC) and Gravesham Borough Council (GBC). Each of the local authorities has designated Air Quality Management Areas (AQMAs) due to high levels of nitrogen dioxide (NO<sub>2</sub>) and/or particulate matter (PM<sub>10</sub>).

## 1.3 Nitrogen Dioxide (NO<sub>2</sub>)

1.3.1 For ease of reference, the modelled receptors are summarised in Table 1.1.

Table 1.1: Summary of Modelled Receptors

Receptor ID	Receptor Name	X	Y
1	Fort Road	564727	174466
2	Sandhurst Road	565429	174069
3	School	565057	174392
4	Gateway Academy	565364	176620
5	Gravel Pit Cottages	565234	176294
6	Princess Margaret Rd	563917	176252
7	Walnut Tree Farm	564255	177812
8	The Green	567414	177570
9	West Street	568507	177407
10	Milton School	566713	177540
11	Royal Pier Road	566062	177921
12	West Tilbury Hall	566066	177709
13	Cooper Shore	566322	177515
14	R1	557439	179107
15	R2	557597	181084
16	R3	561350	180920
17	R4	563478	180584
18	R5	563560	180866
19	R6	564894	181056
20	R7	563889	179678
21	R8	563101	177478
22	R9	563399	176576
23	R10	563911	176123
24	R11	564314	175875
25	R12	564434	175856
26	R13	565181	176256

Receptor ID	Receptor Name	X	Y
27	R14	565039	176156
28	R15	565339	176504
29	R16	564701	175973
30	R17	564617	175897
31	R18	562008	180949
32	R19	563904	176281
33	R20	560604	180416
34	R21	560035	179870
35	R22	556895	179284
36	R23	555379	179902
37	R24	558144	183519
38	R25	567446	182119
39	R26	558009	184058
40	R27	563778	179720
41	16/01232/OUT (Proposed Development)	567251	177967
42	18/00664/CONDC (Proposed Development)	567931	178212
43	16/00412/OUT (Proposed Development)	565034	178056
44	15/00379/OUT (Proposed Development)	564844	178304
45	16/01475/SCR (Proposed Development)	567622	179079
46	GR/17/674 (Proposed Development)	564174	172500
47	20141214 (Proposed Development)	564292	172307

1.3.2 The baseline NO<sub>2</sub> concentrations at Receptors 1 – 13, and 41 - 47 have been established based on available monitoring data from representative monitoring locations. For Receptors 14 – 40, the baseline NO<sub>2</sub> concentrations have been informed by the concentrations predicted in the Tilbury 2 Air Quality Assessment.

1.3.3 Monitoring of NO<sub>2</sub> is undertaken by TC and GBC at several locations in the study area. These locations are depicted, along with the monitoring locations which formed the RPS project specific monitoring study<sup>1</sup> and nearby modelled sensitive receptors, in the Figure 1.1, Figure 1.2 and Figure 1.3.

<sup>1</sup> Not all of receptors 14 to 40 are shown in the figures as the baseline concentrations for these receptors have been derived from the Tilbury2 Air Quality Assessment and not the results of local air quality monitoring.

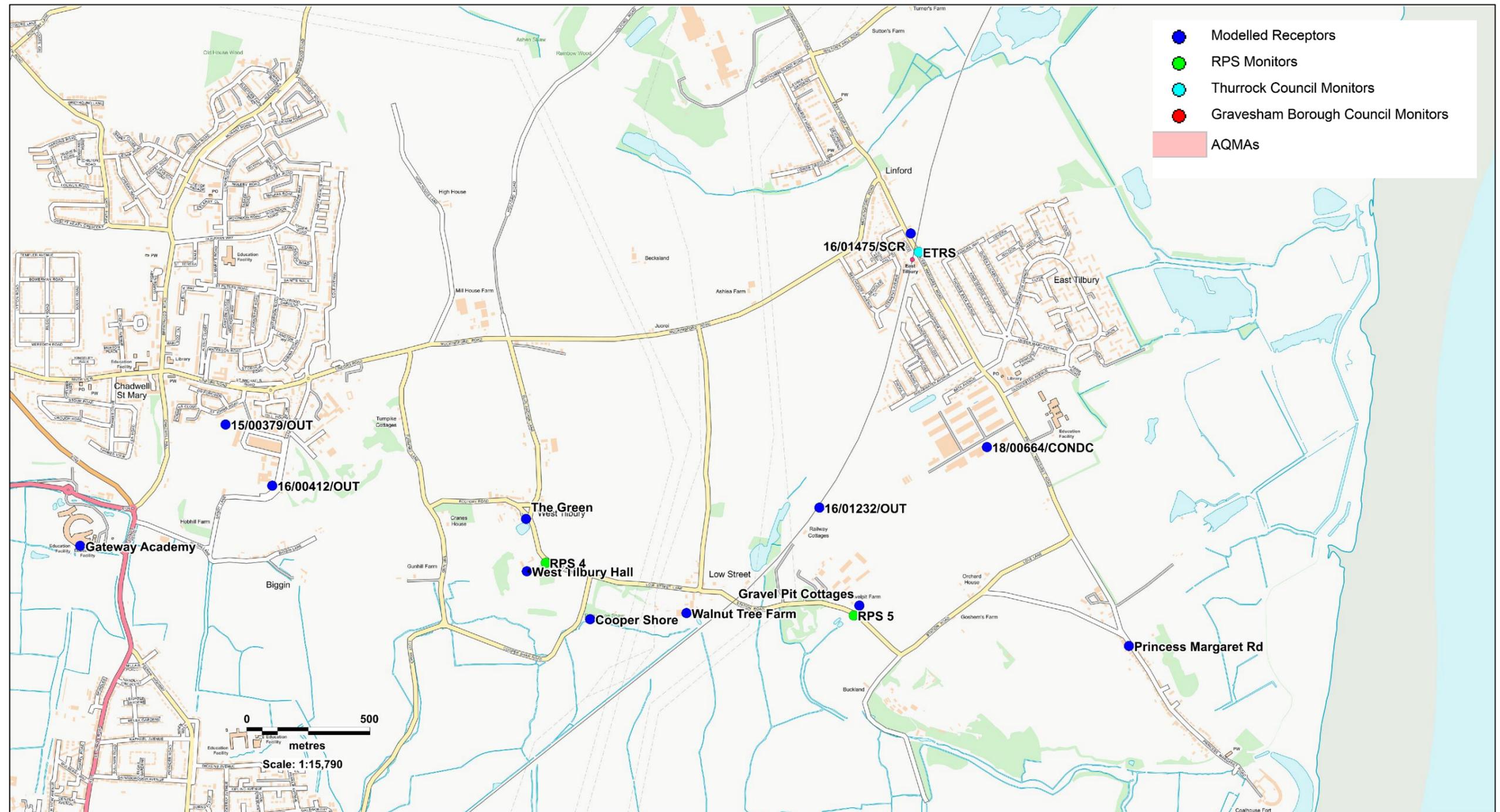


Figure 1.1: Modelled Receptors and Monitoring Locations – Thurrock (North of Proposed Development)

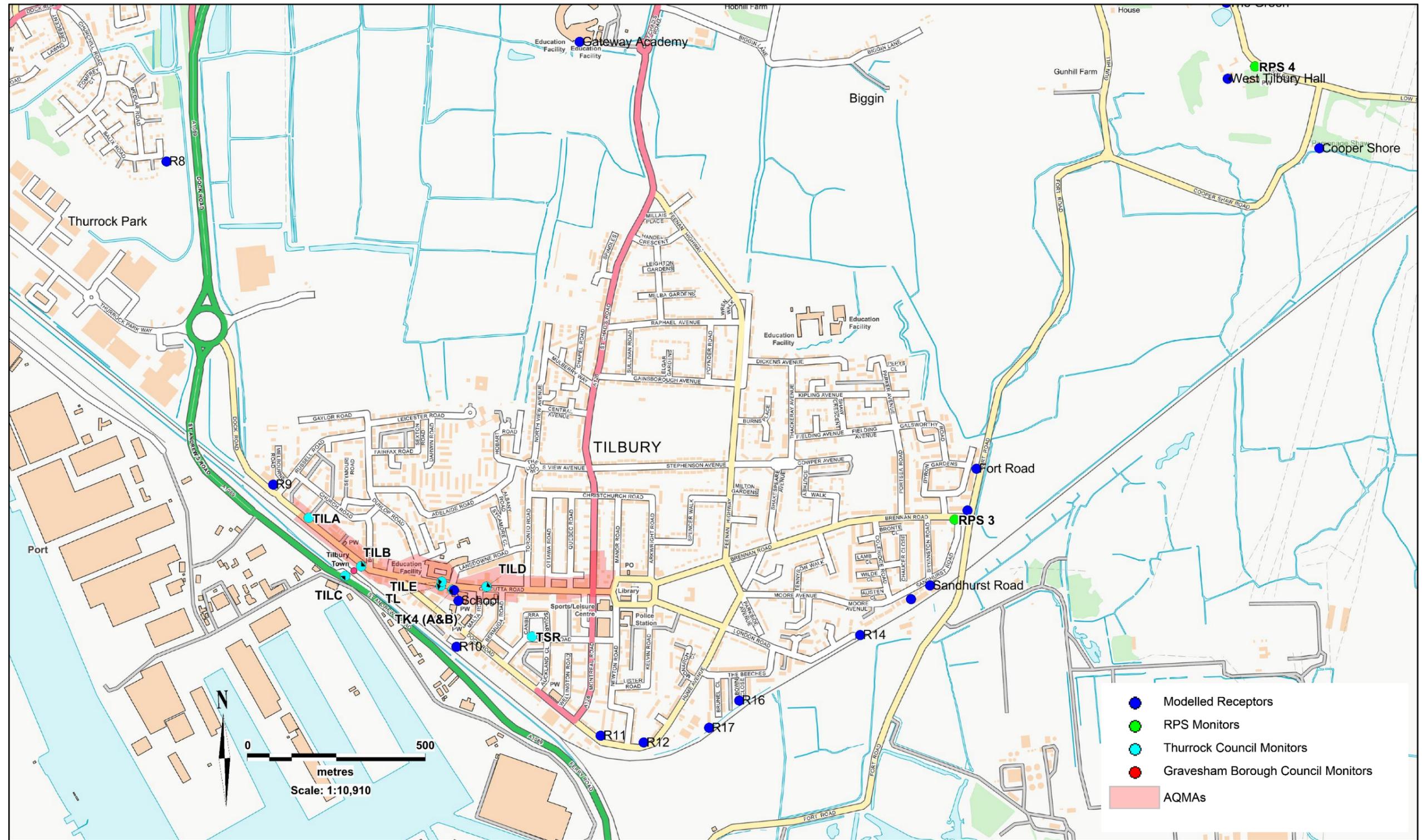


Figure 1.2: Modelled Receptors and Monitoring Locations – Thurrock (West of Proposed Development)

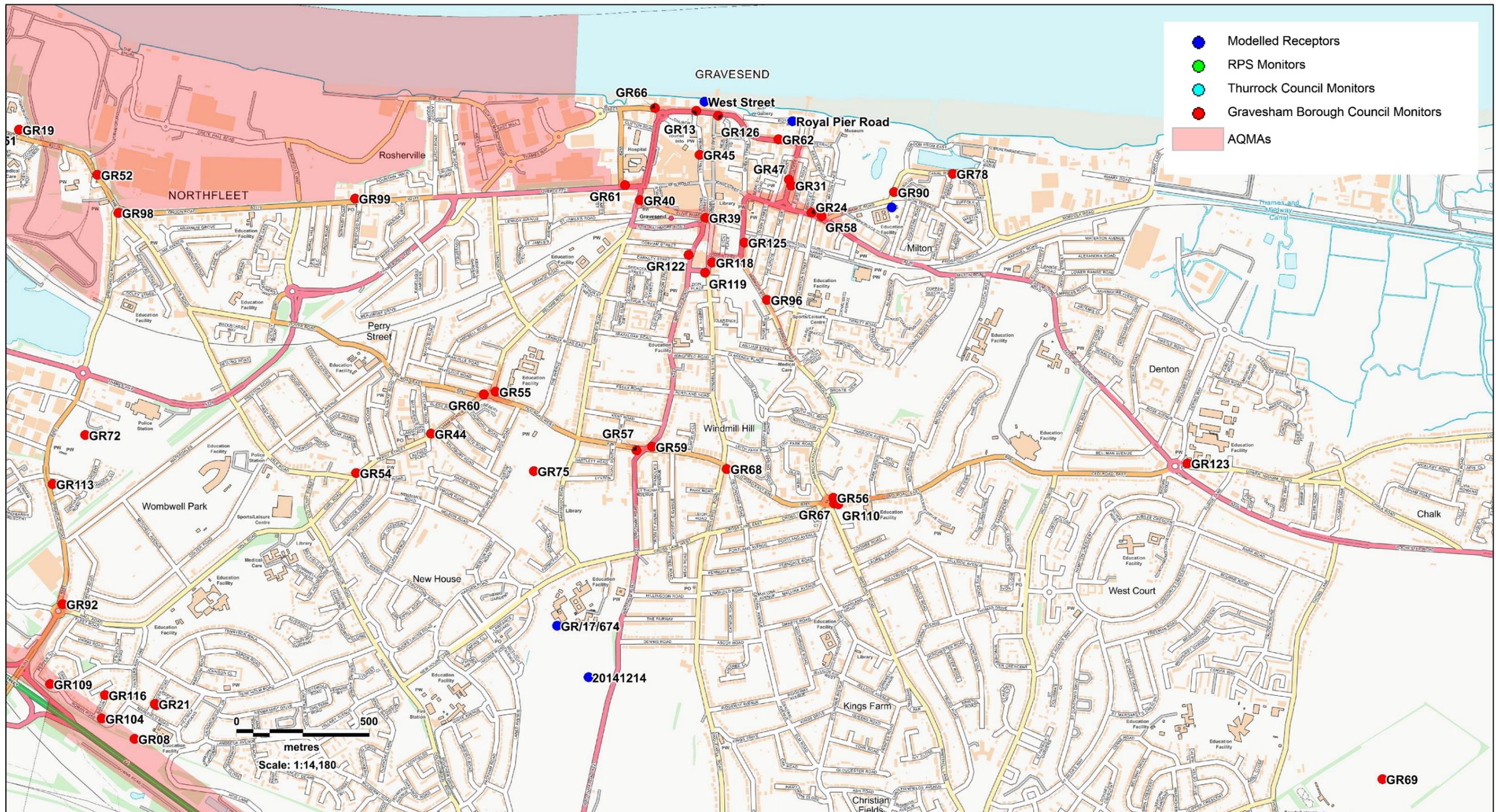


Figure 1.3: Modelled Receptors and Monitoring Locations – Gravesham

1.3.4 The most recently measured annual-mean NO<sub>2</sub> concentrations for TC and GBC monitors used to establish baseline conditions are presented in Table 1.2.

**Table 1.2: Monitored Annual-Mean NO<sub>2</sub> Concentrations**

Monitor ID	Concentration (µg.m <sup>-3</sup> )					
	2013	2014	2015	2016	2017	Average
<b>Thurrock Council Monitors</b>						
TILE	35.26	35.85	31.68	34.92	36.18	34.8
TL	37.13	35.56	30.55	35.68	35.81	34.9
TK4	32.79	31.05	29.50	31.51	30.1	31.0
TILD	38.08	33.90	31.12	36.85	37.15	35.4
TSR	31.88	27.17	27.39	28.05	29.02	28.7
<b>Gravesham Borough Council Monitors</b>						
GR13	45.2	42.5	40	37.5	44	41.8
GR62	34	29.7	29.2	30.2	31.2	30.9
GR90	37.2	31.5	28.6	30.5	31.2	31.8

1.3.5 The results of the RPS project specific monitoring study are summarised in Table 1.3.

**Table 1.3: Results of RPS Project Specific NO<sub>2</sub> Monitoring Study**

Monitoring Location	Monitored Annual-Mean NO <sub>2</sub> Concentration (µg.m <sup>-3</sup> )	Data Capture (%)
1	21.2	92
2	19.5	50
3	26.4	50
4	18.3	83
5	18.0	92

Note: Concentrations have been annualised and adjusted for bias in accordance with LAQM.TG16.

1.3.6 The baseline NO<sub>2</sub> concentrations for the modelled receptors are summarised in Table 1.4. For Receptors 1 - 13, the average concentrations at representative monitors have been used to establish the baseline. For Receptors 14 – 40, the baseline NO<sub>2</sub> concentrations have been informed by the concentrations predicted in the Tilbury 2 Air Quality Assessment. To allow a comparison, Defra's total annual-mean NO<sub>2</sub> concentration estimates for the 1 km grid squares of the receptors are also shown. It is evident that the Defra mapped estimates are lower than the average monitored concentrations and the use of these data would not be conservative.

**Table 1.4: Summary of Baseline Annual-Mean (Long-term) NO<sub>2</sub> Concentrations**

Receptor ID	Receptor Name	Baseline Annual-Mean NO <sub>2</sub> Concentration (µg.m <sup>-3</sup> )	Data Source	Estimated Defra Mapped Concentration (µg.m <sup>-3</sup> )
1	Fort Road	26.4	Project specific monitoring -location 3	21.6
2	Sandhurst Road	26.4	Project specific monitoring location 3	21.6
3	School	34.0	Thurrock monitoring - Average of TILE, TL, TK4, TILD	25.9
4	Gateway Academy	28.7	Thurrock monitoring - TSR	20.5
5	Gravel Pit Cottages	18.0	Project specific monitoring location 5	18.6
6	Princess Margaret Rd	18.0	Project specific monitoring location 5	18.5
7	Walnut Tree Farm	18.3	Project specific monitoring location 4	18.1
8	The Green	18.3	Project specific monitoring location 4	18.1
9	West Street	41.8	Gravesham monitoring - GR13	29.7
10	Milton School	30.9	Gravesham monitoring - GR62	28.9
11	Royal Pier Road	31.8	Gravesham monitoring - GR90	28.9

Receptor ID	Receptor Name	Baseline Annual-Mean NO <sub>2</sub> Concentration (µg.m <sup>-3</sup> )	Data Source	Estimated Defra Mapped Concentration (µg.m <sup>-3</sup> )
12	West Tilbury Hall	18.3	Project specific monitoring location 4	18.1
13	Cooper Shore	18.3	Project specific monitoring location 4	18.1
14	R1	31.1	Tilbury2 Air Quality Assessment (Note: these concentrations are the predicted concentrations with Tilbury2 in place in 2020)	28.8
15	R2	27.6		23.8
16	R3	28.3		23.7
17	R4	26.9		24.0
18	R5	32.2		24.0
19	R6	26.9		20.3
20	R7	28.1		20.9
21	R8	28.9		22.3
22	R9	36.6		25.9
23	R10	30.6		25.9
24	R11	26.6		29.6
25	R12	26.1		29.6
26	R13	26.4		21.6
27	R14	26.8		21.6
28	R15	23.6		21.6
29	R16	25.8		29.6
30	R17	26.2		29.6
31	R18	24.1		21.2
32	R19	31.6		25.9
33	R20	23.5		22.8
34	R21	34.8	25.4	
35	R22	24.8	25.2	
36	R23	34.1	23.9	
37	R24	28.5	21.0	

Receptor ID	Receptor Name	Baseline Annual-Mean NO <sub>2</sub> Concentration (µg.m <sup>-3</sup> )	Data Source	Estimated Defra Mapped Concentration (µg.m <sup>-3</sup> )
38	R25	33.8		21.9
39	R26	22.6		21.7
40	R27	24.5		20.9
41	16/01232/OUT	18.0	Project specific monitoring location 5	18.6
42	18/00664/CONDC	29.9	Thurrock monitoring - ETRS	18.1
43	16/00412/OUT	18.3	Project specific monitoring location 4	19.0
44	15/00379/OUT	18.3	Project specific monitoring location 4	20.6
45	16/01475/SCR	29.9	Thurrock monitoring - ETRS	17.6
46	GR/17/674	22.4	Gravesham monitoring – GR75	18.7
47	20141214	38.6	Gravesham Monitoring – GR57	18.7

1.3.7 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

## 1.4 Particulate Matter (PM<sub>10</sub>)

1.4.1 Automatic monitoring of PM<sub>10</sub> is carried out at two locations within 5 km of the proposed development site. The most recently measured annual-mean concentrations are presented in Table 1.5, along with the Defra mapped estimates for the grid squares containing the monitoring sites and the proposed development site.

**Table 1.5: Monitored and Defra Mapped Annual-Mean PM<sub>10</sub> Concentrations**

Local Authority	Monit or ID	Monitored Concentration (µg.m <sup>-3</sup> )						Estimated Defra Mapped Concentration (µg.m <sup>-3</sup> )
		2013	2014	2015	2016	2017	Average	
TC	TK1	19.16	19.28	17.08	17.27	18.21	18.2	16.2
GBC	ZG3	20	19.3	19.7	18	19.4	19.3	15.9
Proposed Development Site							16.4	

1.4.2 The Defra mapped concentration estimate is below the range of monitoring results at TK1 and ZG3, and the use of these data would not be conservative. The highest concentrations were monitored at ZG3. To ensure the assessment is conservative, the baseline PM<sub>10</sub> concentration assumed for the proposed development site has been derived from the 19.3 µg.m<sup>-3</sup>, the average concentration monitored at ZG3 between 2013 and 2017, which is higher than the Defra mapped concentration estimate and is similar to the most recent monitored concentration.

1.4.3 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

## 1.5 Particulate Matter (PM<sub>2.5</sub>)

1.5.1 Automatic monitoring of PM<sub>2.5</sub> is carried out at one location within the TC area. The most recently measured annual-mean concentrations are presented in Table 1.5, along with the Defra mapped estimates for the grid square containing the monitoring site and the proposed development site.

**Table 1.6: Monitored and Defra Mapped Annual-Mean PM<sub>2.5</sub> Concentrations**

Local Authority	Monit or ID	Monitored Concentration (µg.m <sup>-3</sup> )						Estimated Defra Mapped Concentration (µg.m <sup>-3</sup> )
		2013	2014	2015	2016	2017	Average	
TC	TK3	14.07	14.23	9.84	13.41	11.05	12.5	11.0
Proposed Development Site							10.7	

1.5.2 The Defra mapped concentration estimate is towards the lower end of the range of monitoring results. To ensure the assessment is conservative, the baseline PM<sub>2.5</sub> concentration assumed for the proposed development site is 12.5 µg.m<sup>-3</sup>, the average concentration monitored at TK3 between 2013 and 2017, which is higher than the Defra mapped concentration estimate.

1.5.3 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

## 1.6 Baseline Concentrations used in Assessment of Traffic-related emissions

1.6.1 For the assessment of emissions from the traffic generated during the construction phase, a different background concentration has been used. For the operational phase the NO<sub>2</sub> baseline concentrations considered both urban background and roadside monitoring locations to ensure traffic emissions were considered as there were not required to be explicitly modelled. For the construction phase traffic emissions, the baseline is based on the nearest urban background monitoring location to the site and the traffic emissions included in the dispersion modelling undertaken in Volume 6 Appendix 12.6 Assessment of Traffic-related Emissions. If a roadside monitoring location was used as the basis for the construction traffic assessment, the road contribution would be double counted. On that basis, the background NO<sub>2</sub> concentration used for the construction traffic assessment is 28.7 µg.m<sup>-3</sup>, the five year average monitored concentration at TSR which is the nearest urban background monitoring location to the development site.

1.6.2 There is limited urban background PM<sub>10</sub> monitoring in the vicinity of the Application Site. The Air Quality Expert Group (AQEG) study of Particulate Matter in the UK (AQEG, 2005) provides a comparison of NO<sub>2</sub> and PM<sub>10</sub> monitoring undertaken in the UK at roadside, urban background and rural locations. A much larger variation in monitored NO<sub>2</sub> concentrations is reported compared to PM<sub>10</sub> concentrations. The lower variation in monitored PM<sub>10</sub> concentrations reflects the more even distribution of particulate matter across the UK due to the wide range of sources and the contribution of secondary particulate matter. On this basis, the results of PM<sub>10</sub> roadside monitoring at ZG3 and PM<sub>2.5</sub> roadside monitoring at TK3 have been used to inform background concentrations.

1.6.3 Table 1.7 summarises the annual-mean background concentrations for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> used in the assessment of traffic-related emissions.

**Table 1.7: Summary of Background Annual-Mean Concentrations used in the Assessment of Traffic-related Emissions**

Pollutant	Concentration ( $\mu\text{g.m}^{-3}$ )	Data Source
NO <sub>2</sub>	28.7	Thurrock Monitoring – TSR
PM <sub>10</sub>	19.3	Gravesham Monitoring – ZG3
PM <sub>2.5</sub>	12.5	Thurrock Monitoring – TK3

## 2. References

AQEG (2005). Particulate Matter in the UK: Defra, London

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## Annex A Project-Specific NO<sub>2</sub> Monitoring Methodology

- A.1.1.1 Nitrogen dioxide (NO<sub>2</sub>) concentrations in ambient air were monitored around the proposed development in Thurrock over a six-month period between December 2017 and June 2018. The results are presented in this appendix.
- A.1.1.2 Diffusion tube samplers for NO<sub>2</sub> were deployed in duplicate at five locations around the proposed development site in Tilbury. The locations are illustrated in the Figure A.1.
- A.1.1.3 All diffusion tubes were fixed to suitable street furniture at heights of approximately 2 metres above the ground, and were exposed over nominally monthly time periods. The exposed tubes were analysed by our approved sub-contract laboratory (Gradko), which holds UKAS accreditation for this analysis.
- A.1.1.4 At each location, the mean was calculated of the five concentration results obtained over successive four-week periods between 12 December 2017 and 18 June 2018. This “period-mean” was then annualised in accordance with the method set out in LAQM.TG16. This adjustment provides an estimate of what the annual mean concentration is expected to be at each monitoring location had monitoring been carried out for a full year. This annualisation calculation involves obtaining the full, measured annual-mean NO<sub>2</sub> concentrations and the period-mean concentrations for the same study period from two background automatic monitoring stations (Thurrock and London Bexley). At each of these reference monitoring stations, the ratio between the annual mean and the period mean NO<sub>2</sub> concentration was determined and an overall annualisation factor was calculated.
- A.1.1.5 The diffusion tube data were also corrected for bias using Defra’s most recent national bias adjustment factor spreadsheet in accordance with good practice.



Figure A.1: Map of Monitoring Locations