Gravesham Borough Council

Air Quality and Nitrogen Deposition Assessment Peer Review – Lower Thames Crossing

June 2023

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Document Control Sheet

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Table of Contents

1 Introduction

Bureau Veritas has been appointed by Gravesham Borough Council (The Council) to peer review the air quality assessment submitted by Highways England, as part of the Environmental Statement (ES) assessing the impacts of the A122 Lower Thames Crossing Project.

The air quality ES chapter 6 (APP-150) was submitted on the 31st October 2022 following a previous submission and withdrawal in June 2020. The ES Chapter considers the impact of the construction and operational phases of the scheme on sensitive human and ecological receptors.

The primary purpose of this report is to ensure that the air quality assessment submitted by the applicant follows an appropriate methodology and makes reference to and utilises as far as possible, the custom and practice guidance that is available locally and nationally for such an assessment. The review focuses on the impacts within Gravesham.

The air quality assessment has thus been peer reviewed in order to inform the Council around issues which have the potential to be material for Air Quality in the decision-making process.

2 The Proposal

2.1 The Proposal as it relates to Air Quality

The application is known as the A122 Lower Thames Crossing and would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel. The A122 would be approximately 23km long, 4.25km of which would be in a tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.

The application would result in significant changes in vehicle distribution as a result of the new roads and different access across the Thames. This in turn would result in changes in pollutant concentrations from vehicles in places where there are currently minimal emissions and potential reductions in other locations. Of particular significance are changes along the A2/M2 links within Gravesham.

Key pollutants for consideration with regards to vehicle emissions are Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10} & $PM_{2.5}$). Ammonia should also be considered where sensitive habitats have the potential to be affected.

2.1.1 Construction Phase

Within the Gravesham Borough area, the application proposes the construction of a new A-road (A122) connection between the A2 and M2 and a new tunnel portal west of Gravesend. Much of the new road will be constructed within a cutting, down to a depth of up to 25m below local ground level at the tunnel portal location.

Following a period of preliminary works, the main construction works will take place over 60 months, with the aim to open the new road to traffic in late 2030. Construction will require significant earthworks notably to create the deep cutting to the southern portal and to take the new road under Thong Lane, which will be reconstructed over a new green bridge.

There would be potential for significant dust emissions as a result of works during the construction phase of the scheme. These have been assessed in line with DMRB LA 105 guidance to be ‘large' with the area sensitivity determined to be ‘high’. This is considered appropriate. Mitigation measures are detailed to control dust emissions.

Emissions from river vessels have been considered within the Air Quality ES chapter and have been screened out. This is considered appropriate based on the number of river vessels likely to be used.

Emissions from construction plant have also been considered but screened out on the basis of their short0-term use and any plant being compliant with best practice London Low Emission Zone standards for NRMM. This is also considered appropriate.

The impacts of changes in traffic as a result of the construction has been assessed for each year from 2025-2030 by the applicant. The summary of impacts with regards to NO_2 at Receptors in Gravesham is shown below for each year. Results are obtained from 6.3 Environmental Statement Appendix 5.3.

Table 2-1 Summary of Assessed Construction Traffic Impacts in Gravesham

Metric	2025	2026	2027	2028	2029	2030
Total no. Receptors assessed in Gravesham	63	63	63	63	63	63

Metric	2025	2026	2027	2028	2029	2030
Max NO_2 Concentration (µg/m³)	36.4	36.0	34.3	33.8	33.8	34.3
Max NO_2 Increase (µg/m³)	0.6	0.5	0.9	1.1	0.5	0.4
No. of receptors which are predicted to experience an increase in NO_2 Concentrations	24	23	32	30	23	25
No. of receptors which are predicted to experience a decrease in NO_2 Concentrations	24	9	24	25	19	10
No. of receptors which are predicted to experience an increase of >1% of AQO in NO_2 Concentrations	1	1	6	7	1	0
No. of receptors which are predicted to experience a decrease of >1% of AQO in NO_2 Concentrations	2	0	13	14	4	0

There are no predicted exceedances of the Air Quality Objective of 40µg/m³ at any of the modelled receptors in any scenario. Of the assessed receptors, it is accepted that there are not predicted to be any significant air quality impacts during the construction phase of the assessment as a result in changes of traffic movement and any that do arise would be temporary in nature.

Assessment of ecological receptors has been dealt with looking at the cumulative impact of construction and operation traffic changes.

2.1.2 Operational Phase

Residential Receptors

Table 2-2 provides a summary the 81 residential receptors assessed in Gravesham as taken from 6.3 Environmental Statement Appendix 5.4. The findings are presented graphically in Appendix A to show the Total modelled Concentrations with the Development in Place and the changes in concentrations as a result of the development for each pollutant.

Table 2-2 Summary of Assessed Operational traffic Impacts in Gravesham

Impact	NO_2	PM_{10}	$PM_{2.5}$
Total no. Receptors assessed in Gravesham	81	81	81
Relevant Annual Mean Air Quality Objective (AQO) (µg/m³)	40	40	20
Max Concentration (µg/m³)	36.2	22.1	15.6
Max Increase (µg/m³)	2.4	0.6	0.6
No. of receptors which are predicted to experience an increase in Concentrations	51	34	39
No. of receptors which are predicted to experience a decrease in Concentrations	27	26	24
No. of receptors which are predicted to experience an increase of >1% of AQO in Concentrations	18	2	7
No. of receptors which are predicted to experience a decrease of >1% of AQO in Concentrations	4	0	2

There are no modelled exceedances of the Air Quality objective in the assessment year of 2030 within Gravesham.

Since completion of the modelling exercise using a 2016 baseline, a new monitoring location has been put in place at Gravesham at 'G146' from 2018 which is roughly equivalent to the modelled receptor 'LT257'. This location is that which experiences the greatest modelled increase as a result of the development in Gravesham. This is due to a new section of road being constructed close to receptor, with predicted flows of 86,400 AADT and 11,800 HDV. Monitoring and Modelling Results are presented at this location below.

Figure 2-1 Location of Greatest Change in NO_2 Concentrations

Table 2-3 Concentrations at Max Change receptor in Gravesham

Monitored NO_2 Concentration (µg/m³)				Modelled NO_2 Concentration (µg/m³)		
2018	2019	2020	2021	Baseline 2016	DM 2030	DS 2030
22.8	18.5	14.9	14.3	21.5	15.8	18.2

The baseline concentration is in good agreement. The increase is significant, but the concentration remains below the Air Quality objective of 40µg/m³. It is therefore not considered that any further work or mitigation is needed at this location.

In summary, any changes as a result of model verification changes or changes as a result of a different background are not considered likely to result in significant impacts with regards to changes in Nitrogen Dioxide concentrations.

In summary, the findings of the assessment conclude that, within Gravesham, there are no predicted exceedances of Air Quality Objectives for either NO_2, PM_{10} or $PM_{2.5}$.

The development in operation will result in more residential receptors experiencing an increase in emissions rather than decreases across all pollutants. Of these receptors, several would experience a 'perceptible' increase of greater than 1% of the AQO as defined in DMRB LA105.

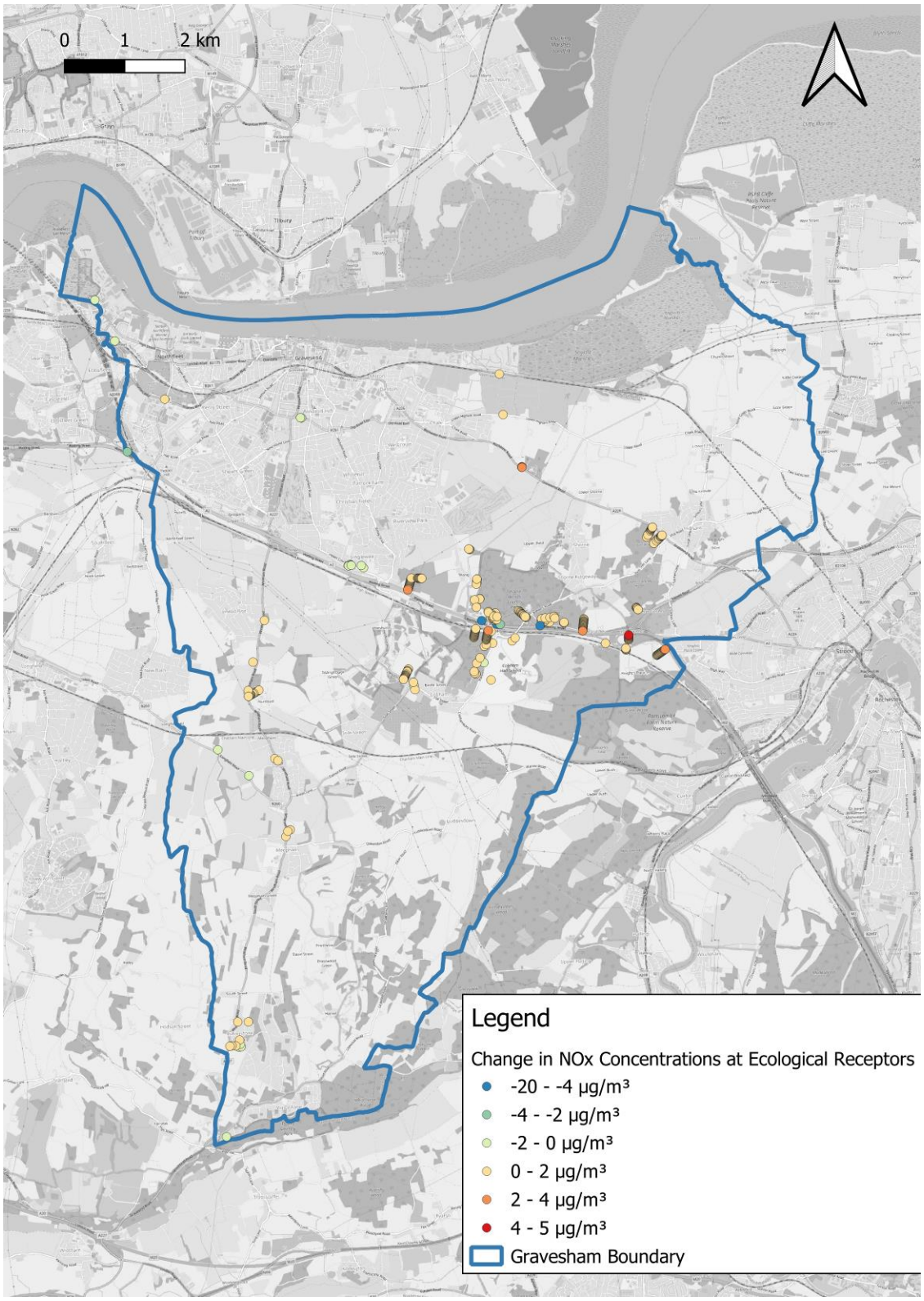
Ecological Receptors

There are multiple sensitive habitats within the Gravesham area which are sensitive to changes in Nitrogen Deposition. Excessive nitrogen disrupts nutrient balances, alters plant composition, and leads to soil acidification, diminishing biodiversity and ecosystem functioning.

The modelling assessment completed by the applicant as part of 6.1 Environmental Statement Chapter 5 Air Quality has assessed sites within Gravesham for the change in Nitrogen Deposition at sensitive habitats as identified through the online 'MAGIC' portal provided by Defra.

An initial screening of NO_x concentration changes was undertaken for all receptors which identified where there were potential significant impacts. These were then reviewed by the competent expert with the findings included in the Habitats Regulations Assessment and Section 8.6 of Chapter 8: Terrestrial Biodiversity. The assessed receptors and changes are shown in Figure 2-2.

Figure 2-2 Change in NOx Concentration at Ecological Receptors



The assessment concluded that there would be significant effects on a number of Designated Habitats across the project study area. Specifically, within Gravesham, the following sites were identified as being significantly affected:

- Shorne And Ashenbank Woods SSSI
- Shorne/Brewers Woods Ancient Woodland

The locations of the assessed significantly affected receptors are shown in Figure 2-3.

Figure 2-3 Significantly affected ecological receptors within Gravesham at Shorne Woods and Ashenbank

3 Proposed Mitigation and Compensation for Air Quality

3.1.1 Construction Phase

In order to reduce the potential impacts of the Project, the Applicant proposes embedded mitigation measures including:

- Construction: Earthworks/bunding established early in the construction programme to provide screening;
- Construction: 300m restriction zone preventing earthworks taking place during the Summer evening period (up to 10pm); and
- Operation: Route alignment design away from sensitive receptors, and screened by earthworks (cuttings/bunds).

Good construction practice will be implemented and secured within the Code of Construction Practice (APP-). Further consideration of the Register of Environmental Actions and Commitments (REAC) relevant to construction noise and vibration is discussed in Section 5.

To control dust emissions from the works during the construction phase, best practice control measures are to be put in place, as set out in the REAC (Application Document 6.3, Appendix 2.2). No specific measures are proposed in Gravesham to control dust emissions.

3.1.2 Operational Phase

There is no project specific embedded/good practice mitigation proposed for the residents of Gravesham for the operational phase of the development to manage the changes in Air Quality.

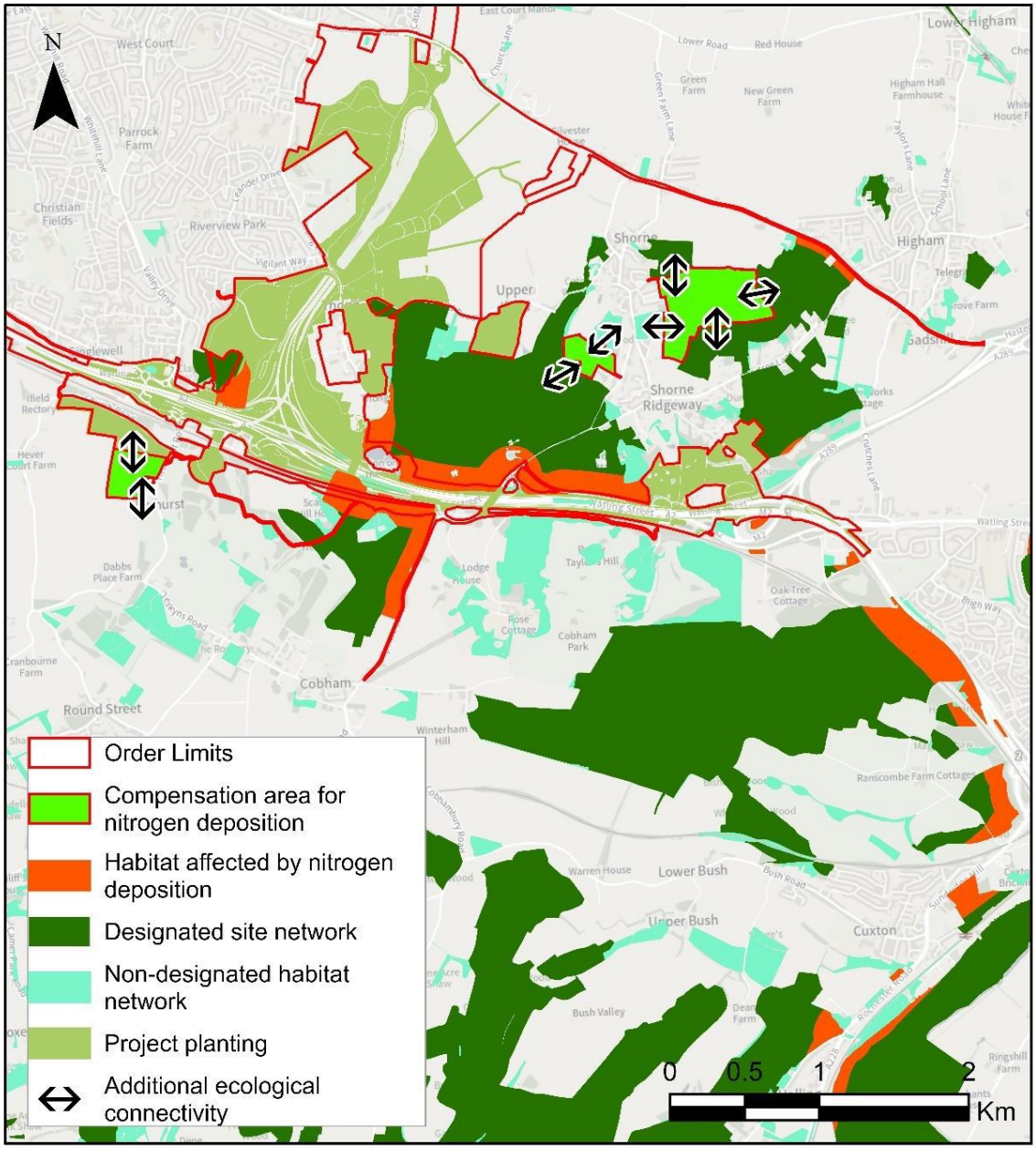
However, as there have been significant effects identified with regards to impact on ecological sites from changes in emissions, a 'Project Air Quality Action Plan' (PAQAP) has been produced, which is inclusive of specific measures for the Shorne and Ashenbank SSSI and Shorne/Brewers Ancient Woodland sites within Gravesham.

The PAQAP is presented in Appendix 5.6 (Application Document 6.3) and provides an assessment of measures that have been considered that have potential to reduce the impacts of the Project on the sites affected as detailed above. Measures considered included barriers, speed limits and speed enforcement.

There are significant effects predicted within Gravesham at the Shorne Woods and Ashenbank Ecological areas which comprise a Site of Special Scientific Interest (SSSI), Local Wildlife Site (LWS) and Ancient Woodland.

The proposed mitigation is provided as part of the scheme within Gravesham:

Figure 3-1 Proposed Mitigation for Affected Habitats within Gravesham



There was consideration of speed limit changes at the area around the Ashenbank Woods SSSI but this was not taken further forward for assessment. The applicant also states in 5.8.2 of 6.1 Environmental Statement Chapter 5 *"The Project does not require mitigation for operational air quality effects for human health or compliance with Limit Values. Whilst there are significant effects on the biodiversity sites and speed enforcement on the M2 has been assessed, it is not appropriate to undertake nitrogen deposition monitoring. Monitoring will not aid in determining whether the mitigation is effective as there is no ability to monitor conditions with and without the Project. Given that the impacts are as a result of the change in N deposition rather than for example absolute concentrations against AQS objectives, monitoring would only provide information related to the conditions at the time the monitoring was undertaken. In addition, as the speed enforcement would not be time limited, monitoring would not be needed to determine when the measure is removed."*

4 Methodology and Assumptions

4.1 Are the findings of the assessment robust, appropriate and defensible?

The air quality ES chapter was submitted on the 31st October 2022 following a previous submission and withdrawal in June 2020. The ES Chapter considers the impact of the construction and operational phases of the scheme on sensitive human and ecological receptors.

The air quality assessment, as it stands, provides for a reasonable analysis of the air quality impacts in relation to exposure of sensitive human and ecological receptors to existing poor air quality and the impact of the Lower Thames Crossing scheme on existing sensitive receptors situated close to the roads impacted by the works. In addition, the assessment has clearly evaluated the construction phase impacts, inclusive of both construction dust and construction traffic impacts. There are, however, a number of areas where further explanation or clarification is required to justify the decisions that have been made.

4.1.1 Legislative and Policy Context

The assessment covers all the prevailing legislation and relevant policy context in sufficient detail. 6.3 Environmental Statement Appendix 5.5 specifies the legislative requirements considered during the assessment.

The assessment correctly identifies the pollutants that need to be focused on. Namely: nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$ fractions). Reference is made to the necessary statutory drivers and legislation which gives rise to the focus on these pollutants and need for the air quality assessment overall. In addition, there is an appropriate level of information provided on the role of Local Authorities as required under Section 82 of the Environment Act (1995). In regards to planning policy, the National Planning Policy Framework and the National Planning Practice Guidance are correctly referenced and the local planning policies specific to Gravesham Borough Council have also been addressed.

There is discussion of the Environment Act 2021 which sets an Annual Mean Concentration Target for $PM_{2.5}$ of 10µg/m³ by 2040.

It is accepted that at the time of submission, the current applicable objective should be used for the purpose of compliance. However, the report has used an assessment level of 25µg/m³ for $PM_{2.5}$ when the applicable limit is 20µg/m³. Regardless of this omission, using this lower limit does not change the findings of the overall assessment with regards to the significance of change in $PM_{2.5}$ concentrations.

4.1.2 Baseline Conditions

The focus of the assessment has been clearly defined as the likely emissions arising from road traffic as a consequence of the Lower Thames Crossing project. This is appropriate given the potential for the scheme to significantly modify traffic flows. It has been acknowledged within the assessment that the study covers 25 local authorities and 45 Air Quality Management Areas (AQMAs). AQMAs are areas where relevant Air Quality Objectives are known to be exceeded and so the air quality has been identified as poor.

Appendix 5.2: Air Quality Baseline Conditions provides a complete table of all AQMAs within the study area and the associated pollutants they cover. This includes the Gravesham A2 AQMA, Northfleet Industrial Area AQMA, Gravesham A227 Wrotham Road/B261 Old Road West AQMA and Gravesham A226 One-way system AQMA.

The baseline year has been defined as 2016 and all baseline air quality data has been correctly derived from 2016. A thorough review of local authority monitoring, National Highways monitoring and project-specific

monitoring was undertaken, which provided for a comprehensive review of the existing air quality conditions. It has been correctly highlighted that, within 200m of the Project route alignment, there are four monitoring locations situated inside the Gravesham A2 AQMA. Furthermore, the annual mean NO_2 concentrations reported within Table 5.9 align with what was reported within the Gravesham Annual Status Reports (ASR).

No receptors have been included in either the Northfleet Industrial Area AQMA, Gravesham A227 Wrotham Road/ B261 Old Road West AQMA or Gravesham A226 One-way system AQMA. It is assumed that traffic will not change significantly within these areas.

Model Verification

All Air Quality Modelling should be compared against monitored concentrations to confirm that the modelled outputs reflect real-world concentration data. This has been completed as part of the Air Quality Assessment. The following statements are made with regards to the model verification within the Air Quality assessment:

5.3.157 Following the verification process, an overall Root Mean Square Error value of 5.8µg/m3 was derived for the Project air quality model, which is well within the Defra (2022) recommended Root Mean Square Error value of 10µg/m3. The model verification for this Project is presented in Appendix 5.1: Air Quality Methodology (Application Document 6.3).

LAQM TG(22)[1] has been cited as being used for reference for the methodology for completing the verification process which is in line with industry standard best practice in the UK. 7.585 of LAQM TG(22) states *"If the RMSE values are higher than ±25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40µg/m^3, if an RMSE of 10µg/m^3 or above is determined for a model, the local authority would be advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4µg/m3 for the annual average NO_2 objective."*

The statement that Defra recommends an RMSE within 10µg/m³is not accurate. Defra recommends a value of 4µg/m³. It is noted that this value of 5.8µg/m³ is a result of all of the 19 'model verification zones' combined. Data on the RMSE within each zone is not provided, but it is considered that if it is within 4µg/m³ within each zone this would be acceptable. If not, the modelling could be revisited.

The verification zones used within Gravesham are:

Table 4-1 Verification Zones used within Gravesham

Zone ID	Description	Road NO_x Verification Factor
12	A2 & A289	0.80
13	Thurrock/Dartford/Gravesham urban	1.36
14	Non Urban Road	0.93
16	M2 J1 to J3	1.03

Plate 6.2 in 6.3 Environmental Statement Appendix 5.1 shows that there are several monitoring locations which are outside of the recommended 25% variation between the modelled and monitored total NO_2. A comparison of monitoring and modelling sites within Gravesham is shown below.

[1] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

Table 4-2 Comparison of Modelling and Monitoring Results within Gravesham

Site ID	Verification zone	2016 Monitored Total NO_2 (µg/m³)	2016 Adjusted modelled Total NO_2 (µg/m³)	Ratio of monitored vs modelled total NO_2	% Change
GR52	13	32.9	41.8	0.79	27.1
GR92	13	38	43.0	0.88	13.2
GR98	13	32.7	44.6	0.73	36.4
GR104	12	34.4	36.5	0.94	6.1
GR110	12	34.5	33.4	1.03	-3.2
GR107	12	36.9	38.9	0.95	5.4
GR112	13	33.2	37.1	0.89	11.7
GR124	13	31.1	35.0	0.89	12.5
GR137	13	32.8	31.7	1.04	-3.4
GR138	16	30.8	31.0	0.99	0.6
GR141	12	31.4	36.5	0.86	16.2
GR142	12	58.9	40.2	1.46	-31.7
LTC38	12	43.6	40.9	1.07	-6.2
LTC39	12	45	39.5	1.14	-12.2
LTC40	14	28.8	29.2	0.99	1.4
LTC44	13	33.5	28.8	1.16	-14.0
LTC45C	13	27.8	27.4	1.02	-1.4
LTC47	13	30.7	28.0	1.1	-8.8
LTC48	13	22.4	25.6	0.87	14.3
LTC49	13	35.7	30.1	1.19	-15.7
LTC50	13	35.1	30.3	1.16	-13.7
LTC51	16	32	38.0	0.84	18.8
GR113	13	35.1	27.7	0.79	-21.1
GR56	13	38.7	30.8	0.8	-20.4
GR67	13	37.5	34.0	0.91	-9.3
GR68	13	37.4	33.7	0.9	-9.9
GR109	13	35.5	32.8	0.93	-7.6

As shown, three sites are outside of the recommended 25% difference. Of particular concern is site GR142 which is close to 60µg/m³, at this limit there is a greater chance of exceedances of the 1-hour short term objective for NO_2 however the modelling is predicting concentrations around 20µg/m³ lower than this at this location. Monitoring data for GR142 in recent years is presented below. Bold and underlined sites are those which exceed 60µg/m³ and are at risk of exceeding the short-term AQO and those in bold are those exceeding the annual average in line with standard LAQM presentation.

Table 4-3 Monitored Annual Average NO_2 Concentration in µg/m³ in recent years at GR142

Site ID	2017	2018	2019	2020	2021
GR142	**65.6**	**55**	**59.8**	**46.1**	**41.1**

As shown, concentrations remain high at this location in later years beyond the 2016 baseline and remain in exceedance during 2020 and 2021 despite the effect of COVID-19 pandemic related reductions in transport emissions in these years.

Site GR142 it located adjacent to the A2 within the existing AQMA. It is located close to the Shorne and Ashenbank Woods SSSI. There is a risk therefore that results in this area therefore may be underpredicting.

The closest modelled receptor to GR142 is at LTC195_H, representative of the 'Inn on the Lake' Hotel. The predicted change at this concentration is 0.6µg/m³ which is above 1% of the Air Quality Objective, this could lead to a significant effect at this receptor.

LAQM TG(22) recommends revisiting modelling assumptions around these areas to achieve better modelling agreement.

PM Verification

the road NO_x adjustment factors were applied to modelled road contribution PM_{10} concentrations. Across the modelled area including within Gravesham there are Particulate matter monitoring stations which could have been used to derive a separate PM verification factor. There is therefore greater margin for error in the modelled PM_{10} and $PM_{2.5}$ concentrations. However, it is considered that should this additional work be done it is unlikely to change the significance of effect with regards to the Air Quality assessment.

4.1.3 Background Concentrations Used in Modelling

While the modelling accounts for emissions from the major roads, there are many other sources of pollutant concentrations which are not accounted for within the modelling (e.g. aviation, domestic sources, industrial sources etc.). These are accounted for by adding the emissions from roads to a 'background' concentration. These background concentrations are mapped by Defra for the whole of the UK. LAQM TG(22) recommends that for modelling, the below factors should all be derived from the same base year:

- Traffic Data
- Background Data
- Monitoring Data
- Meteorological Data

6.1.3 of Appendix 5.1 states:

For each monitoring site, the relevant 1x1km 2016 background concentrations for NOx and NO2 were acquired by using the 2018 reference year Defra background maps which were adjusted by a monitoring-based adjustment factor to ensure that the modelled maps did not under-predict when compared to observed backgrounds. It should also be noted that the reference year of the background maps was also backcasted from 2018 to 2016 based on monitoring data from background sites.

It is accepted that 2016 monitoring data would not have been possible to obtain for the project specific monitoring sites when work on the project had commenced in 2018 and so some assumptions were required to make to the modelling.

However, it is not clear why adjustments have also been made to the latest background maps to 'backcast' to 2016 rather than using older background maps. 2016 background mapping data is freely available on the UK-Air website which would be more reliable and not require as many assumptions to have been used.

Given that all modelled results are inclusive of a background concentration, all concentration results reported are less likely to reflect actual concentrations. However, it is unlikely to significantly change the findings of the assessment by more than 1-2µg/m³ at modelled concentrations. Within Gravesham this is unlikely to result in any new exceedances but may result in additional perceptible changes in Air Quality which are not recognised with the current modelling assumptions.

This does not apply to the assessment of Nitrogen Deposition which has used different background data sourced from Apis.ac.uk. This website provides a best practice database for completing air quality assessment of changes in emissions and this methodology is considered appropriate for ecological receptors.

4.1.4 Assessment Methodology

The DMRB Volume 11, Section 3, Part 1 LA105 Air Quality (DMRB LA015) and the Local Air Quality Management Technical Guidance (LAQM.TG(22)) documents have been used to devise the methodology for data collection and assessment of air quality impacts. Both these guidance documents are the most relevant to the study and have been used appropriately to define the scope and assessment methodology.

The ES Chapter has used a framework of assessment based on DMRB LA105 as opposed to other guidance documents commonly used for assessment of impacts from development such as the EPUK/IAQM Guidance document "Land -Use Planning and Development: Planning for Air Quality".

While it is considered appropriate to use this document for its intended purpose for reviewing the impacts of a road scheme, the methodology looks at the overall impact across the length of the road links which are predicted to experience a change. The IAQM/EPUK guidance methodology allows for a review of changes in concentrations at hotspots. Using the IAQM/EPUK guidance allows for identification of potential changes which may result in significant issues in Gravesham being able to fulfil their duties as part of the Local Air Quality Management (LAQM) regime as defined in the UK Air Quality Strategy and LAQM PG(22). Their role requires them to reduce air quality concentrations as quickly as possible to below the relevant Air Quality Objectives.

Instead the approach used for the DMRB LA105 guidance is for only receptors where there are exceedances of the annual mean NO2 AQS objective and perceptible changes in annual mean NO_2 (>0.4µg/m3) are considered in the judgement as to whether the Project leads to a significant effect. These are then divided into 'Large' effect (a change of >4µg/mm³), 'Medium' effect (a change of >2µg/m³) and 'Small' effect (>0.4µg/m³).

Using the IAQM/EPUK methodology would result in a 'slight' adverse effect at receptors LTC054 and LTC247 within Gravesham. All other receptors would be 'negligible'. It is therefore not considered that using a different assessment methodology would result in a significant changing to the findings of the submitted assessment for residential receptors within Gravesham.

Construction Assessment Methodology

For construction dust impacts a risk-based approach has been taken which deploys the methods set out in the DMRB LA015 guidance document. The approach is based on the scale and type of construction activity and also the sensitivity of the areas likely to be impacted. The assessment appears to take a precautionary approach by assuming that construction activities would occur up to the boundary of the Order Limits. As a consequence the construction dust impact assessment methodology applied appears to be sensible.

Construction traffic has also been considered based on DMRB LA015 guidance criteria. Construction traffic data was obtained for five construction periods, which have been defined as the phases which reflect when there will be the largest changes in construction traffic across the construction programme.

Operational Impact Assessment Methodology

The latest available tools, including the Emissions Factors Toolkit (EFT) and NO_x to NO_2 conversion tool are all appropriately used in the assessment. The impact assessment has been undertaken using a commercially available dispersion modelling package, which is widely used to support the assessment of air pollution levels by local authorities and consultants (ADMS-Roads).
Both NO_2 and PM_{10} concentrations have been modelled. There is no requirement for modelling $PM_{2.5}$ as specified within DMRB LA105.

The years of assessment are identified as 2016 (existing) and future "with" and "without" development in 2030.

The latest version of the Emissions Factors toolkit has been used.

The assessment correctly highlights the requirement to evaluate ecological sites within 200m of the affected road network and the methodology to calculate the impact of nitrogen deposition is deemed to be appropriate.

4.1.5 Assessment of Ammonia Emissions

Changes in Ammonia emissions have been assessed as part of the Air Quality chapter. While ammonia emissions from vehicles are typically small, given the scale of the project and the sensitivity of certain species to changes in ammonia concentrations this has been completed. The following text is extracted from 6.3 Environmental Statement Appendix 5.1 'Air Quality Methodology'.

5.3.101 *There is currently no approved emission factors or Government tool for the assessment of NH_3 emissions from road traffic. However, as it is recognised that NH_3 can be a significant contributor to N deposition, National Highways developed a tool (which has been peer reviewed by the Institute of Air Quality Management) to calculate N deposition associated with the road NH_3 component.*

5.3.102 The tool calculates road NH3 concentrations using the modelled road NOx concentrations, which are factored against NH_3/NO_x ratios specific to Light Duty Vehicles (LDVs) and HDVs. The NH3/NOx ratio varies depending on the year being assessed as well as the dominant road type. The tool has been developed by reviewing the latest emissions literature and incorporating National Highways vehicle emission testing to develop the relationship between emissions of NO_x and NH_3 from the various vehicle types (e.g., diesel cars, petrol cars, Heavy Goods Vehicles). The ratios can then be applied to the modelled road NOx to derive an NH_3 concentration.

5.3.103 Since the NH_3/NO_x ratios vary between LDVs and HDVs, the air quality models were rerun with only the HDV emissions. This enabled the contribution of LDVs and HDVs to road NO_x to be derived (total road NOx could be subtracted from HDV NOx to calculate LDV NOx). The road NH_3 concentration was then converted to N deposition by a tool supplied by National Highways which incorporates the deposition velocities for NH_3 depending on whether the habitat type was short or tall vegetation.

The applicant has kindly provided a version of the tool used for deriving ammonia emissions from traffic. While this tool is not industry standard, upon review it is considered to be an appropriate tool and the assumptions used within the tool sensible for predicting ammonia emissions.

The results of the ammonia modelling have been used to inform the Nitrogen Deposition assessment.

An area which has not been considered is Ammonia emissions against the appropriate Critical Level. This is defined on the APIS website[2] as 1µg/m³ where lichens and bryophytes are present and 3µg/m³ for 'other vegetation'. The impacts of exceedances of these critical levels of ammonia are:

- Direct damage to sensitive species, for example, leaf discoloration, bleaching, observed in Sphagnum

[2] https://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis

species at high concentrations.

- Increase in algal growth over Sphagnum.
- Suppression of root uptake of cations such as Ca, Mg and K leading to nutrient imbalances (DoE 1993).
- Changes in species composition of groundflora, bryophyte and lichen communities.

No assessment of total levels of ammonia has been completed. This would potentially result in additional effects at other sensitive habitats but would require further consultation with project ecologists for full assessment.

4.1.6 Methodology for Assessing $PM_{2.5}$

$PM_{2.5}$ refers to particulate matter with a diameter of 2.5 micrometers or less. These particles are tiny and can be composed of various materials such as dust, soot, and smoke. They are a major component of air pollution and can have adverse effects on human health and the environment.

When it comes to vehicle emissions, $PM_{2.5}$ is a significant pollutant that is released into the atmosphere through combustion processes in engines, particularly from diesel and petrol vehicles. These emissions can result from incomplete fuel combustion, exhaust emissions, and the wear and tear of brakes and tires.

PM_{10} includes particles ranging in size from coarse to fine particles, and $PM_{2.5}$ represents the subset of fine particles within the PM_{10} category.

The following is taken from 6.1 Environmental Statement Chapter 5 – Air Quality:

5.3.37 The PM_{10} predictions were also used to predict $PM_{2.5}$ concentrations at these receptors, as described in paragraph 5.3.70.

5.3.48 Although not explicitly modelled, the impact of the Project against the $PM_{2.5}$ thresholds were also assessed using the modelled PM_{10} annual mean concentrations.

The assumption that PM10 concentrations can be used as a direct substitute for PM2.5 concentrations is not the most robust method for assessing the potential effects of PM2.5 though it is accepted that this would represent a worst-case assessment. An alternative method, should remodelling PM2.5 concentrations not be possible may be to convert PM10 to PM2.5 using methodology in Box 7-7 of TG(22).

For the assessment of $PM_{2.5}$, the modelled PM_{10} changes have been added to the $PM_{2.5}$ background due to constraints with the project timeline rather than remodelling for $PM_{2.5}$. It is accepted that this would present an overestimation of $PM_{2.5}$ concentrations. This is deemed to be an appropriate screening approach to identify any significant changes in $PM_{2.5}$ concentrations.

Additionally, the report states in 5.6.21 that the annual mean AQS objective for $PM_{2.5}$ is 25µg/m³ where it is actually 20µg/m³[3] as of the time of writing of the report. There are no exceedances of the 20µg/m³ limit within Gravesham.

4.2 Critical Assumptions

The traffic data used within the assessment was obtained from the Lower Thames Area Model (LATM), developed by National Highways The total vehicle flows included a breakdown of Heavy Goods Vehicles and speeds for each road link. As per the DMRB LA105 guidance, the traffic speeds were factored against observed speeds from TrafficMaster data and categorised into speed bands. Although this differs from the

[3] https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update.pdf

guidance within LAQM.TG(22), it is an accepted approach for highway developments such as this. It should be noted that the DMRB LA105 guidance does state that "*areas around junctions identified as sensitive to changes in air quality that can result in exceedances of air quality thresholds shall be assessed in greater detail*". Clarification as to whether any junctions were highlighted as those sensitive to changes needs to be sought to ensure the speed banding has been applied sensibly across the model domain. The approach to collating and assigning the traffic data appears to have followed the appropriate guidance.

All of the completed Air Quality work is based on the traffic provided being correct. It is understood that this may be subject to change which will subsequently change the findings of the Air Quality assessment.

Many of the tools used are based on assumptions and predictions made prior to the COVID-19 pandemic. While traffic activity has returned to less disrupted patterns as of 2022, there is still a greater shift towards remote working and reliance on vehicles servicing online deliveries which would not be captured in the tools used.

5 Impacts

The Air Quality Assessment ES chapter has concentrated on the impacts from changes in emissions from roads at local residential receptors and at ecological receptors with regards to the change in concentrations of NO_2, PM_{10} and $PM_{2.5}$.

5.1 Local Residents

5.1.1 Without Mitigation

Construction

With no mitigation in place, the magnitude of effect of construction emissions would be large at sensitive human receptors.

Operational

The National Policy Statement for National Networks (NPSNN) requires significance of air quality impacts to be determined in line with the requirements of the Environmental Impact Assessment (EIA) Directive. The assessment has utilised the DMRB LA105 guidance to achieve both the above requirements. With regards to assessing the significance of air quality impacts, the magnitude of change in pollutant concentrations is evaluated based on the number of receptors experiencing the change. This is considered an acceptable approach for determining significance. In order to assess compliance with the EU Directive 2008/50/EC, a compliance risk assessment was carried out following the DMRB LA105 guidance which is also considered an acceptable approach.

5.1.2 With Mitigation

Construction

With best practice dust management measures in place, there is not predicted to be any significant effect as a result of construction dust emissions.

Without Mitigation

At receptor LTC195_H, representative of the 'Inn on the Lake' Hotel, the modelled concentration is underpredicting by greater than the 25% recommended by LAQM TG(22). The predicted change at this receptor is 0.6µg/m³ which is above 1% of the Air Quality Objective, this could lead to a significant effect at this receptor.

Despite some modelling assumptions increasing the uncertainty of the modelling results, it is ultimately accepted that at all other locations there is not considered to be any significant effects with regards to changes in Air Quality on human receptors.

5.2 Ecological Receptors

5.2.1 Without Mitigation

Without mitigation there are several sites which will be significantly impacted by changes in traffic as a result of the Scheme around Gravesham.

5.2.2 With Mitigation

Even with mitigation in place, the below summarises the effects at sensitive sites within Gravesham.

Table 5-1 Residual Impacts at Ecological Receptors

Site name	Effect avoided by mitigation	Effect reduced by mitigation	Extent of site affected (ha)	Residual significant effect remains
Shorne And Ashenbank Woods SSSI	No	No	53.9	Yes
Shorne/Brewers Woods AW	No	No	11.24	Yes

Following review of the methodology, the findings of the assessment are accepted at these locations. It is therefore considered that the scheme will have significant effects with mitigation in place at sensitive habitats within Gravesham.

6 Asks

6.1 Monitoring Strategy

As part of the scheme, there is the offer for additional monitoring sites from Gravesham. Potential suggested monitoring locations based on the findings of the Air Quality Assessment and where there are existing gaps in Gravesham's existing Network are set out below.

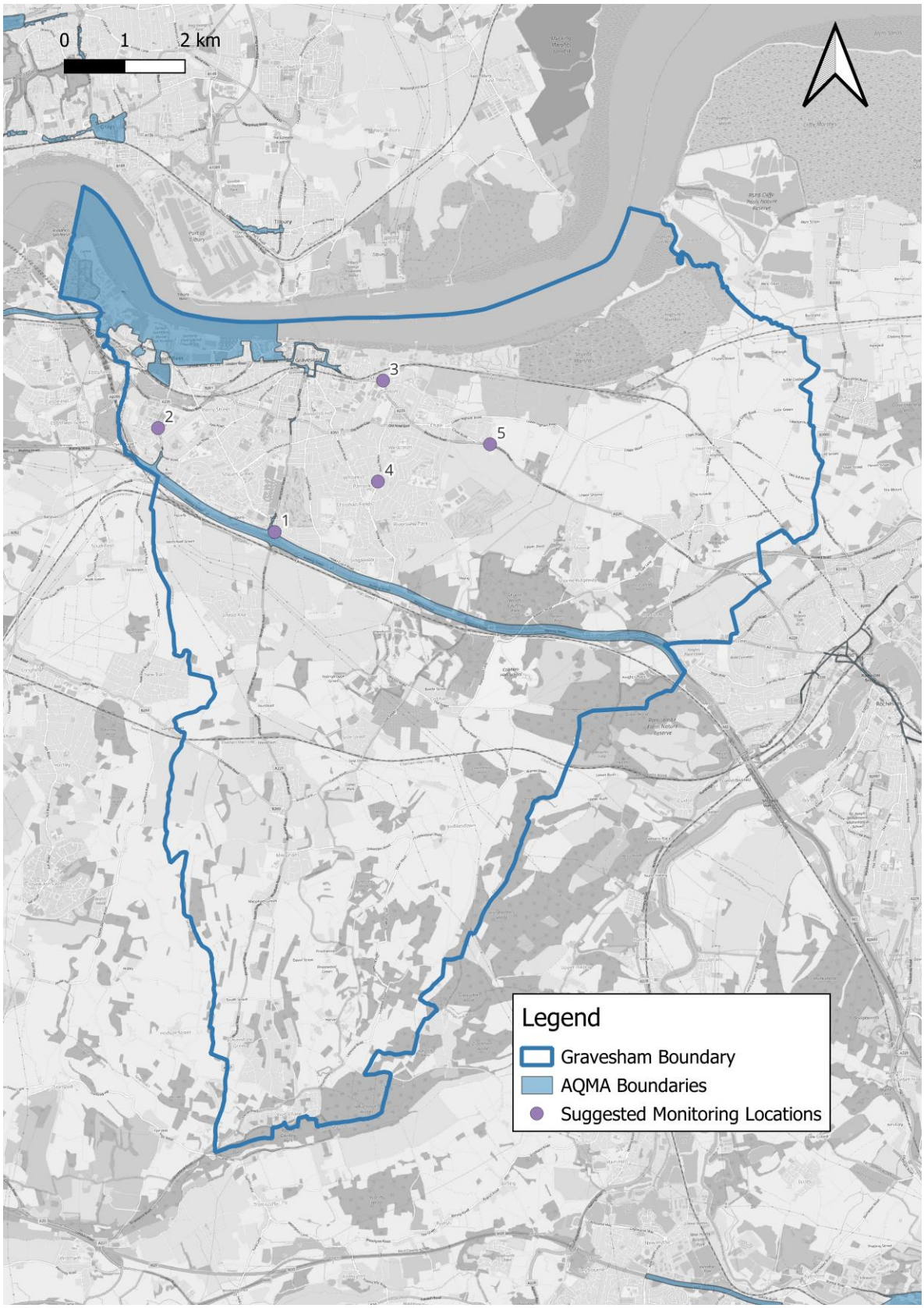
Five potential locations are shown below for including monitoring at locations where there are predicted increases which are greater than 1% of the AQO for NO_2 (i.e. 0.4µg/m³) and where there is not already existing monitoring.

Ideally, automatic monitoring stations would be installed through which live data could be recorded. An alternative would be for NO_2 diffusion tubes to be installed at these locations.

Table 6-1 Proposed Monitoring Locations

Proposed Location ID	X	Y
1	564203	171307
2	562269	173026
3	566000	173814
4	565915	172142
5	567774	172759

Figure 6-1 Suggested Monitoring Locations



To give greater confidence in the findings of the assessment, the following could be completed:

- Revisit the model verification around GR142 to give greater confidence that the model is not significantly underpredicting the impacts on the area around this site including at Shorne and Ashenbank SSSI.
- Complete an assessment of total ammonia concentrations, if deemed appropriate by a project ecologist, to understand the effects of ammonia in isolation on sensitive habitats inclusive of any sites with sensitive lichens and bryophytes.

6.2 Additional Mitigation/Compensation

No further additional mitigation/compensation is proposed by the applicant. However, as significant effect is identified at ecological receptors within Gravesham for which additional mitigation/compensation may be sought.

Appendix A – Maps of Operational Effects in Gravesham

Figure 6-2 Total NO_2 Concentrations in 'Do Something' Scenario

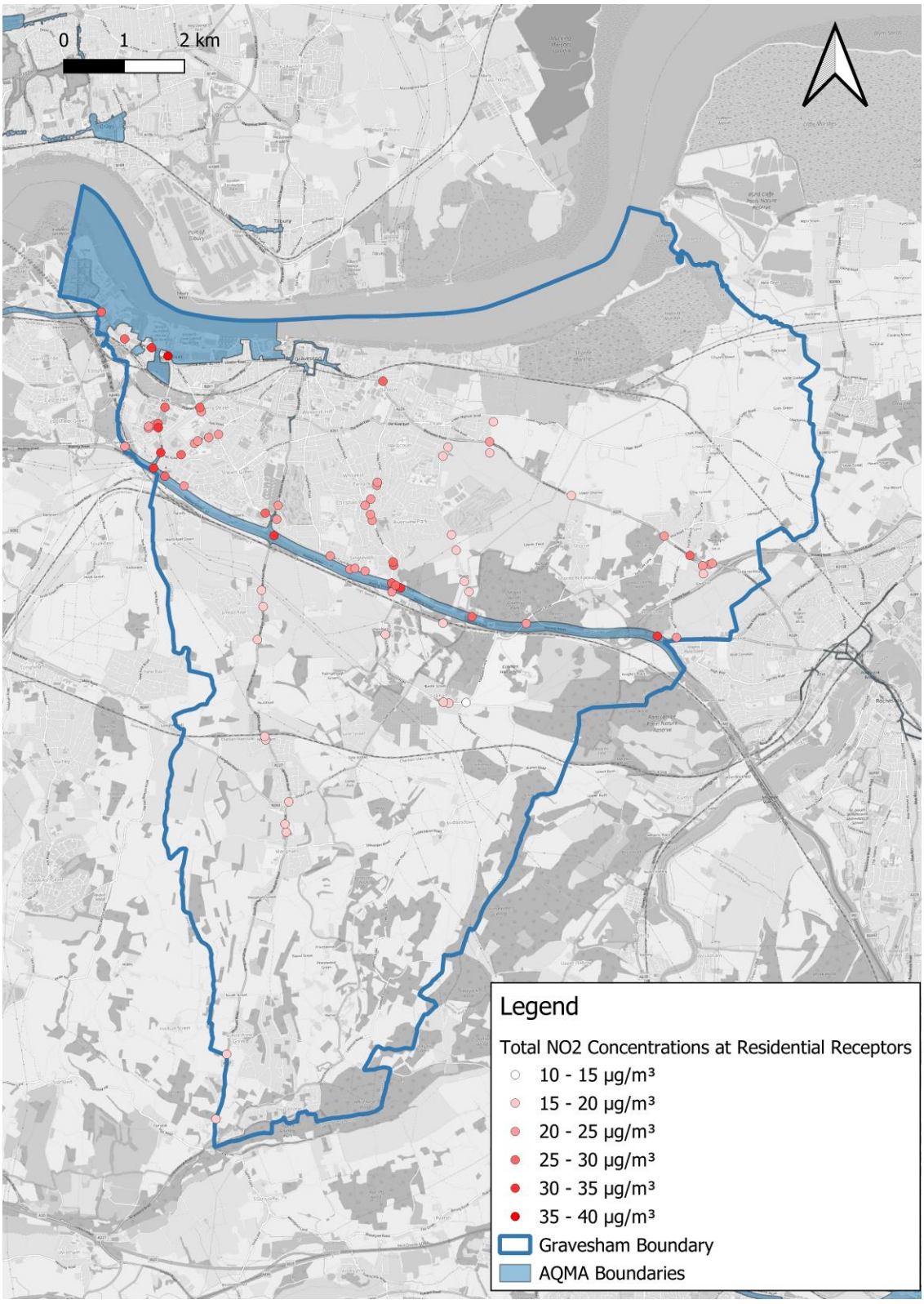


Figure 6-3 Change in NO_2 Concentrations as a Result of the Development

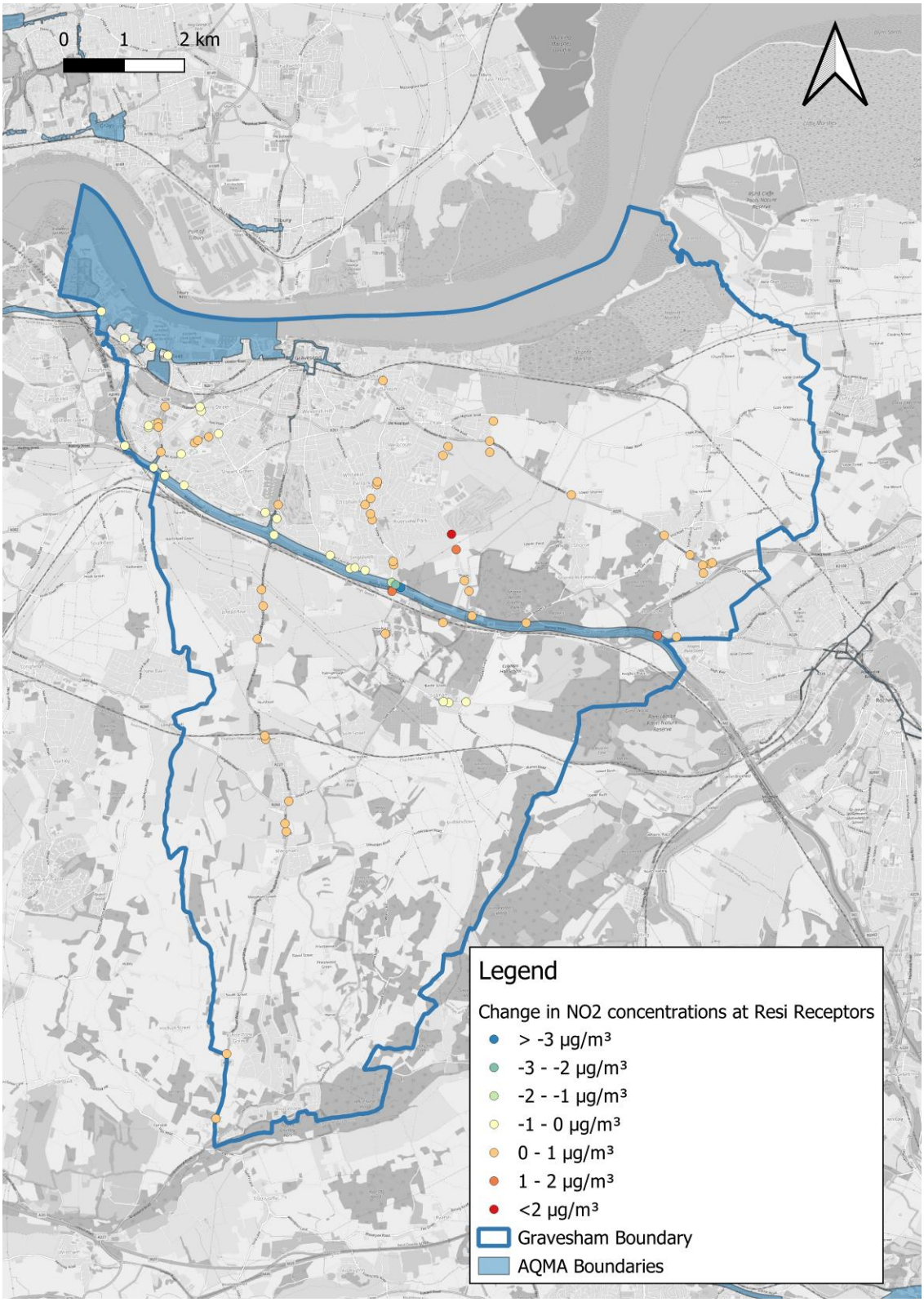


Figure 6-4 Total PM_{10} Concentrations in 'Do Something' Scenario

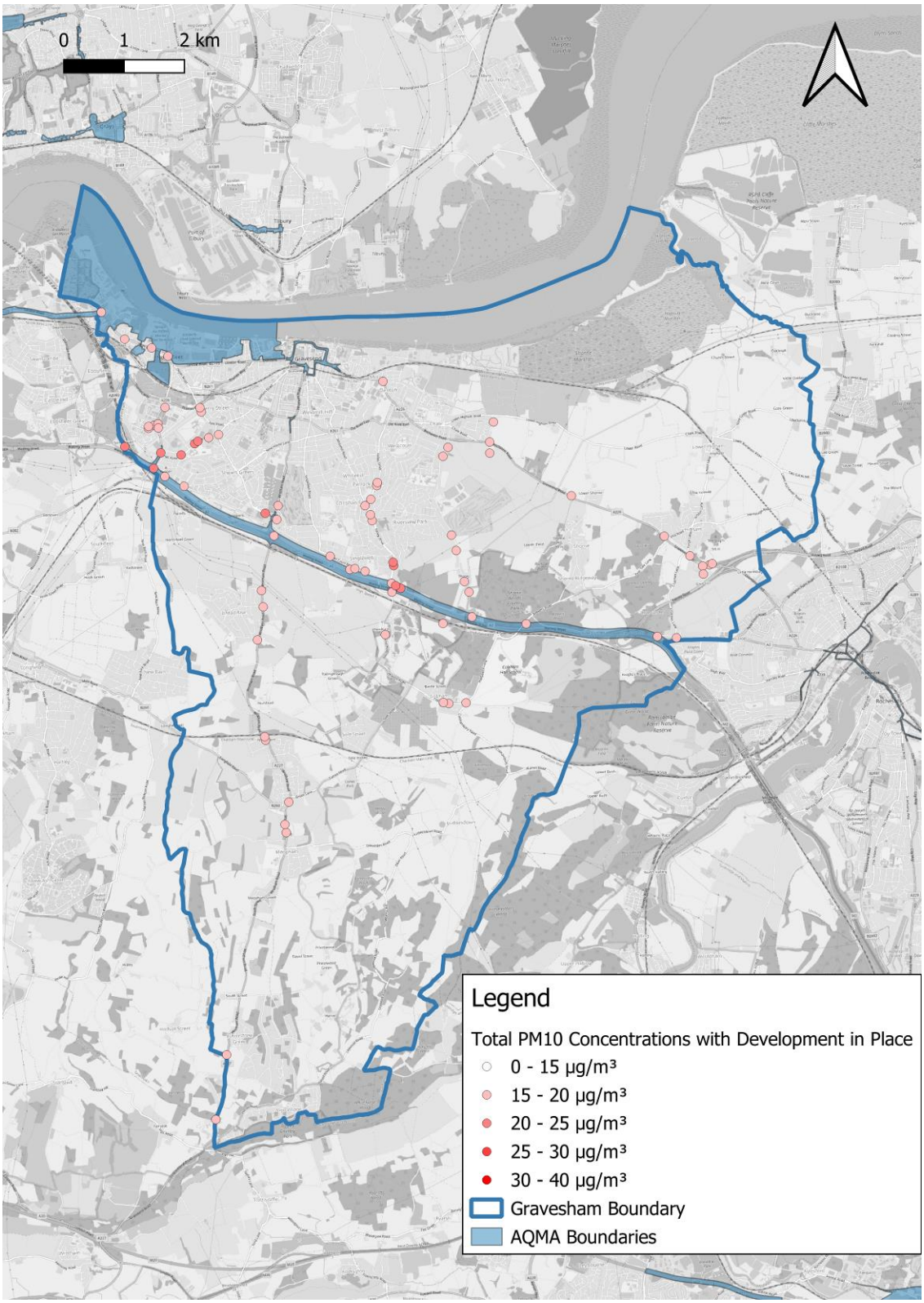


Figure 6-5 Change in PM_{10} Concentrations as a Result of the Development

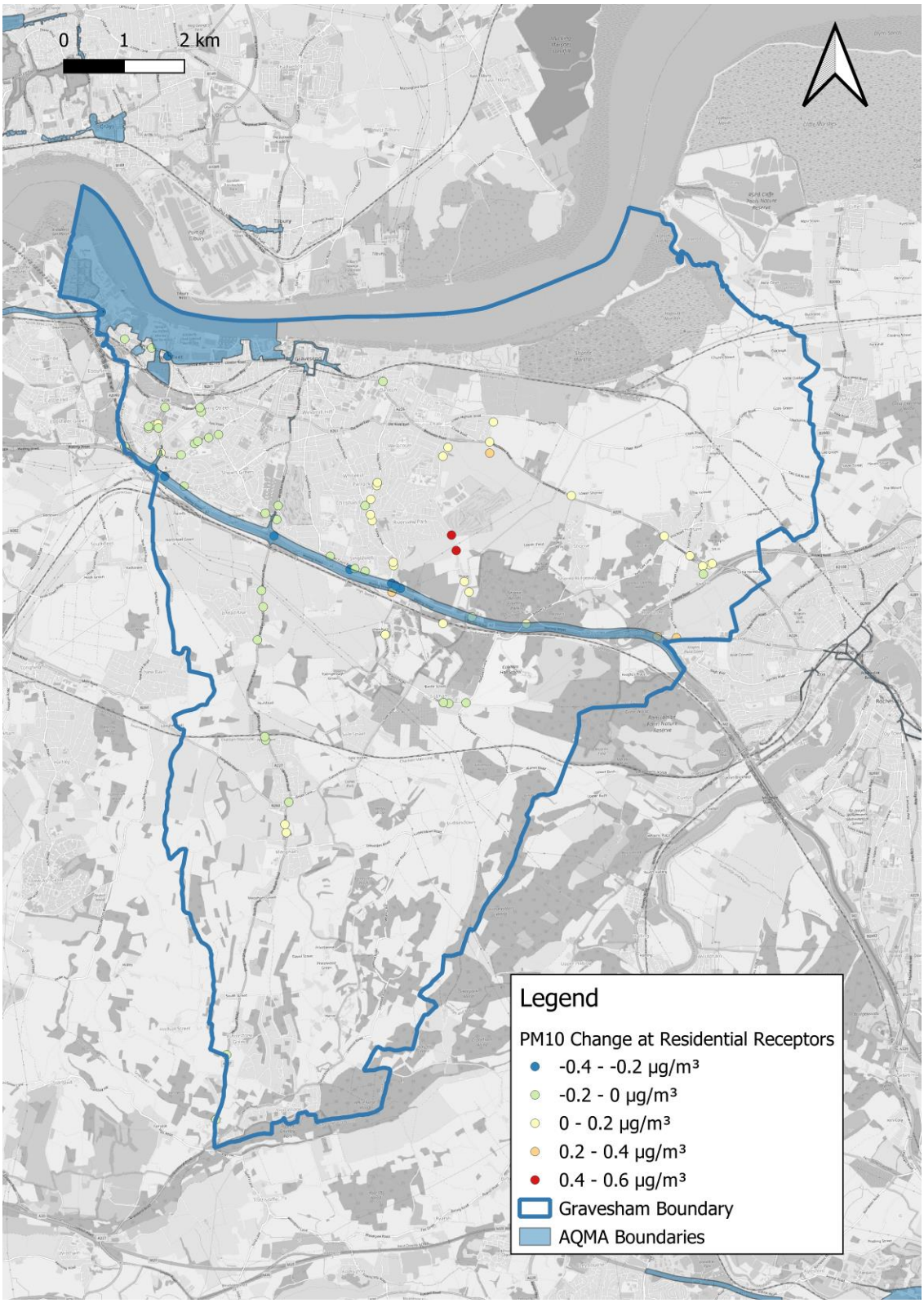


Figure 6-6 Total $PM_{2.5}$ Concentrations in 'Do Something' Scenario

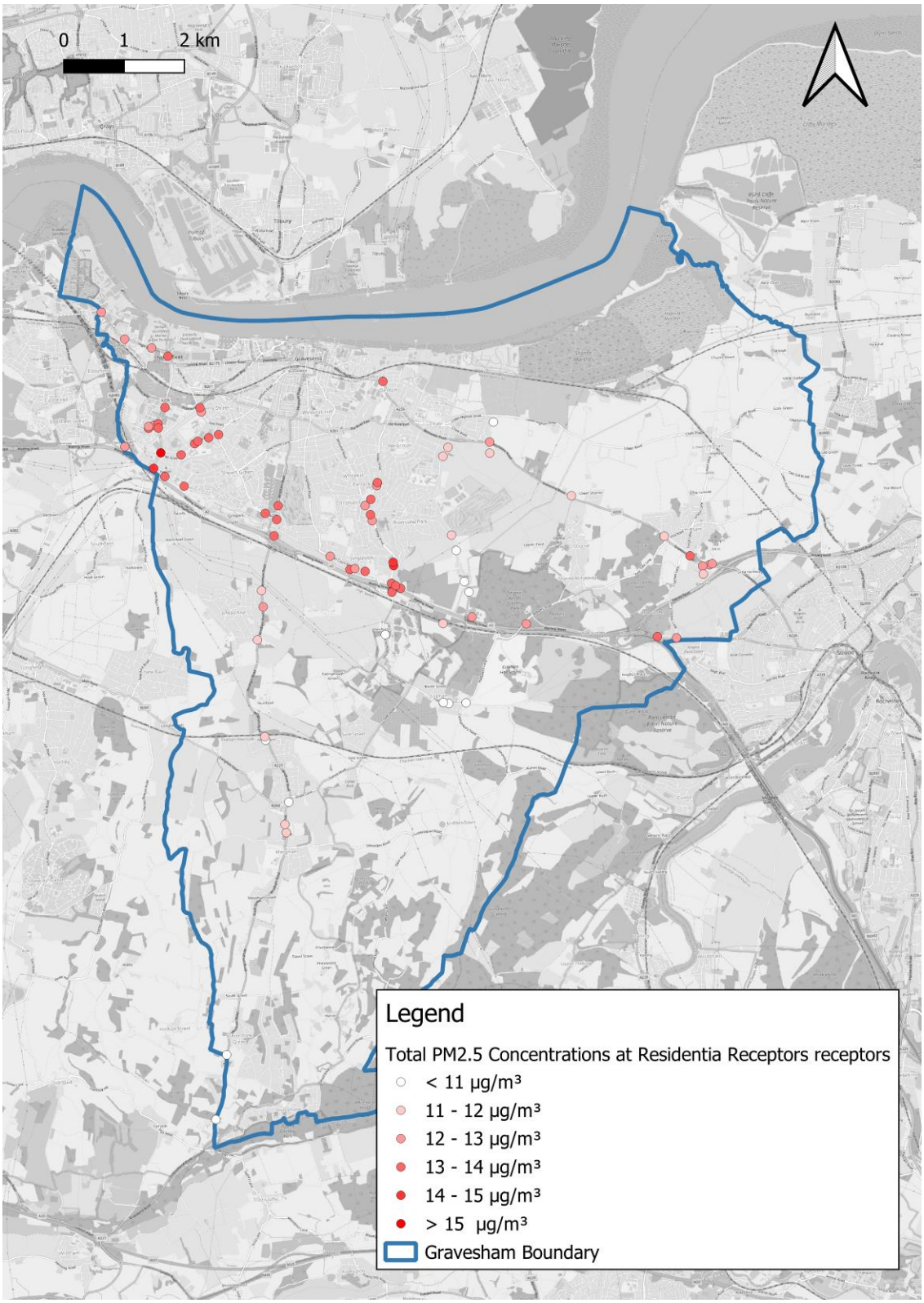


Figure 6-7 Change in $PM_{2.5}$ Concentrations as a Result of the Development