Thurrock Flexible Generation Plant

Environmental Statement Volume 3
Chapter 11: Noise and Vibration

Date: February 2020

Environmental Impact Assessment

Environmental Statement

Volume 3

Chapter 11

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Table of Contents

List of Tables

List of Figures

Summary

This ES document considers the noise and vibration impact of the proposed Thurrock Flexible Generation Plant development. Supporting information on the baseline, assessment methodology and modelling results can be found in Volume 3, Appendix 11.1: Baseline Sound

Monitoring Report, 11.3: Construction Noise Assessment Methodology and Results and Appendix 11.4: Operational Noise Assessment Methodology and Results.

Qualifications

This document has been prepared by Josh Wilson, an Acoustic Consultant and Corporate Member of the Institute of Acoustics, who has four years' experience of environmental noise impact assessment.

It has been checked by Charlotte Birch, an Acoustic Consultant and Associate Member of the Institute of Acoustics, who has two years' experience of environmental noise impact assessment.

It has been checked and authorised by Simon Stephenson, a Technical Director within the Acoustics Team and Corporate Member of the Institute of Acoustics, who has 20 years' experience of environmental noise impact assessment.

1. Introduction

1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) work undertaken concerning potential impacts of Thurrock Flexible Generation Plant on noise and vibration.

1.1.2 This chapter assesses the potential noise and vibration effects on surrounding noise and vibration sensitive receptors (NVSRs) as a result of the construction, operation and decommissioning of the proposed development.

1.1.3 This chapter begins by setting out the policy, legislative context and relevant standards and guidance for the assessment. The methods and criteria used to assess potential adverse noise and vibration effects are then described. Baseline conditions at receptors potentially impacted by the development are described. Conclusions have been drawn as to the significance of the residual effects.

1.1.4 This chapter summarises information contained within technical appendices, which are included at Volume 6, Appendix 11.1: Baseline Sound Monitoring Report, Appendix 11.2: BS 4142 Statements, Appendix 11.3: Construction Noise Assessment Methodology and Results, Appendix 11.4: Operational Noise Assessment Methodology and Results and Appendix 11.5: Standards and Guidance.

1.1.5 In particular, this ES chapter:

- presents the existing environmental baseline established from desk studies, surveys and consultation to date;
- presents the potential environmental effects of noise and vibration arising from Thurrock Flexible Generation Plant, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

1.2 Planning policy context

1.2.1 Planning policy for energy generation Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to noise and vibration, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2, DECC, 2011b).

1.2.2 NPS EN-1 and NPS EN-2 include guidance on what matters are to be considered in the assessment. These are summarised in Table 1.1 below.

Table 1.1: Summary of NPS EN-1 and EN-2 provisions relevant to this chapter.

Summary of NPS EN-1 and NPS EN-2 provision	How and where considered in the ES
NPS EN-1 Section	
Paragraph 5.11.4 identifies the elements that should be included in the noise assessment.	Construction, operation, and decommissioning phases of Thurrock Flexible Generation Plant have been assessed using the principles in the relevant British Standards. The existing noise environment is described in Volume 6, Appendix 11.1: Baseline Sound Monitoring Report. Construction and decommissioning impacts are assessed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results. Operational impacts are assessed in Volume 6, Appendix 11.4: Operational Noise Assessment Methodology and Results.
Paragraph 5.11.5 refers to noise impacts from ancillary activities associated with the development, such as increased road traffic movements.	Construction traffic impacts are assessed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results.
Paragraph 5.11.6 refers to the need to assess operational and construction noise using the principles of the relevant British Standards (BS) and other guidance.	Operational and construction noise impacts have been assessed using the principles in the relevant British Standards (see Volume 6, Appendix 11.5: Standards and Guidance Relevant to Noise and Vibration for details of guidance documents).
Paragraph 5.11.7 refers to the need to consult the Environment Agency and Natural England as necessary and in particular with regard to assessment of noise on protected species or other wildlife.	Noise impacts on wildlife are assessed in Volume 3, Chapter 9: Onshore Ecology.
NPS EN-2 Section	
Paragraphs 2.7.1 and 2.7.2 refer to considerations and potential sources of noise relevant to fossil fuel electricity generating infrastructure. Reference is made to the noise assessment requirement as set out in Section 5.11 of EN-1.	Operational noise impacts from gas fired engines and associated infrastructure are assessed in Volume 6, Appendix 11.4: Operational Noise Assessment Methodology and Results.

1.2.3 NPS EN-1 and NPS EN-2 also highlight a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 1.2 below.

Table 1.2: Summary of NPS EN-1 and NPS EN-2 policy on decision making relevant to this chapter.

Summary of NPS EN-1 and NPS EN-2 policy on decision making and mitigation	How and where considered in the ES
NPS EN1 Section	
Paragraph 5.11.8 refers to the need to demonstrate good design through the selection of the quietest cost-effective plant available, containment of noise within buildings wherever possible, optimisation of plant layout to minimise noise emissions and where possible, the use of landscaping bunds or noise barriers.	The design of Thurrock Flexible Generation Plant and an indicative site layout is described in Volume 2, Chapter 2: Project Description. The list of proposed operation equipment is described in Volume 6, Appendix 11.4: Operational Noise Assessment Methodology and Results. Designed-in mitigation measures are set out in Table 2.11.
Paragraph 5.11.9 refers to the requirements of the proposal in order for development consent to be granted. The document states that the following aims should be met: • "*avoid significant adverse impacts on health and quality of life from noise;* • *mitigate and minimise other adverse impacts on health and quality of life from noise; and* • *where possible, contribute to improvements to health and quality of life through the effective management and control of noise.*"	A summary of the results of the assessment of noise impacts from Thurrock Flexible Generation Plant is presented in Section 4. Designed-in mitigation measures are set out in Table 2.11.
Paragraphs 5.11.11 to 5.11.13 refer to the mitigation of noise impacts and measurable requirements.	Designed-in mitigation measures are set out in Table 2.11. Construction noise management is set out in the CoCP (application document A8.6) with specific mitigation identified within this chapter as necessary.
NPS EN2 Section	
Paragraphs 2.7.3 and 2.7.4 refer to the requirements of the proposal in order for development consent to be granted. Consideration is given for the extent to which operational noise will be separately controlled by the EA.	A summary of the results of the assessment of noise impacts from Thurrock Flexible Generation Plant is presented in Section 4. The operation of the proposed development will operate subject to the requirements of the Environmental Permit. Further details are provided in Volume 2, Chapter 2: Project Description.
Paragraphs 2.7.5 and 2.7.6 refer to the mitigation of noise impacts and measurable requirements.	Designed-in mitigation measures are set out in Table 2.11.

1.2.4 A number of other policies are relevant to noise and vibration including;

- National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2019);
- National Planning Practice Guidance – Noise (Ministry of Housing, Communities and Local Government, 2019);
- Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010); and
- Thurrock Council Core Strategy and Policies for Management of Development (Thurrock Council, 2015).

National Planning Policy Framework

1.2.5 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The emphasis of the Framework is to allow development to proceed where it can be demonstrated to be sustainable. In relation to noise, Paragraph 180 of the Framework states that:

"Planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from the development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

1.2.6 The point 'a)' refers to 'significant adverse impacts' which relates to the 'significant observed adverse effect level' (SOAEL) in the Noise Policy Statement for England (NPSE). Although the term 'effect' is used instead of the term 'impact' these are considered to be interchangeable in this context.

National Planning Practice Guidance – Noise (NPPG)

1.2.7 The NPPG reiterates general guidance on noise policy and assessment methods provided in the NPPF, Noise Policy Statement for England (NPSE) and British Standards (BS), and contains examples of acoustic environments commensurate with various effect levels. It is considered appropriate to NSIPs. A summary of the guidance from the NPSE and NPPG is set out in Table 1.3.

Table 1.3: Summary of guidance from NPSE and NPPG.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, for example turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, for example avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, for example regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm (e.g. auditory and non-auditory).	Unacceptable Adverse Effect	Prevent

1.2.8 The NPPG describes noise that is not noticeable to be at levels below the No Observed Effect Level (NOEL). It describes a range of noise exposure that is noticeable but not to the extent there is a perceived change in quality of life. Noise exposures in this range are below the Lowest Observed Adverse Effect Level (LOAEL) and need no mitigation. On this basis, the audibility of noise from a development is not an appropriate criterion to judge noise effects.

1.2.9 The NPPG advises that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the NPPG include:

- having to turn up the volume on the television;
- needing to speak more loudly to be heard; or
- where there is no alternative ventilation, closing windows for some of the time because of the noise.

1.2.10 In line with the NPPF and NPSE, the NPPG states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.

1.2.11 The NPPG advises that noise exposures above the Significant Observed Adverse Effect Level (SOAEL) cause material changes in behaviour. An example of noise exposures above the SOAEL provided in the NPPG are:

- where there is no alternative ventilation, keeping windows closed for most of the time; or
- avoiding certain activities during periods when the noise is present.

1.2.12 In line with the NPPF and NPSE, the NPPG states that effects above the SOAEL should be avoided and that while the economic and social benefits derived from the activity causing the noise must be taken into account, such exposures are undesirable.

Noise Policy Statement for England

1.2.13 The Noise Policy Statement for England (NPSE) (Defra, 2010), aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. Paragraphs 1.6 and 1.7 of the NPSE set out the long term vision and aims of Government noise policy:

"Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

"Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

1.2.14 The aims of the policy differentiate between noise impacts on health (e.g. sleep disturbance, hypertension, stress etc.) and noise impacts on quality of life (e.g. amenity, enjoyment of property etc.). The aims also differentiate between "significant adverse impacts" and "adverse impacts". The explanatory note to the NPSE clarifies that a significant adverse impact is deemed to have occurred if the "Significant Observed Adverse Effect Level" (SOAEL) is exceeded. An adverse effect, on the other hand, lies between the "Lowest Observed Adverse Effect Level" (LOAEL) and the SOAEL.

1.2.15 The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations.

Thurrock Council Core Strategy

1.2.16 The Thurrock Council Core Strategy and Policies for Management of Development was adopted in January 2015. The document contains the following policies with regards to noise that are relevant to the proposed development:

"PMD1 – Minimising Pollution and Impacts on Amenity, Health, Safety and the Natural Environment

1. Development will not be permitted where it would cause or is likely to cause unacceptable effects on:

i. the amenities of the area;
ii. the amenity, health or safety of others;
iii. the amenity, health or safety of future occupiers of the site; or
iv. The natural environment.

2. Particular consideration will be given to the location of sensitive land uses, especially housing, schools and health facilities, and national, regionally and locally designated biodiversity sites, and areas of recreational and amenity value which are relatively undisturbed by noise and valued for this reason.

3. The Council will require assessments to accompany planning application where it has reasonable grounds to believe that a development may suffer from, or cause:

i. Air pollution;
ii. Noise pollution;
[…/…]"

"PMD9 – Road Network Hierarchy

The Council will only permit the development of new accesses or increased use of existing accesses where:

…vii. The development will minimise adverse impacts on the quality of life of local residents, such as noise, air pollution, and the general street environment.

…"

1.3 Legislation

1.3.1 Details of how the proposed development is compliant with relevant legislation are provided in Table 1.4.

Control of Pollution Act

1.3.2 Section 60, Part III of the Control of Pollution Act (CoPA) refers to the control of noise (including vibration) on construction sites. It provides legislation by which local planning authorities can control noise from construction sites, by stopping activities if necessary, to prevent noise disturbance occurring. In addition, it recommends that guidance provided by British Standard (BS) 5228:2014 'Code of practice for noise and vibration control on construction and open sites – Parts 1&2' (British Standards Institute, 2014), is implemented to ensure compliance with Section 60.

1.3.3 The CoPA provides the local planning authority, in whose area work is going to be undertaken, or is being undertaken, with the power to serve a notice imposing requirements as to the way in which construction works are to be carried out. This notice can specify the plant or machinery that is or is not to be used, the hours during which the construction work can be carried out, the level of noise and vibration that can be emitted from the premises in question or at any specified point on these premises or that can be emitted during specified hours, or for any change of circumstances.

1.3.4 Section 61, Part III of the CoPA refers to prior consent for work on construction sites. It provides a method by which a contractor can apply for consent to undertake construction works in advance. If consent is given, and the stated method and hours of work are complied with, then the local authority cannot take action under Section 60.

1.3.5 Section 71, Part III of the CoPA refers to the preparation and approval of codes of practice for minimising noise. The current, June 2014, version of BS 5228 is one such approved code.

1.3.6 Section 72, Part III of the CoPA refers to 'best practicable means' (BPM), which is defined as:

"reasonably practicable, having regards among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications'. While 'Means' includes 'the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures."

1.3.7 If BPM is applied, then it can provide a defence against prosecution by the consenting body, usually the local authority.

Environmental Protection Act 1990, Part III (EPA)

1.3.8 The Environmental Protection Act 1990 (EPA) deals with statutory nuisance, including noise.

1.3.9 Section 79, Part III of the EPA, 'Statutory nuisances and inspections therefor', places a duty on local authorities to regularly inspect their areas to detect whether a statutory nuisance exists.

1.3.10 Where a local authority is satisfied that a statutory nuisance does exist, or is likely to occur or recur, it must serve an abatement notice. Section 80, Part III of the EPA, 'Summary proceedings for statutory nuisances', provides local authorities with the power to serve an abatement notice requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence; and/or carrying out such works or other action necessary to abate the nuisance.

1.3.11 Section 82, Part III of the EPA, 'Summary proceedings by persons aggrieved by statutory nuisances', allows a Magistrates' court to act on a complaint made by any person on the grounds that they are aggrieved by a statutory nuisance, such as noise.

1.3.12 The procedures for appeals against abatement notices are detailed in the Statutory Nuisance (Appeals) Regulations 1995.

1.3.13 Table 1.4 provides a summary of how the proposed development demonstrates compliance with the relevant legislation.

Table 1.4: Details on compliance with relevant legislation.

Relevant Legislation	How the proposed the development demonstrates compliance
Control of Pollution Act	Section 61 prior consents will be sought from the local authority prior to construction commencing where appropriate. The assessment of construction noise effects has been undertaken in accordance with BS 5228:2009+A1:2014. Proposed mitigation measures, in accordance with BPM are detailed in the Outline CoCP (application document A8.6).
Environmental Protection Act 1990, Part III	The noise and vibration assessment provided within this chapter considers the potential adverse noise and vibration impacts resulting from the construction, operation and decommissioning of the proposed development..

1.4 Consultation

1.4.1 Key issues raised during scoping and consultation to date specific to noise and vibration are listed in Table 1.5, together with how details of how these issues have been considered in the production of this ES and cross-references to where this information may be found.

Table 1.5: Key points raised during scoping and consultation to date.

Date	Consultee and type of response	Points raised	How and where addressed
January 2018	Thurrock Council Environmental Health Officer	Agreement on the scope and methodology of the baseline acoustic surveys	Baseline survey methodology and scope are presented in Volume 6, Appendix 11.1: Baseline Sound Monitoring Report.
September 2018	Gravesham Borough Council – Scoping Opinion	"Noise – Noise has been a key issue in relation to the proposals for Tilbury2 and there is potential for noise generated at both the RWE Tilbury Energy Centre and the Tilbury Flexible Energy Generation Plant to impact both individually and cumulatively on sensitive receptors to the south of the River Thames. The adopted Gravesham Local Plan Core Strategy (2014) identifies a key development site on the waterfront at Gravesend Canal Basin (under policy CS04) which will result in the introduction of further residential units in this area. The Council would therefore seek to ensure that potential noise impacts on both existing and potential sensitive noise receptors on the south side of the River Thames are fully understood for both the construction and operational phases. To ensure consistency of approach with adjoining projects, the developer is directed to the papers available on the NSIP website in relation to Tilbury2…"	Cumulative noise effects resulting from the construction, operation and decommissioning of Thurrock Flexible Generation Plant and other proposed developments in the surrounding area has been assessed in Volume 4, Chapter 24. Noise predictions have been made at receptors considered to be the most affected by construction, operational or decommissioning noise from Thurrock Flexible Generation Plant, including a representative receptor south of the River Thames. The chosen study areas for the noise assessment are described in Section 2.3.
September 2018	Marine Management Organisation – Scoping Opinion	"Noise and Vibration The ES should include an assessment of the potential risk of impact of underwater noise on sensitive receptors. This should be supported by relevant and recent scientific literature… … Noise disturbance to local ornithological features should be considered in any final ensuing ES. The MMO draw your attention to the local RSPB Thames Estuary and Marshes IBA which is within the direct vicinity of proposed outfall, intake and jetty work area."	The impacts of underwater noise caused by the construction of the causeway have been scoped out of this assessment due to the low source levels (for example dredging) and the lack of underwater piling. Further explanation is given in Volume 3, Chapter 17: Marine Environment. Noise effects on ecologically sensitive receptors from the construction, operation and decommissioning of the proposed development are considered in Volume 3, Chapter 9: Onshore Ecology.
September 2018	Port of London Authority- Scoping Opinion	"Noise & Vibration Paragraph 8.131 relates to construction and decommissioning traffic, which the PLA considers must also include ship/barges given the intention to utilise the Thames for the transportation of materials."	The noise impacts of the movements of barges on the Thames has been scoped out of this assessment. It is considered that the small number of movements associated with the construction of the development will be indistinguishable from the other river traffic.
September 2018	Tilbury2 – Scoping Opinion	"Noise It is not anticipated that there will be any significant cumulative effects of TFGP with Tilbury2 during construction. As described above there is likely to be limited overlap between the construction phases of Tilbury2 with those of the TFGP proposal. In operation, the Scoping Report for TFGP indicates that noise generating plant items such as the gas engines, inverters, transformers, air coolers/conditioning units and substations have the potential to result in noise impacts. These will need to be considered cumulatively with the operation of Tilbury2, TEC and LTC."	Cumulative noise effects resulting from the construction, operation and decommissioning of Thurrock Flexible Generation Plant and other proposed developments in the surrounding area has been assessed in Volume 4, Chapter 24.
September 2018	Thurrock Council Public Health Team - Scoping Opinion	"Noise pollution It is stated that there is the possibility of piling and dredging noise which may affect the population of Tilbury during construction. A cumulative assessment of current noise levels and modelled noise levels from this and other new and emerging development should be undertaken and used as part of the noise impact assessment. Public Health would like to see the noise impact assessment and strategies to alleviate this, as ongoing noise at a significant level can have a detrimental impact on mental health. The high health needs of the Tilbury population could lead to exacerbation to existing conditions such as circulatory disease etc."	Results of the construction and decommissioning noise assessment are presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results and summarised in Section 4. Results of the operational noise assessment are presented in Volume 6, Appendix 11.4: Operation Noise Assessment Methodology and Results and summarised in Section 4. Noise effects from the proposed development on human health are considered in Volume 3, Chapter 13: Human Health.

Date	Consultee and type of response	Points raised	How and where addressed
September 2018	PINS – Scoping Opinion Applicants proposed matters to scope out	"Impacts from operational traffic noise – Paragraph 8.142 of the Scoping Report proposes to scope this matter out of the ES, explaining that 'traffic generation in operation would be negligible'. Paragraph 9.10 of the Scoping Report further explains that the Proposed Development would largely be operated remotely and there would be no permanent staff present on a day-to-day basis. Impacts from operational traffic vibration are not mentioned, but the Inspectorate assumes that the same justification would apply. The Inspectorate considers that significant effects from operational traffic noise and vibration from the Proposed Development alone are unlikely to occur and agrees that this matter can be scoped out of the ES. However, the ES should address cumulative impacts from operational traffic noise from the Proposed Development together with other developments (including Tilbury2, Tilbury Energy centre and the Lower Thames Crossing).	Cumulative effects from operational traffic noise and vibration are assessed in Volume 4, Chapter 24.
		"Quantitative assessment of operational vibration – Paragraph 8.135 of the Scoping Report explains that the main source of operational vibration will be from the gas engines. Due to rapid attenuation of vibration levels and the distances to receptors sensitive to vibration, the Applicant considers significant effects from operational vibration area unlikely to occur. The Scoping Report does not explain whether vibration could occur from operation of other development components, such as the gas pipeline and AGI. Having regard to the characteristics of the Proposed Development and the distance to sensitive receptors, the Inspectorate considers that significant vibration effects from operation of the Proposed Development are not likely to occur. A quantitative assessment of operational vibration is not necessary and can be scoped out of the ES."	Agreed.
September 2018	PINS – Scoping Opinion Other points – 4.8.3	"Sensitive receptors – Paragraphs 8.122-127 of the Scoping Report describes the noise sensitive receptors relative to the main development site only. Specific vibration sensitive receptors have not been identified. The ES should contain a comprehensive list and figure illustrating the locations of receptors sensitive to noise and vibration impacts, relative to the entirety of the Proposed Development including elements beyond the main development site. Residential, recreational and ecological receptors should be selected, including locations on the south side of the River Thames. It should be clear how other aspects (for example, construction traffic routes to the different parts of the application site) relate to the choice of sensitive receptors. The assessment of noise and vibration impacts on sensitive ecological receptors e.g. birds and fish should take into account the seasonality of potentially affected species. Cross reference should be made to the ecological impact assessment in the ES. For the assessment of cumulative impacts, the Applicant should consider the noise and vibration sensitive receptors selected for other developments in the area including Tilbury2, Tilbury Energy Centre and Lower Thames Crossing."	Receptors identified within the noise and vibration chapter are shown on Figure 2.1. Noise predictions have been made at receptors considered to be the most affected by construction, operational or decommissioning noise from Thurrock Flexible Generation Plant. The chosen study areas for the noise assessment are described in Section 2.3. Noise effects on ecologically sensitive receptors from the construction, operation and decommissioning of the proposed development are considered in Volume 3, Chapter 9: Onshore Ecology. Cumulative effects resulting from the construction, operation and decommissioning of Thurrock Flexible Generation Plant and other proposed developments in the surrounding area has been assessed in Volume 4, Chapter 24.

Date	Consultee and type of response	Points raised	How and where addressed
September 2018	PINS – Scoping Opinion Other points – 4.8.4	"Construction Impacts – The Scoping Report explains that impact piling may be required. The ES should detail the modelling undertaken, including the input parameters such as the number, location and size of piles. Any cumulative impacts from piling (e.g. with Tilbury2 and Tilbury Energy Centre) which are likely to result in significant effects should also be assessed. Aside from piling, the ES should identify all sources of noise and vibration which may result from the Proposed Development, including those which cross other developments and those which extend into the marine area. Where uncertainty exists and flexibility is required the assessment should be based on a worst case scenario."	At this stage, details on the method of piling and number of piles required is not known. The assessment of construction noise effects has considered impact piling within Zone A at a location considered representative of the worst case location with regards to effects on nearby NSRs. Due to the distance between the boundary of Zone A and the nearest receptors (>500 m) it is considered that vibration effects from piling in this area would be negligible. As such, vibration effects from piling are not considered further within this chapter. Results of the construction noise assessment and assumed model inputs are presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results and summarised in Section 4. Cumulative noise effects resulting from the construction of Thurrock Flexible Generation Plant and other proposed developments in the surrounding area has been assessed in Section Volume 4, Chapter 24.
September 2018	PINS – Scoping Opinion Other points – 4.8.5	"Construction Impacts – If the option to transport materials/abnormal loads via water is pursued, noise impacts from ships/barges should be assessed where significant effects are likely."	The transport of abnormal indivisible loads via the river has been scoped out of the assessment as it is considered that significant effects are unlikely, as discussed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results. This is due to the low number of deliveries and the high pre-existing river traffic.
September 2018	PINS – Scoping Opinion Other points – 4.8.6	"Construction Impacts – The ES should provide details of the anticipated working hours (including any night time working required) and incorporate this into the noise level predictions and assessment of likely significant effects. This should be consistent with the working hours specified in the dDCO."	Details on the proposed construction methodology, including working hours is presented in Volume 2, Chapter 2: Project Description.
September 2018	PINS – Scoping Opinion Other points – 4.8.7	"Noise level predictions – It should be clear what assumptions have been made to develop and inform noise modelling. This would include the placement of construction activities/plant within the application site; and how the likely noise levels generated by the necessary construction activities/plant have been estimated. If uncertainty exists and flexibility is sought, the noise impact assessment should be undertaken on the basis of a worst case scenario."	The construction noise assessment methodology and results are presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results.
September 2018	PINS – Scoping Opinion Other points – 4.8.8	"Vibration from Heavy Goods Vehicles (HGVs) – Paragraph 8.141 of the Scoping Report explains that impacts from traffic noise arising from construction and decommissioning of the Proposed Development will be assessed. However it is unclear whether the Applicant intends to assess the impact of ground-borne vibration from HGVs during construction and decommissioning. The ES should assess impacts from ground-borne vibration from HGV traffic during construction and decommissioning where significant effects are likely. This should include consideration of cumulative impacts with other developments. Any such assessment should be based on the traffic modelling and likely HGV movements. The vibration sensitive receptors should be identified and shown on a supporting plan within the ES."	It is not anticipated that vibration from construction/decommissioning traffic is likely to result in significant effects at receptors. As such, vibration effects from construction traffic have not been considered further.
September 2018	PINS – Scoping Opinion Other points – 4.8.9	"Assessment method – The ES should fully explain how the predicted noise levels relate to the 'base year' and 'with development' traffic data predictions. Cross reference should be made to the Traffic and Transport aspect chapter where relevant."	The methodology and results of the construction traffic noise assessment is presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results.

Date	Consultee and type of response	Points raised	How and where addressed
September 2018	PINS – Scoping Opinion Other points – 4.8.10	"Significant Observed Adverse Effects Level (SOAEL) and Lowest Observed Adverse Effect Level (LOAEL) – Consistent with the Noise Policy Statement for England, LOAEL and SOAEL should be defined for all of the noise and vibration matters assessed. Mitigation measures should be set out accordingly."	A summary of the guidance on 'adverse effect levels' from the NPSE and NPPG is presented in Table 1.3 for guidance. Reference to the representative 'adverse effect level' is made in the summary of the assessment results in Section 4. Mitigation measures built into the proposed development are summarised in Table 2.11.
September 2018	PINS – Scoping Opinion Other points – 4.8.11	"Noise limits and monitoring – The ES should define noise limit values and explain how they were determined. The ES should explain the need for monitoring of noise to ensure adherence to the specified noise limits and the appropriateness of mitigation. The need for and scope of monitoring during construction, operation and decommissioning of the Proposed Development should be agreed with relevant consultation bodies and presented in the ES, along with an explanation of how it is secured."	Noise limits during the construction phase are determined by BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise. The ES describes the worst case noise levels experienced by the most affected receptors, which are taken to be the action values during the operational further monitoring stage. The results and methodology are described in Volume 6, Appendix 11.4: Operational Noise Assessment Methodology and Results. The need for monitoring of noise is described in Section 4.2.
November 2019	Gravesham Borough Council – Consultation Response	"It may be noted that in the September 2018 Scoping Opinion from PINS Table 1.5 on Construction Impacts it says 'If the option to transport materials/abnormal loads via water is pursued, noise impacts from ships/barges should be assessed where significant effects are likely'. This was scoped out previously as no longer being proposed, but is now logically back in scope. There is no information provided on these potential implications of the new proposed causeway..."	A detailed investigation of the impact of vessels using the causeway has been scoped out of the ES assessment, as discussed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results, and "PINS – Scoping Opinion: Other points – 4.8.5" response above.
November 2019	Gravesham Borough Council – Consultation Response	"It will be necessary to explore the implications from these proposals on Gravesham including the in combination effects. Tilbury 2 is now permitted and under construction, and far more is known about Lower Thames Crossing than when the original consultation was carried out. From these revised proposals and following the list in Part 5 of the Overarching National Policy Statement for Energy (EN-1, July 2011) lists generic impacts that may arise from infrastructure projects. The following would appear to be potentially relevant: … 5.11 Noise and vibration"	An assessment of the cumulative effect of noise and vibration with both Tilbury2 and the Lower Thames Crossing is included in Volume 4, Chapter 24.

2. Assessment approach

2.1 Relevant guidance and standards

2.1.1 The chapter has followed the methodology set out in Volume 2, Chapter 4: Environmental Impact Assessment Methodology. The following standards and guidance documents, specific to the noise and vibration assessment have also been considered:

- BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' – Part 1: Noise;
- BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' – Part 2: Vibration;
- BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'(British Standards Institute, 2019);
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7 'Noise and Vibration' (Highways Agency, 2019);
- Calculation of Road Traffic Noise (Department of Transport, 1998);
- Guidelines for Community Noise (Berglund *et al.*, 1999);
- Night Noise Guidelines for Europe (World Health Organisation (WHO), 2009); and
- International Standard (ISO) 9613-2:1996 'Acoustics: Attenuation of sound during propagation outdoors. Part 2: General method of calculation' (ISO, 1996).

2.1.2 Further information on the above Standards and guidance documents can be found in Volume 6, Appendix 11.5: Standards and Guidance Relevant to Noise and Vibration.

2.2 Baseline studies

2.2.1 This section provides information on the baseline studies undertaken in order to inform the basis of the noise and vibration assessment.

Desktop study

2.2.2 Information on potential sources of noise and vibration within the surrounding area of the proposed development was collected through a detailed desktop review of the data sources summarised within Table 2.1.

Table 2.1: Summary of key desktop study data sources.

Title	Source	Year	Author
OS Open Data Mapping & Terrain	Ordnance Survey	2018	Ordnance Survey
Google Earth Imagery	Google Earth	2018	Google

Site-specific surveys

2.2.3 In order to inform the noise assessment, and supplement the desktop study, the site-specific surveys listed in Table 2.2 were undertaken in February 2018 to establish baseline sound levels in the vicinity of the proposed development. Survey locations and results are summarised in Section 3.

2.2.4 Details of the survey scope and methodology were discussed and agreed with Thurrock Council prior to deployment of the monitoring equipment. The scope, methodology, results of the survey, and figures showing surveys locations are set out in Volume 6, Appendix 11.1: Baseline Sound Monitoring Report.

Table 2.2: Summary of site-specific surveys undertaken.

Title	Extent of survey	Overview of survey	Survey provider	Year	Reference to further information
Thurrock Flexible Generation Plant baseline sound surveys	Representative locations for the nearest noise sensitive receptors to the proposed development.	Unattended surveys at five locations, with additional attended measurements undertaken at a further two locations, using a sound level meter. Measurements were undertaken between Thursday 1 February to and Wednesday 21 February 2018.	RPS	2018	Volume 6, Appendix 11.1: Baseline Sound Monitoring Report

2.3 Study area

2.3.1 There is no national government guidance or legislation on the extent of the study area to adopt for the assessment of noise effects from power generation infrastructure or the construction or operation of industrial facilities on NSRs. The study areas in this chapter have therefore been chosen on the basis of guidance contained within Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7: Noise and Vibration (Highways Agency *et al.,* 2019), professional judgment of the distances over which significant noise effects may occur and consideration of the likely magnitude and duration of impact and the sensitivity of receptors.

2.3.2 During the construction and decommissioning phases, the study area for noise impacts considers NSRs within 500 m of the boundary of zones within which construction or decommissioning activity will occur. As the majority of such activity will be concentrated within Zone A, an increased study area of 1 km from the boundary has been adopted for construction/decommissioning noise effects from within this zone. Locations of potentially sensitive receptors within this study area have been determined from Ordnance Survey data and the results of a desk based baseline assessment. The sensitivity of all NSRs within the chosen study area have been determined and predictions made at the most affected receptors. No NSRs have been identified within the study areas for construction/decommissioning noise with high sensitivity in accordance with Table 2.7[1].

2.3.3 During the operational phase, the study area for noise impacts considers NSRs within 1 km of the main development site boundary. Locations of potentially sensitive receptors within this study area have been determined from Ordnance Survey data and the results of a desk based baseline assessment. The sensitivity of all NSRs within the chosen study area have been determined and predictions made at the most affected receptors. One NSR has been identified within the study area for operational noise with high sensitivity in accordance with Table 2.7: St James' Church, located approximately 850 m from the main operational site boundary.

2.3.4 It is not considered that vibration effects during the operational phase will be discernible beyond the boundary of the proposed development. Given that levels of vibration attenuate very rapidly through the ground within a few metres and the approximate distance to the nearest receptor is >500 m from the main site boundary, it is considered that the operation of plant items will not cause significant adverse effect at any receptor.

2.3.5 During the construction phase of the proposed development, it is not considered that any significant vibration generating plant is likely to be used outside of Zone A. Percussive piling techniques may be utilised within Zone A, however, due to the distance between the boundary of Zone A and the nearest receptors (>500 m), it is not considered that this will give rise to significant adverse effect at any receptor.

2.3.6 HGV movements during the construction phase have the potential to cause vibration at receptors located adjacent to access routes; however, it is considered that any effect would be negligible. Based on previous RPS measurements undertaken at dwellings located 5 m from the edge of a carriageway during an HGV pass-by, measured levels of vibration were below the level which might be just perceptible in residential environments, as given in BS 5228:2009+A1:2014 – Part 2: Vibration. While levels of vibration are dependent on local ground conditions, it is considered that vibration from HGVs associated with the proposed development will not give rise to a significant adverse effect at any receptor.

2.3.7 Based on the above, it is considered appropriate to scope vibration effects out of further assessment. As such, study areas for vibration have not been assigned.

2.3.8 Noise sensitive ecological receptors have been identified within Volume 3, Chapter 9: Onshore Ecology.

2.3.9 The locations of NSRs identified in the construction and operational assessments are shown in Figure 2.1.

[1] St James' Church has previously been identified as a high sensitivity receptor, however it has since been identified as a converted residential property. It is considered that the amenity and tranquillity of the graveyard, which is still accessible by appointment, is covered by the WHO Guidelines for Community Noise (World Health Organisation, 1999) criterion for the onset of annoyance during the daytime in external amenity areas.

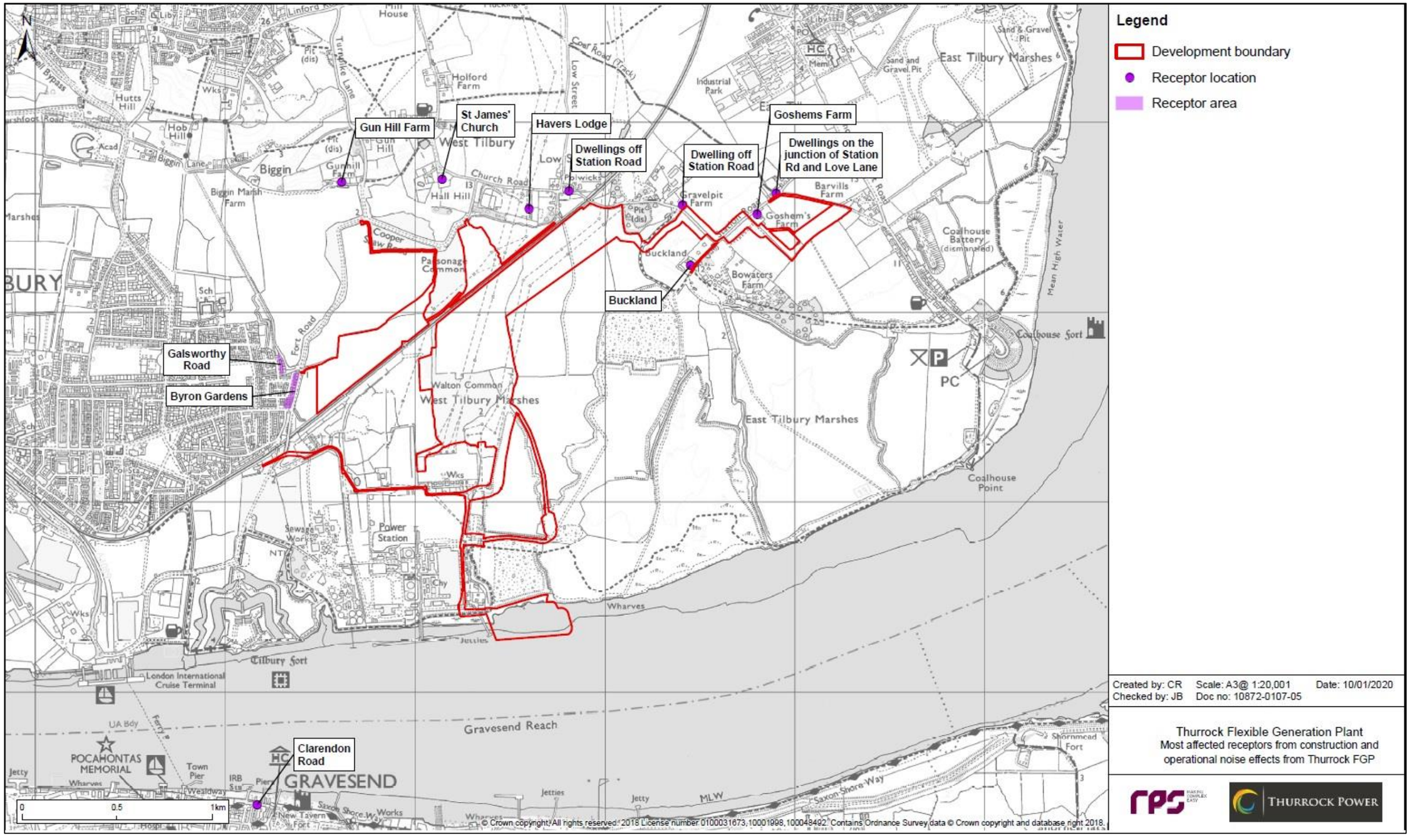

Figure 2.1: Most-affected receptors from construction and operational noise effects from Thurrock Flexible Generation Plant.

2.4 Uncertainties and data limitations

Baseline sound survey data

2.4.1 Ambient and background sound levels are subject to seasonal variations due to a number of factors (e.g. wind and rain); the metrics derived from the noise monitoring, however, reduce the effects of seasonal variation. Baseline sound monitoring was undertaken in February 2018. As detailed in Section 3, a 'representative' background L_{A90} sound level has been adopted, which is considered to be representative of the background sound level during calm weather conditions (e.g. with little or no wind or precipitation) when background sound levels are likely to be lower. No significant seasonal variation in noise attenuation occurs.

2.4.2 Uncertainty due to instrumentation has been significantly reduced with the introduction of more modern instrumentation and is reduced further by undertaking field calibration checks on sound level meters before and after each measurement period and ensuring that all instrumentation is within accepted laboratory calibration intervals.

Construction methodology

2.4.2.1 Details of the indicative construction activities and phasing programme are provided in Volume 2, Chapter 2: Project Description. While the specific number and type of plant and working methods cannot be specified at this stage, assumptions have been made based on professional judgement and experience with similar sites. The assessment has been based on typical construction activities for this type of infrastructure, using sound source terms from BS 5228-1:2009+A1:2014 and professional judgement. This is a standard approach and is considered to be an acceptable and robust method. Details on the assumed plant items are provided in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results.

Operational sound source data

2.4.3 A quantitative assessment has been undertaken based on source levels provided by the plant manufacturer and measurement data on similar types of equipment. Assumptions have been made based on the maximum design envelope parameters as detailed in Table 2.9.

Prediction methods and assessment

2.4.4 There are uncertainties in any prediction methodology. International Organisation for Standardization 9613 (ISO 9613) Part 2 (ISO, 1996) provides a method for predicting acoustic propagation outdoors. The method is applicable in practice to a great variety of sound sources and environments. It is applicable (directly or indirectly) to most situations including industrial sound sources, construction activities and many other ground-based sound sources. The estimated accuracy for values of the average downwind sound pressure level (LAT (DW)) is stated as +/-3 dB for a mean source/receptor height of up to five metres and source/propagation separation distance of up to 1 km. For a mean source height between 5 and 30 m, the estimated accuracy is given as +/-1 dB for a source/propagation separation distance of 0 to 100 m and +/-3 dB for a source/propagation separation distance of >100 m. This is a standard approach and is considered to be an acceptable prediction methodology.

2.4.5 With regard to subjective response, the noise standards adopted for the assessment will have been based upon the subjective response of the majority of the population or will be based upon the most likely response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective response which will vary dependent upon a wide range of factors.

2.5 Impact assessment criteria

2.5.1 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors. The terms used to define magnitude and sensitivity are based on those used in the DMRB methodology, which is described in further detail in Volume 2, Chapter 4: Environmental Impact Assessment Methodology.

Magnitude

2.5.2 This section describes how the magnitude of impacts relating to noise and vibration have been identified for the construction, operational and maintenance, and decommissioning phases. The noise and vibration threshold criteria identified within this section have been used to inform the impact assessment criteria in Section 4 of this chapter.

Construction noise

2.5.3 The magnitude of construction noise impacts has been determined in accordance with Annex E of BS 5228-1:2009+A1:2014. The criteria for assessing noise impact from construction works have been based on Example Method 2 contained within Annex E.3.3 of BS 5228-1:2009+A1:2014; this indicates that:

"Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect."

2.5.4 Table 2.3 summarises the criteria that have been used for the assessment of construction noise impacts for residential dwellings and other NSRs of medium sensitivity, based on the guidance in BS 5228-1:2009+A1:2014. Determination of impact also includes consideration of duration, absolute noise levels and management of the noise sources, all of which make up the context. Professional judgement has been used when adopting the criteria in Table 2.3 for the assessment of high sensitivity receptors.

Table 2.3: Adopted thresholds for evaluation of magnitude of construction noise at residential building façades.

Assessment category and threshold value period (L_{Aeq})	Threshold Value*					
	No change	*Negligible*	*Minor*	*Median line for receptors of medium sensitivity*	*Moderate*	*Major*
Night-time (23:00 to 07:00 hours)	>10 dB below baseline ambient noise level	<40 dB Or ≤ baseline ambient noise level	>40 dB - <45 dB Or <5 dB above baseline ambient noise level		≥45 dB - <55 dB	≥55 dB
Evenings (19:00 to 23:00 hours weekdays). Weekends (13:00 to 23:00 hours Saturdays and 07:00 to 23:00 hours Sundays)	>10 dB below baseline ambient noise level	<50 dB Or ≤ baseline ambient noise level	>50 dB - <55 dB Or <5 dB above baseline ambient noise level		≥55 dB - <65 dB	≥65 dB
Daytime (07:00 to 19:00 hours) weekdays. Saturdays (07:00 to 13:00 hours)	>10 dB below baseline ambient noise level	<60 dB Or ≤ baseline ambient noise level	>60 dB- <65 dB Or <5 dB above baseline ambient noise level		≥65 dB - <75 dB	≥75 dB
*Subject to duration and where ambient noise levels are low						

2.5.5 The calculation method of BS 5228-1:2009+A1:2014 takes account of the duration of an activity per hour, the 'on-time'; and the attenuation of sound due to distance, ground attenuation and barrier effects. The assessment is based on reasonably expected construction phases as summarised in Volume 2, Chapter 2: Project Description, as well as plant items and on-times based on the information provided within BS 5228-1:2009+A1:2014. The average percentage on-time comes from estimates of the time that the plant will be operating at full power.

2.5.6 Where predicted construction noise levels are below ambient noise level or are 5 dB below the lower cut-off values for the relevant time period, or of short duration (<1 month), there is considered to be 'no change' or a negligible magnitude of impact.

2.5.7 For works of significant duration (>1 month) where predicted noise levels are up to 5 dB above ambient or are less than the lower cut-off values, this is considered to result in a minor magnitude of impact depending on the context and duration of the works. Where predicted noise levels are equal to the lower cut-off values or exceed them by up to 10 dB, this is considered to be a moderate magnitude of impact depending on the context and duration of the works. Predicted noise levels greater than 10 dB above the lower cut-off values are considered to result in a major magnitude of impact depending on the context and duration of the works.

Construction traffic

2.5.8 The noise changes identified in Table 2.4 have been used in the assessment of noise impacts associated with construction traffic on the local road network and from temporary diversion routes resulting from construction of the Thurrock Flexible Generation Plant. These are based on the guidance in DMRB, Volume 11, Section 3, Part 7 'Noise and Vibration' for the classification of magnitude of noise impacts in the short term. These DMRB criteria best reflect the temporary nature of the construction impacts; and allow for a robust, worst case assessment of response to construction traffic noise.

Table 2.4: Criteria for magnitude of noise impacts from construction traffic noise.

Noise change, dB $L_{A10,18hr}$	Magnitude of impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

Operational noise

2.5.9 The magnitude of impact of the noise effects associated with the operation of the proposed development has been determined based upon the general methodology contained within BS 4141:2014+A1:2019. Following guidance contained within the Standard, the thresholds in Table 2.5 have been used to provide an initial evaluation of the magnitude of impact (Stage 1). From there, an additional step has been included to consider the context of the sound, as required by BS 4142, giving a final magnitude of impact (Stage 2).

2.5.10 The magnitude of impacts on the receptors has been defined in Table 2.5, taking into account both the absolute ambient noise level and the change in ambient noise. The rationale for this is based on the assumption that a given change in noise level would have a greater impact if the end absolute noise level exceeds the criteria in World Health Organisation Guidance and BS 8233 for annoyance or sleep disturbance (Stage 2). Thus, if the end noise level is less than the absolute noise level criteria for onset of sleep disturbance and the change in noise will not be noticeable (i.e. less than 3 dBA change) then it seems logical that the impact of the development would be negligible. Likewise, it is unlikely that even a large change in ambient noise would result in a severe impact unless the criteria for sleep disturbance or annoyance were also exceeded.

Table 2.5: Initial evaluation of operational noise magnitude of impact.

STAGE 1		STAGE 2	
Difference between rating level and background noise level	**BS 4142 semantic description**	**Operational Ambient Sound Level (Baseline Ambient plus Specific Level)**	**Magnitude of impact**
>10 dB	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.	Daytime/evening >=55 dB L_{Aeq} Night-time >=42 dB L_{Aeq}	Major
		Daytime/evening <55 dB L_{Aeq} Night-time <42 dB L_{Aeq}	Moderate
+5 to +10 dB	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.	Daytime/evening >=55 dB L_{Aeq} Night-time >=42 dB L_{Aeq}	Moderate
		Daytime/evening <55 dB L_{Aeq} Night-time <42 dB L_{Aeq}	Minor
0 to +5 dB	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Daytime/evening >=55 dB L_{Aeq} Night-time >=42 dB L_{Aeq}	Minor
		Daytime/evening <55 dB L_{Aeq} Night-time <42 dB L_{Aeq}	Negligible
≥-5 to 0 dB	-	Daytime/evening >=55 dB L_{Aeq} Night-time >=42 dB L_{Aeq}	Negligible
		Daytime/evening <55 dB L_{Aeq} Night-time <42 dB L_{Aeq}	No change

STAGE 1		STAGE 2	
Difference between rating level and background noise level	**BS 4142 semantic description**	**Operational Ambient Sound Level (Baseline Ambient plus Specific Level)**	**Magnitude of impact**
<-5 dB	-	Daytime/evening >=55 dB L_{Aeq} Night-time >=42 dB L_{Aeq}	No change
		Daytime/evening <55 dB L_{Aeq} Night-time <42 dB L_{Aeq}	No change

2.5.11 Following on from the magnitudes derived from Table 2.5 of the noise impact from the proposed development at the nearest NSRs, further consideration has been given to the context of the sound, including discussions of the outcomes described within the NPPG, as summarised in Table 1.3.

2.5.12 The assessment of impact has considered the context of the sound source, including:

- the Wold Health Organisation guideline levels;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

2.5.13 These considerations comprise the context of any potential impact identified and will inform the overall outcome of further assessment.

2.5.14 The operational noise magnitude of impact criteria presented in Table 2.5 are derived from BS 4142:2014+A1:2019 and, as such, are representative of noise impacts on residential premises. A non-residential, higher sensitivity receptor, St James' Church, has been identified within the operational noise study area. It is considered appropriate to use the criteria within Table 2.5 in conjunction with consideration of the specific requirements of this receptor in order to determine the magnitude of impact at this receptor.

Terms of magnitude used in this chapter

2.5.15 The criteria for defining magnitude in this chapter are outlined in Table 2.6. The magnitude of the impact is defined through consideration of the spatial extent, duration, frequency and reversibility of that impact. The descriptions in Table 2.6 inform professional judgement to pull together the disparate magnitudes of impact for construction, vibration and operation into a single magnitude of impact table.

2.5.16 There is no nationally adopted guidance to relate the numerical relative impact magnitude of noise from construction or industrial sites to the impact magnitude scale described above. There is evidence (Fritschi *et al.,* 2011) that human response in terms of annoyance and sleep disturbance to noise from transportation sources is not linearly related to noise dose. Notwithstanding this, the noise assessment has adopted 5 dB steps in noise level to correspond to the divisions of the semantic scale based upon the following comment in Guidelines for Community Noise (WHO):

"The concept of an environmental noise impact analysis is central to the philosophy of managing environmental noise. Such an analysis should be required before implementing any project that would significantly increase the level of environmental noise in a community (typically, greater than a 5 dB increase)".

2.5.17 Based on professional judgement, it is considered that, for the construction phase, operational phase and decommissioning phase, short-term is defined as less than one month, medium term is defined as one month to two years and long term is defined as greater than two years. It is understood that each construction phase of the proposed development will have duration of approximately 18 months.

Table 2.6: Criteria for magnitude of impact.

Magnitude of impact	Definition used in this chapter
Major	An impact where a limit or standard may be exceeded by a significant margin.
Moderate	An impact around the accepted limits and standards. Moderate impacts may cover a broad range, although the emphasis is on demonstrating that the effect has been reduced to a level that is as low as reasonably practical, such effects should be recognised and addressed in consultation with particular stakeholders. Between the LOAEL and SOAEL
Minor	An impact considered sufficiently small (with or without mitigation) to be well within accepted standards. No action is required if it can be controlled by adopting normal good working practices. Below the LOAEL
Negligible	An impact that is found not to be significant in the context of the stakeholder/regulator objectives or legislative requirements. Below the LOAEL

Magnitude of impact	Definition used in this chapter
No change	No discernible impact. Below the NOEL.

Sensitivity

2.5.18 There is no nationally adopted guidance on how the sensitivities of NSRs should be determined. Therefore, for this chapter, the sensitivity of classes of receptor is defined through consideration of the vulnerability, recoverability and value/importance of that receptor class. The criteria for defining sensitivity in this chapter are outlined in Table 2.7.

Table 2.7: Criteria for receptor sensitivity.

Sensitivity	Typical NSRs identified
Very High	Subject to particular circumstances (none identified)
High	Schools, churches and concert halls etc. (none identified)
Medium	Residential properties, hotels, hospitals, nursing homes and care homes and sites of historic or cultural importance.
Low	Area used primarily for leisure activities, including Public Rights of Way (PRoW), sports facilities, offices and retail businesses.
Negligible	All other areas such as those used primarily for industrial or agricultural purposes.

Significance

2.5.19 The significance of the effect with regards to noise is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 2.8. Where a range of significance of effect levels is presented in Table 2.8, the final assessment for each effect is based upon expert judgement.

2.5.20 As a guiding principle, the significance of effect has been ranked against the outcomes, as defined within the NPSE and PPGN, and summarised in Table 1.3. A significance of no change is considered to be below the NOEL. A significance of negligible or minor is considered to be below the LOAEL. A significance of moderate is considered to be between the LOAEL and SOAEL. A significance of major or substantial is considered to be above the SOAEL.

2.5.21 For the purpose of this assessment, any effects with a significance level of minor or less are considered to be **not significant** in EIA terms. Effects with a significance level of moderate are not automatically considered to be significant. Further consideration of the assessment outcome is given where a moderate effect is predicted before a determination of whether an effect is **significant/not significant** in EIA terms is made. Effects with a significance level of major are considered to be **significant** in EIA terms.

Table 2.8: Matrix used for the assessment of the significance of an effect.

		Magnitude of impact				
		No change	***Negligible***	***Minor***	***Moderate***	***Major***
Sensitivity of receptor	***Negligible***	No change	Negligible	Negligible or minor	Negligible or minor	Minor
	Low	No change	Negligible or minor	Negligible or minor	Minor	Minor or moderate
	Medium	No change	Negligible or minor	Minor	Moderate	Moderate or major
	High	No change	Minor	Minor or moderate	Moderate or major	Major or substantial
	Very high	No change	Minor	Moderate or major	Major or substantial	Substantial

2.6 Maximum design envelope parameters for assessment

2.6.1 The maximum design envelope parameters identified in Table 2.9 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These parameters have been identified based on the overview description of the development provided in Volume 2, Chapter 2: Project Description, including all potential development options where these are under consideration by the applicant. The NSRs included within the assessment have been identified from OS mapping and are listed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results, and Appendix 11.4: Operational Noise Assessment Methodology and Results.

2.6.2 Effects of greater adverse significance are not predicted to arise should any other development scenario within the project design envelope be taken forward in the final design scheme.

2.6.3 The results of the noise and vibration assessment have been used to inform the design layout and mitigation strategy of the proposed development.

2.7 Impacts scoped out of the assessment

2.7.1 The impacts listed in Table 2.10 have been scoped out of the assessment for noise and vibration as agreed through the EIA scoping process detailed in Volume 2, Chapter 5: Scoping and Consultation.

Table 2.9: Maximum design envelope parameters assessed.

Potential impact	Maximum design scenario	Justification
Construction		
Construction noise impacts to noise sensitive receptors	Impact or driven piling is required for main development site	Impact piling is typically among the most significant construction noise sources
	Normal construction working hours Mon to Fri 0800 to 1800, Sat 0800 to 1300, no Sunday, bank holiday or night working Non-noisy activities (e.g. fit-out within buildings) may be undertaken outside those hours Up to 10 days' 24-hour construction working per phase (three phases) for continuous activity (e.g. concrete pour)	The applicant's proposed construction working hours
	Construction programme: up to six years with 18 month phases	The maximum duration of noise from construction works
	Maximum construction traffic on public highway links (see Volume 3, Chapter 10: Traffic and Transport)	Greatest potential for impact on residential and ecology receptors close to public roads
	Horizontal Directional Drilling (HDD) used for ditch, hedge, road and service crossings by gas pipe	Drilling machinery in HDD compounds may have greater or longer-duration noise impacts than excavation of trenches
	Construction compounds located within close proximity to residences on the boundary of Zone C	Maximum potential construction noise impact for sensitive receptors
	Gas pipe route and above-ground installation for connection to NTS constructed adjacent to residences or allotments in Zones C and D	Maximum potential construction noise impact for sensitive receptors
	160 on-site HGV movements per day during the peak construction periods	Maximum HGV movements during the peak construction period
Operation and maintenance		
Operational noise impacts to noise sensitive receptors	Flexible generation plant operational during day, evening and night	Maximum potential short-term (daily) noise impact
	Flexible generation plant maximum 4,000 operating hours per annum	Maximum potential long-term (annual) noise impact
	Gas engines, batteries and substations located within Zone A, shown in Figure 2.2	The applicant's proposed development design
	Reasonable minimum attenuation of gas engines' noise by building or enclosure fabric	Assumed the minimum level of required mitigation
	Maximum gas engine stack height 40 m	Maximum propagation of stack exhaust noise
	Air cooling for gas engines using heat exchangers with fans	Maximum propagation of cooling fan noise
	Gas engine model MAN 18.4 MW is representative of maximum noise generation	Maximum potential noise source for gas engines; other manufacturers or models would not exceed this level
	Site comprises 33x gas engines (MAN 18.4 MW) and 52x battery containers with associated plant	Assumed operational plant requirements

Potential impact	Maximum design scenario	Justification
Decommissioning		
Operational equipment noise impacts to noise sensitive receptors	Ongoing operation of all or part of flexible generation plant after 35 years	Greatest ongoing, long-term impacts
Deconstruction noise impacts to noise sensitive receptors	Decommissioning and deconstruction of development with similar timescale, plant and working methods as construction	Greatest short-term impact of deconstruction

Figure 2.2: Assumed operational plant site layout.

Table 2.10: Impacts scoped out of the assessment.

Potential impact	Justification
Construction	
Vibration associated with construction of all elements of the proposed development	With the exception of percussive piling, should this be required, it is not expected that significant vibration-generation plant will be used during the construction of the proposed development. Crossings of water courses and hedgerow for the gas pipeline will be undertaken by horizontal directional drilling (HDD) and as such, construction vibration during these activities would be unlikely to be significant beyond the immediate site. While percussive piling techniques may be used on the main site (Zone A), it is considered that due to the large distance between the site boundary and the nearest vibration sensitive receptors (>500 m), significant impacts from vibration are unlikely to occur at these receptors.
Vibration from HGV movements on public highways and access routes	It is considered that vibration effects from construction traffic associated with the proposed development is unlikely to result in a significant impact at receptors located adjacent to construction haul roads and access routes.
Transport of abnormal indivisible loads by barge	The low numbers of movements (on the order of one movement per three days) is not expected to result in a significant impact above the current level of river traffic.
Operation and maintenance	
Operational vibration	Operational vibration from the proposed development will be controlled at source and is unlikely to be perceptible beyond the immediate structure of the building.
Vehicle movement associated with the operation and maintenance of the energy generation infrastructure	It is predicted that as a result of the operation of the proposed development, vehicle movements on the local highway network will not significantly increase, (see Volume 3, Chapter 10: Traffic and Transport). As such, it is considered that vehicle movements associated with the operational phase of the development will generate a negligible increase in road traffic noise levels.
Maintenance associated with the operation of the proposed development	Routine maintenance is unlikely to generate any significant noise or vibration.
Decommissioning	
Vibration associated with decommissioning activities	Decommissioning activities are likely to be similar to those employed during the construction phase. Should decommissioning activities such as concrete break-out occur, it is likely this will be confined to the main site. Due to the distance between the main site and the nearest receptors (>500 m) it is considered that vibration effects would not be perceptible at nearby receptors.

2.8 Measures adopted as part of Thurrock Flexible Generation Plant

2.8.1 A number of measures have been incorporated into the Thurrock Flexible Generation Plant assessment to reduce the potential for impacts on noise and vibration. Example measures that may be employed to reduce noise are listed in Table 2.11. The selection of the final measures will be confirmed during the detailed design phase and will be consistent with Best Available Techniques (BAT) which will be controlled via the Environmental Permit.

Table 2.11: Designed-in measures.

Measures adopted as part of Thurrock Flexible Generation Plant	Justification
Construction Phase	
Best Practicable Means (BPM), for example the use of quieter alternative methods, plant and/or equipment, where reasonably practicable; the use of site hoardings, enclosures, acoustic barriers, portable screens and/or screening nosier items of plant, where reasonably practicable; and maintaining and operating all vehicles, plant and equipment in an appropriate manner, to ensure that extraneous sound from mechanical vibration, creaking and squeaking is kept to a minimum.	To minimise noise and vibration, where reasonably practicable.
Where required, construction noise management measures for specific construction activities will be agreed with Thurrock Council prior to the start of construction and added to the final CoCP to be approved under requirements or sought through s61 Control of Pollution Act prior consents as appropriate.	To ensure compliance with local authority requirements.
Normal construction working hours will be Monday to Friday 08:00-18:00 and Saturday 08:00-13:00 unless otherwise agreed with the relevant planning authority. No Sunday, bank holiday or night working is proposed except where certain activities cannot be interrupted and require 24-hour working.	To minimise noise and vibration impact during quieter periods.
Operational Phase	
Noise measures will be incorporated into the detailed design of the Thurrock Flexible Generation Plant, typical examples of which would include: • Enclosures surrounding the gas engines; • High specification exhaust silencers will be fitted to each of the gas engine exhausts; • Acoustic lagging around all external exhaust ductwork (up to the silencers); • Enhanced air inlet/outlet silencers (including weatherproof louvres) fitted to the air inlet/outlets on the building facades; and • Low noise air conditioning (AC) units for battery enclosures.	To minimise operational noise as far as reasonably practicable

3. Baseline environment

3.1 Current baseline

Measured baseline sound levels

3.1.1 The baseline survey locations and measured baseline data are presented in Volume 6, Appendix 11.1: Baseline Sound Monitoring Report. A summary of the adopted sound levels for the day, evening and night-time periods at each survey location are presented in Table 3.1.

Table 3.1: Adopted measured baseline sound levels.

Survey Location	Adopted Representative Baseline Sound Level, dB(A)					
	Day *07:00 – 19:00*		*Evening* *19:00 – 23:00*		*Night* *23:00 – 07:00*	
	L_{Aeq*}	L_{A90**}	L_{Aeq*}	L_{A90**}	L_{Aeq*}	L_{A90**}
LT1 – Byron Gardens	61	40	55	36	49	35
LT2 – Buckland	48	38	42	34	39	32
LT3 – Walnut Tree Farm	57	42	49	36	45	33
LT4 – St James Church	48	39	44	33	41	34
ST5 – Tilbury Fort	52	50	65	30	-	-
ST6 – Sandhurst Road	52	45	50	43	53	40
LT7 – Goshem's Farm	50	38	44	35	39	32

*The residual levels have been derived from the average of the $L_{Aeq,15m}$ ambient sound levels.

**For long term measurements, the L_{A90} is derived from the lower 25th percentile value from the relevant period. For short term measurements, the L_{A90} is derived from the average of the $L_{A90,15m}$ sound levels for the relevant period.

3.1.2 Construction activity associated with the proposed development is not anticipated to occur outside of daytime working hours. With the exception of survey location LT1, residual sound levels are below 60 dB L_{Aeq} during the day and are therefore subject to the criteria set within the lower cut-off values for the assessment of construction noise impacts (i.e. the most stringent limits). Despite a residual sound level of 61 dB L_{Aeq} at LT1, it is considered appropriate to use the lower cut-off values throughout the construction assessment. This follows a precautionary approach.

3.1.3 With regards to the assessment of operational noise impacts, BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative of the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15 minute intervals, which can be contiguous or disaggregated. However, the Standard also states that there is no 'single' background sound level that can be derived from such measurements.

3.1.4 The 25th percentile value (lower quartile) from the unattended monitoring has been used as a starting point in order to characterise the baseline sound environment. This value is not the lowest sound level encountered but is usually lower than that obtained using the average. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered and thus represents a precautionary assessment. Use of the 25th percentile also ensures that any periods during which higher wind speeds could have affected the measured baseline noise levels do not unduly affect the analysis.

3.1.5 The adopted representative survey locations for the nearest affected receptors during the operational phase of the proposed development are presented in Table 3.2. These receptors have been identified as the likely most affected receptors during the operational phase of the proposed development. All receptors are considered to be of medium sensitivity, including St James' Church which is a residential address.

Table 3.2: Adopted representative survey locations for NSRs – operational noise.

Noise sensitive receptor	Representative survey location
Byron Gardens	LT1
Gun Hill Farm	LT4
Galsworthy Road	LT1
Havers Lodge	LT3
Buckland	LT2
St James' Church	LT4
Clarendon Road	LT3

3.1.6 The receptors identified in Table 3.2 represent the wider body of receptors within the chosen study area for operational noise. It is considered that effects of greater significance than those predicted at the identified receptors will not occur at any other receptor within the study area.

3.1.7 The Clarendon Road receptor is selected to be representative of residential receptors south of the river Thames, including any proposed waterfront developments.

3.1.8 For the construction assessment, receptors for which the highest noise levels are predicted during each construction activity are presented. Receptors of high sensitivity are considered separately to determine whether a greater significance of effect would occur at these receptors. In order to present a robust assessment, the lower cut-off values as given in BS 5229:2009+A1:2014 have been taken as thresholds for the assessment of construction noise.

3.2 Future baseline

3.2.1 No significant change to the future baseline scenario, in the absence of Thurrock Flexible Generation Plant, is anticipated other than that which may be caused by cumulative developments. Effects of cumulative developments have been assessed in Volume 4, Chapter 24.

3.2.2 There is no evidence to suggest receptors would be introduced which would be closer than those which have been assessed; therefore, the adopted baseline assumptions are considered representative of the future baseline conditions over the operational life of the proposed development.

3.2.3 The future baseline traffic data indicate that there would be a minor increase in baseline noise levels from road traffic due to natural growth. However, the increases are very low and are unlikely to have an influence on the assessment.

Climate change

3.2.4 The Met Office Hadley Centre (MOHC) UK Carbon Projections ('UKCP18') dataset (MOHC, 2018) provides probabilistic projections of change in climatic parameters over time for 25 km grid squares across the UK. Projected changes for a RCP8.5[2] future global greenhouse gas emissions scenario have been reviewed for the 2050–2069 and 2080–2099 periods, representing changes towards the end of the proposed development's initial 35-year operating lifetime and changes for the period beyond that should operation continue.

3.2.5 The likely ranges of change in climatic parameters including precipitation, temperature, wind speed, humidity and frequency of extreme weather are not considered to materially affect the future baseline described above for noise and vibration or increase the sensitivity of receptors to impacts beyond that described in Section 4.

[2] RCP8.5 refers to a high-emissions scenario assuming 'business as usual' growth globally with little additional mitigation. This is a conservative (worst-case) approach for the assessment

4. Assessment of effects

4.1 Construction phase

4.1.1 The impacts of the construction phase of Thurrock Flexible Generation Plant have been assessed with regards to noise in accordance with the maximum design envelope parameters as described in Table 2.9.

Construction noise

Magnitude of impact

4.1.2 This section contains details on the magnitude of the impact of construction activity associated with the proposed development.

4.1.3 The noise modelling assumptions, predictions and results of the assessment are presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results. A summary of the outcome is provided below. Construction noise contours for each activity are presented in Figure 4.1 to Figure 4.14.

4.1.4 Predictions have shown that predicted noise levels from the construction activity associated with the proposed development will be below the lower cut-off value during the day of 65 dB L_{Aeq}, as given in Method 2 within Annex E of BS 5228-1:2009+A1:2014.

4.1.5 The highest predicted noise levels are predicted at the façade of Walnut Tree Farm from the general activities and HDD drilling within Zone C with levels of 55 dB $L_{Aeq,T}$. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible magnitude of impact at these receptors. Predictions are based on construction activity occurring in the worst case positions within the zones and, as such, consideration must be given for activity moving across the construction area as work progresses (see paragraph 4.1.9).

4.1.6 The highest predicted noise level at the closest residential receptor on the southern bank of the River Thames, Clarendon Road, is 31 dB L_{Aeq} during the construction of the causeway within Zone G. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible magnitude of impact at this receptor.

4.1.7 The highest predicted noise level at St James' Church is 44 dB L_{Aeq}, during HDD drilling within Zone C. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible magnitude of impact at this receptor.

4.1.8 The highest noise level due to piling activities within Zone A is predicted at Havers Lodge, with levels of 46 dB $L_{Aeq,T}$. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible magnitude of impact at this most affected receptor.

4.1.9 Certain construction activities have the potential to overlap, resulting in a cumulative noise impact upon receptors. At this stage of the proposed development, a detailed schedule of construction activities is not realistically available. Predicted noise levels, as given in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results, are based on the worst case position of construction plant, adjacent to receptors on the boundary of the associated zone. In practice, noise levels from construction will likely vary as construction progresses and plant items move across the site. Therefore, based on the above, while combined effects from different construction activities may result in an increase in noise levels, it is not considered that this will result in an exceedance of the daytime cut-off value for a period greater than one month.

4.1.10 Based on the above, it is considered that noise from construction activity associated with the proposed development will result in a **negligible** magnitude of impact at the most affected NSRs.

4.1.11 It is considered that noise impacts from construction activity associated with the proposed development on users of PRoWs would be negligible. While users of these PRoWs might experience elevated noise levels for short periods when walking within these areas, this is not considered a mechanism for significant effect. Users of the PRoWs would only experience transitory exposure to elevated noise levels from construction activity associated with Thurrock Flexible Generation Plant.

4.1.12 Noise impacts from construction activity on sensitive ecological receptors are considered in Volume 3, Chapter 9: Onshore Ecology.

Sensitivity of the receptor

4.1.13 The noise sensitive receptors identified within the construction assessment have a sensitivity considered to be **medium**. As discussed in 2.3.2, the nearest NSRs identified for the assessment of construction noise impacts are considered representative of the most affected receptors likely to be affected by the construction of the proposed development.

Significance of effect

4.1.14 Overall, it is predicted that a **negligible** impact on the **medium** sensitivity receptors would result in a **negligible** or **minor adverse** effect. This is equivalent to noise levels below the LOAEL.

4.1.15 Based on the above, it is considered that the negligible to minor adverse effect is not significant in EIA terms.

Further mitigation or enhancement

4.1.16 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Construction traffic

Magnitude of impact

4.1.17 This section contains details on the magnitude of the impact of construction traffic associated with the proposed development.

4.1.18 The potential noise change on the surrounding highway network, occurring as a result of increased traffic flow during the peak construction period of the proposed development, has been predicted and assessed against the noise change criteria as given in Table 2.4.

4.1.19 The assessment methodology and results are presented in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results. A summary of the results is provided below.

4.1.20 During the peak construction period, a noise change is predicted on road links 11 (Cooper Shaw Road / Church Road / Station Road, between Gun Hill Road and EMR East Tilbury junction), 20 (Consented Tilbury 2 Road, between A1089 St Andrews Road and Fort Road) and 21 (Fort Road between Brennan Road and Cooper Shaw Road) during the daytime period of up to 1.6 dB. A noise change of up to 2 dB is predicted on the same links during the night-time period. In accordance with the magnitude of impact criteria in Table 2.4, this is representative of a **minor** impact. All other impacts associated with construction traffic are of negligible magnitude or below during all time periods.

Sensitivity of the receptor

4.1.21 There are a number of NSRs located along Fort Road, Turnpike Lane, Gun Hill Road, Cooper Shaw Road, Church Road and Station Road, the majority of which are **medium** sensitivity residential receptors. There are no high sensitivity receptors identified adjacent to these access routes.

Significance of effect

4.1.22 Overall, it is predicted that a **minor** impact on the most affected **medium** sensitivity receptors would result in a **minor adverse** effect. Minor or negligible adverse effects are considered not significant in EIA terms.

Further mitigation or enhancement

4.1.23 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Future monitoring

4.1.24 Given that the predicted levels are 10 dB or more below the threshold for significant effects at residential receptors, no noise monitoring is considered necessary.

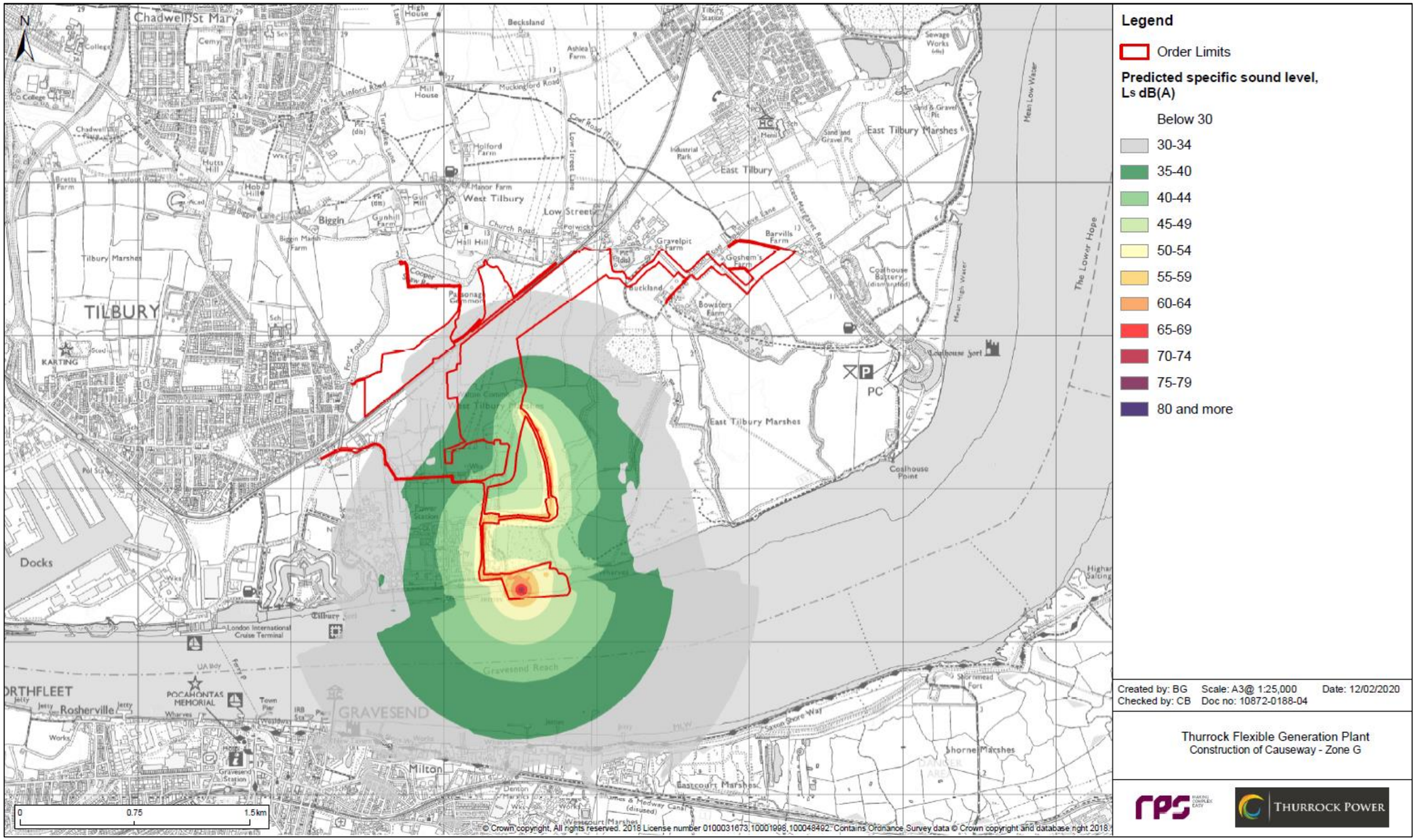

Figure 4.1: Construction – Causeway construction in Zone G.

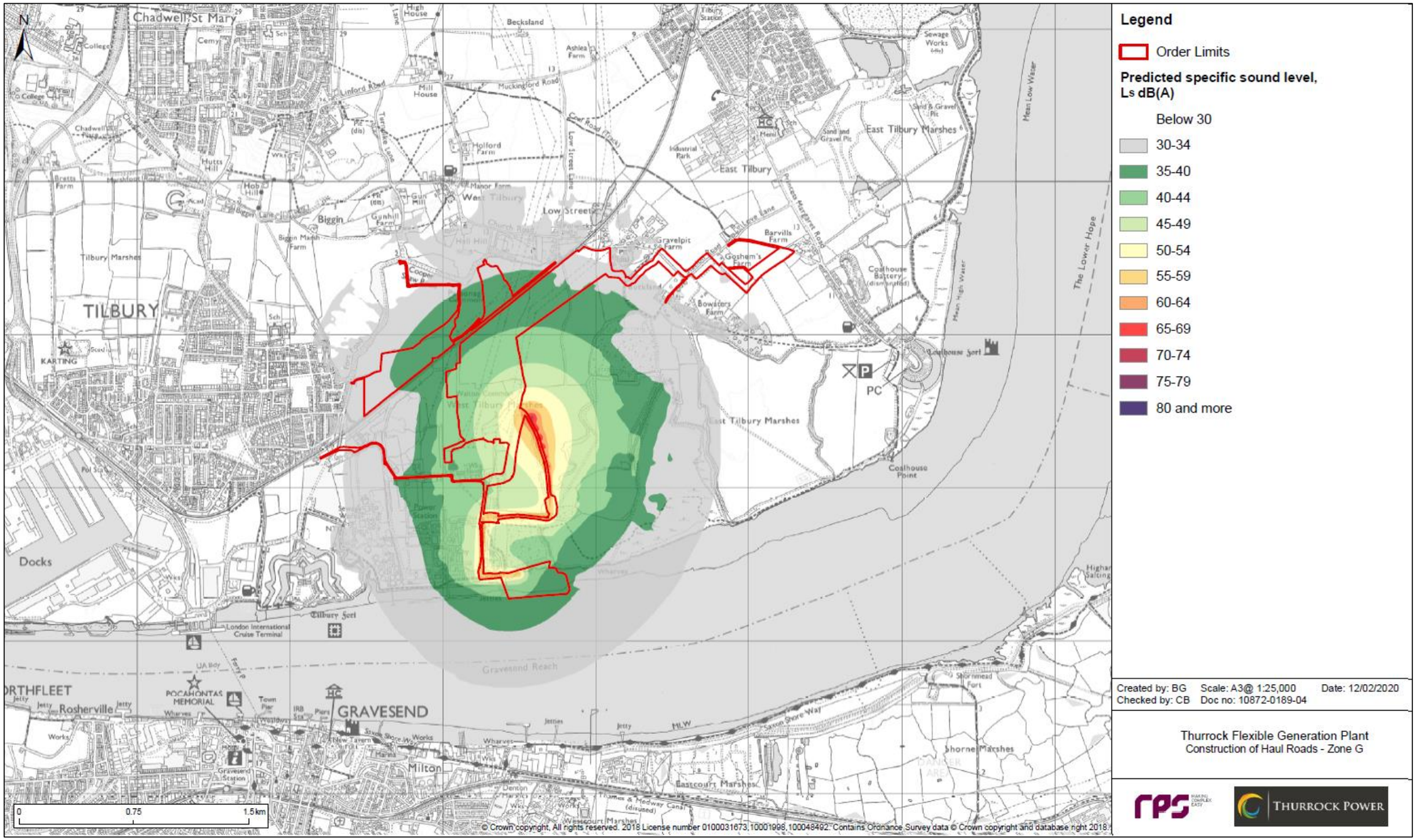

Figure 4.2: Construction – Construction of Haul Roads in Zone G.

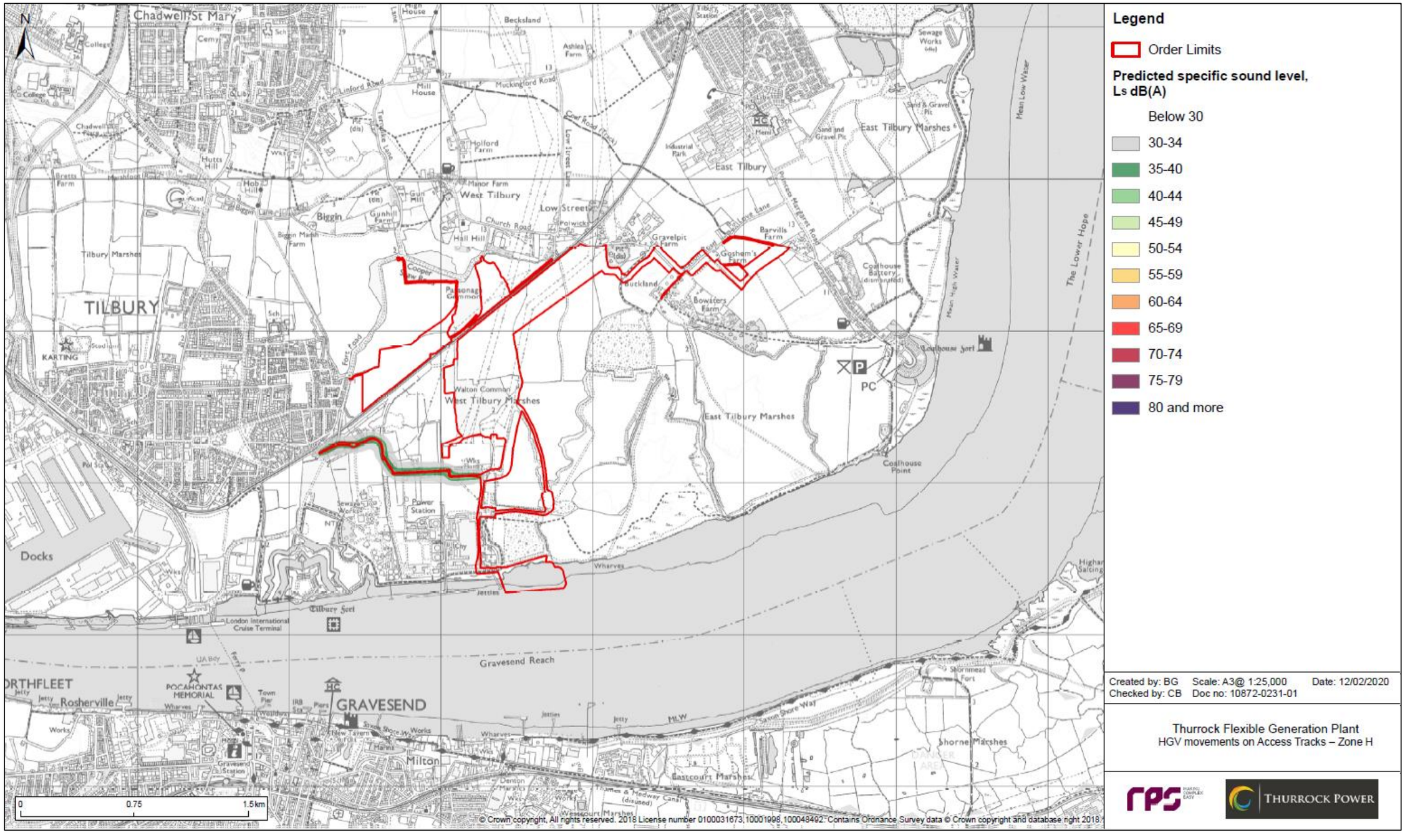

Figure 4.3: Construction –HGV Movements on Access Tracks in Zone H.

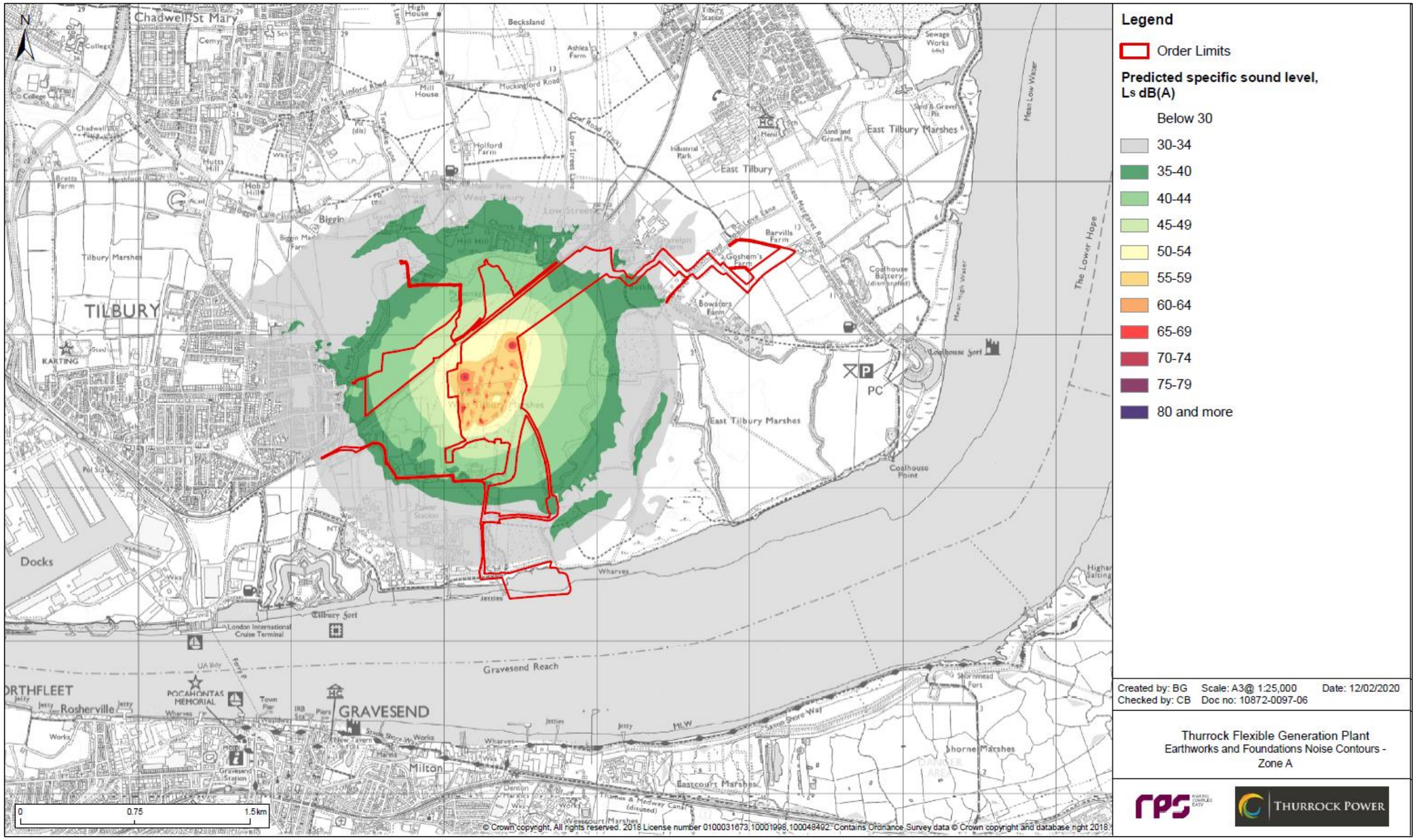

Figure 4.4: Construction – Earthworks and Foundations in Zone A.

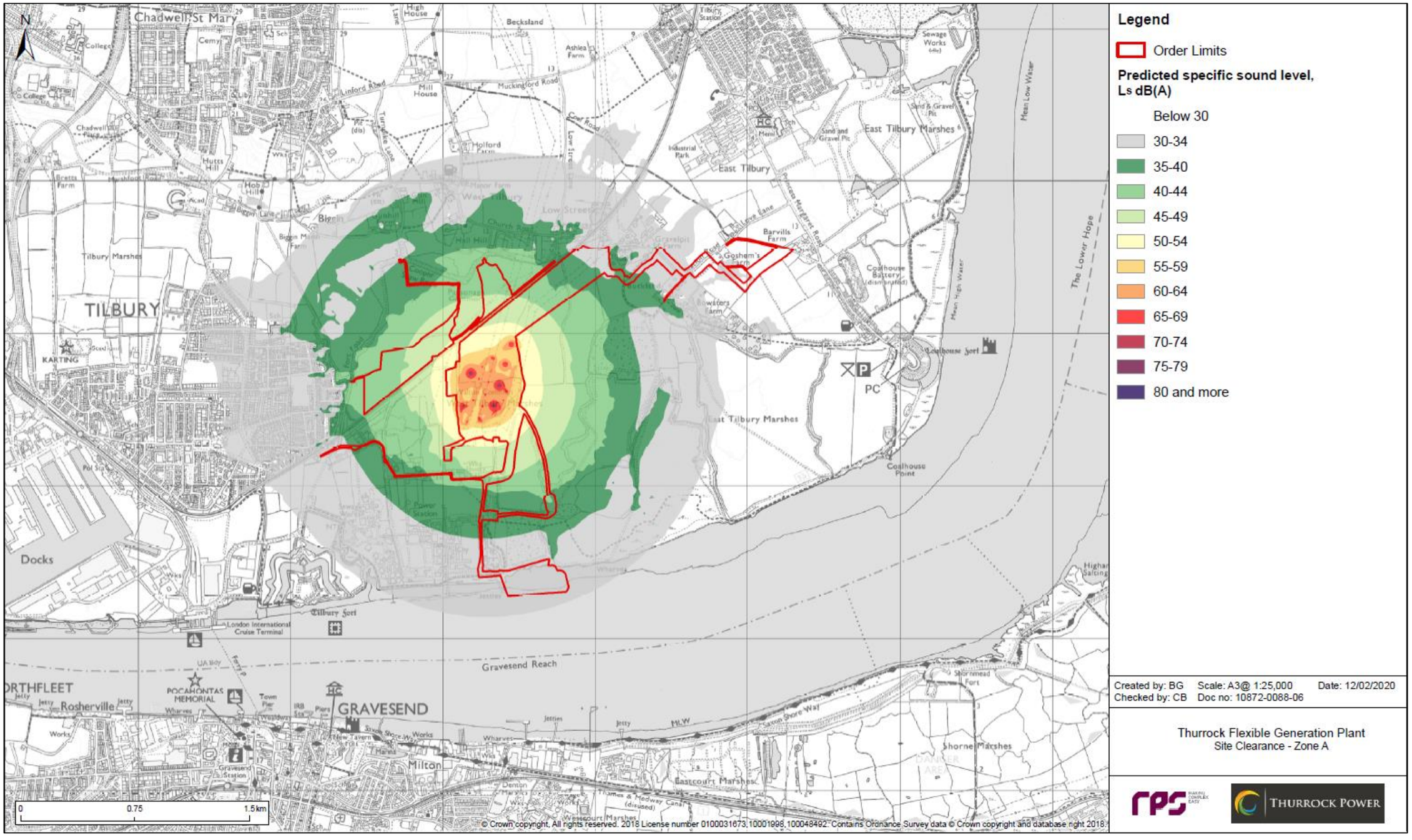

Figure 4.5: Construction – Site clearance Zone A.

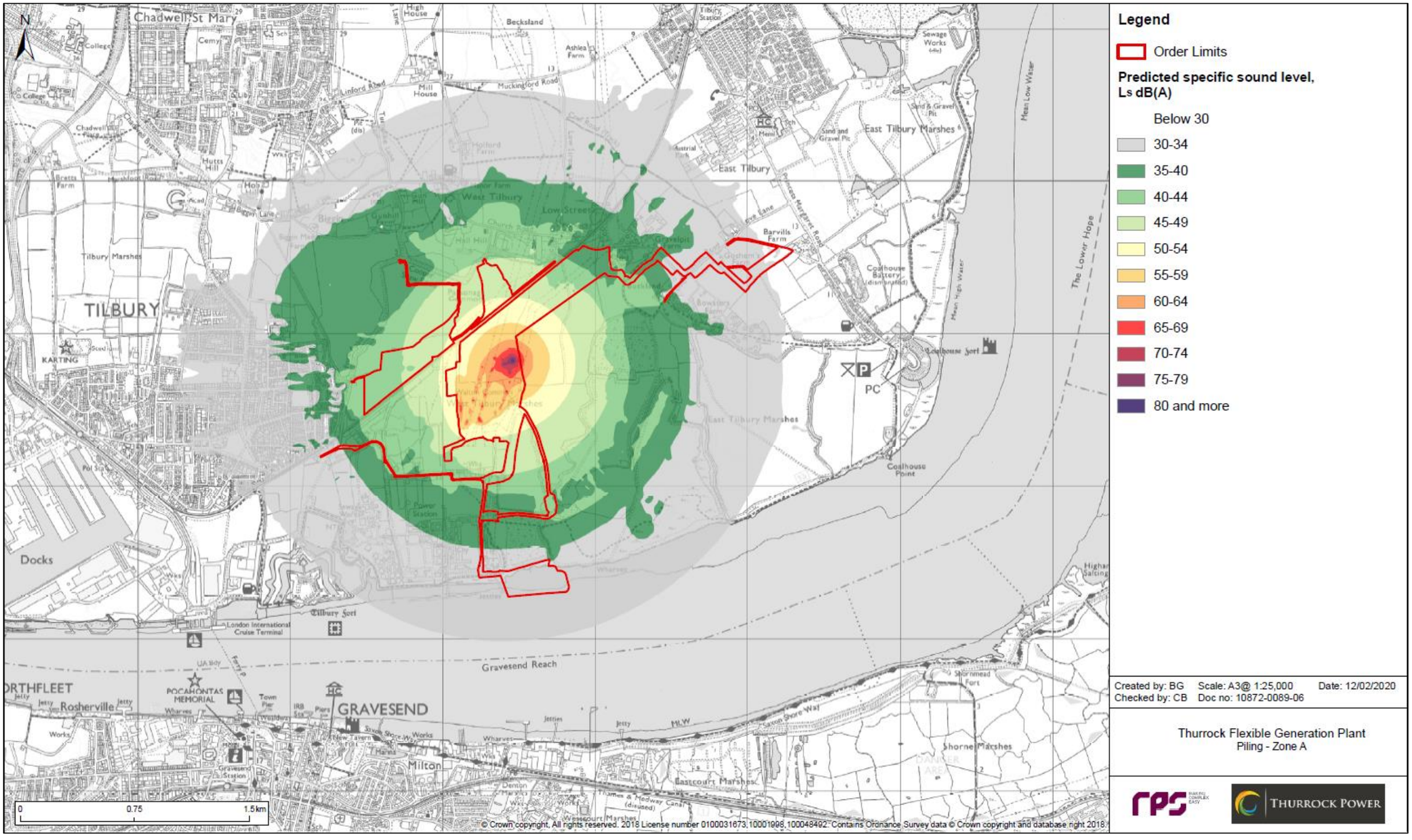

Figure 4.6: Construction – Piling Zone A.

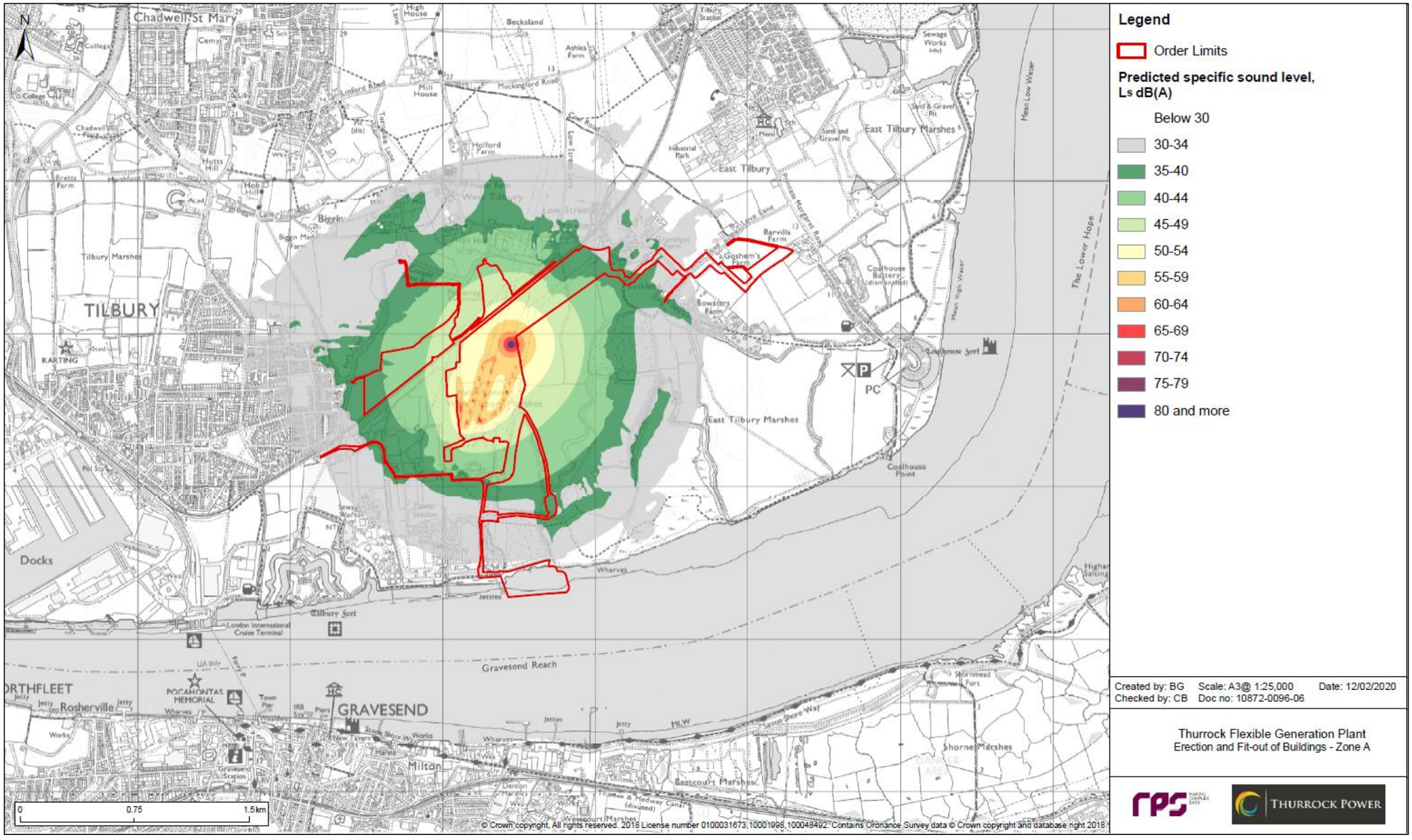

Figure 4.7: Construction – Erection and Fit-out of Buildings in Zone A.

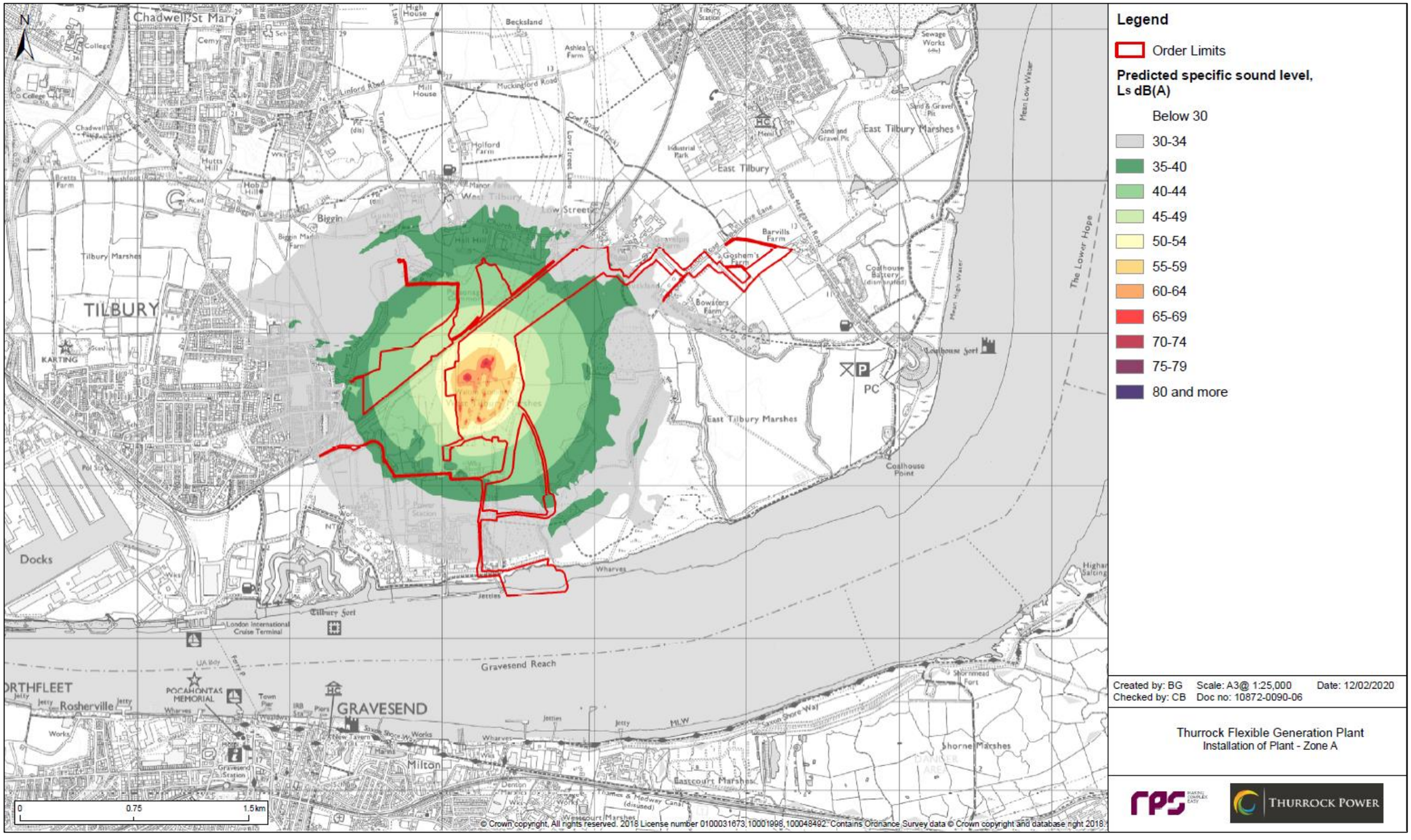

Figure 4.8: Construction – Installation of Plant in Zone A.

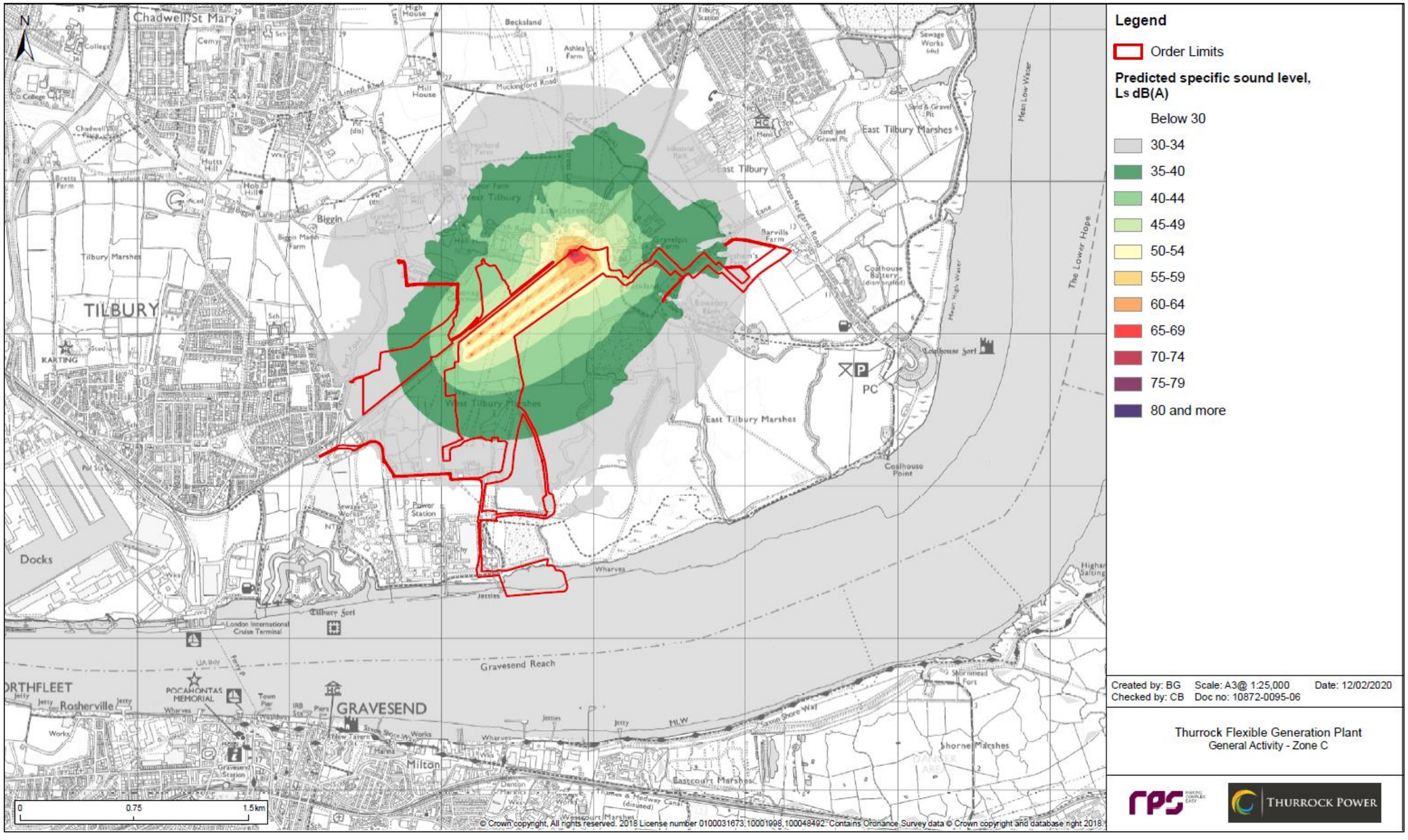

Figure 4.9: Construction – General Activities within Laydown Compound in Zone C.

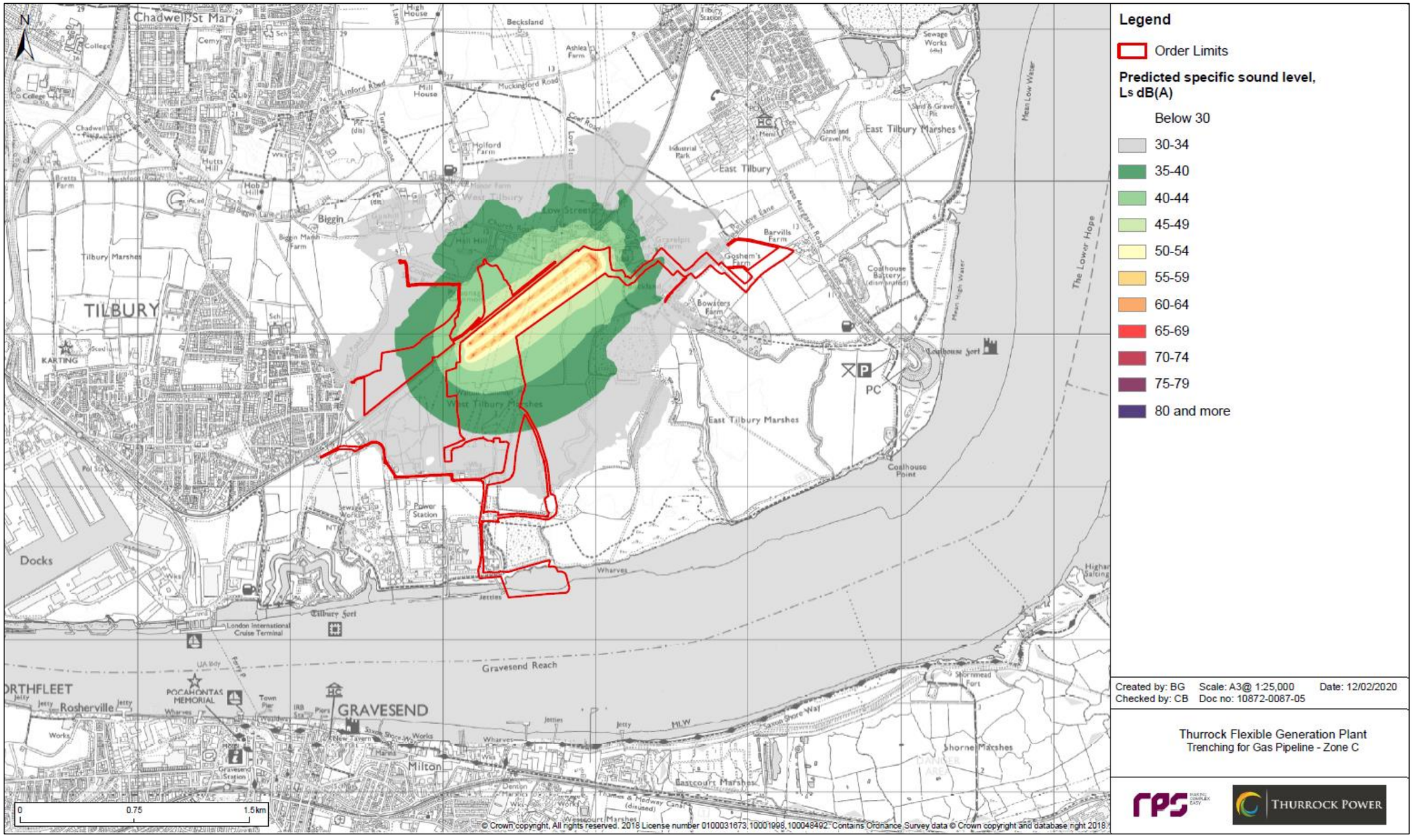

Figure 4.10: Construction Trenching for Gas Pipeline in Zone C.

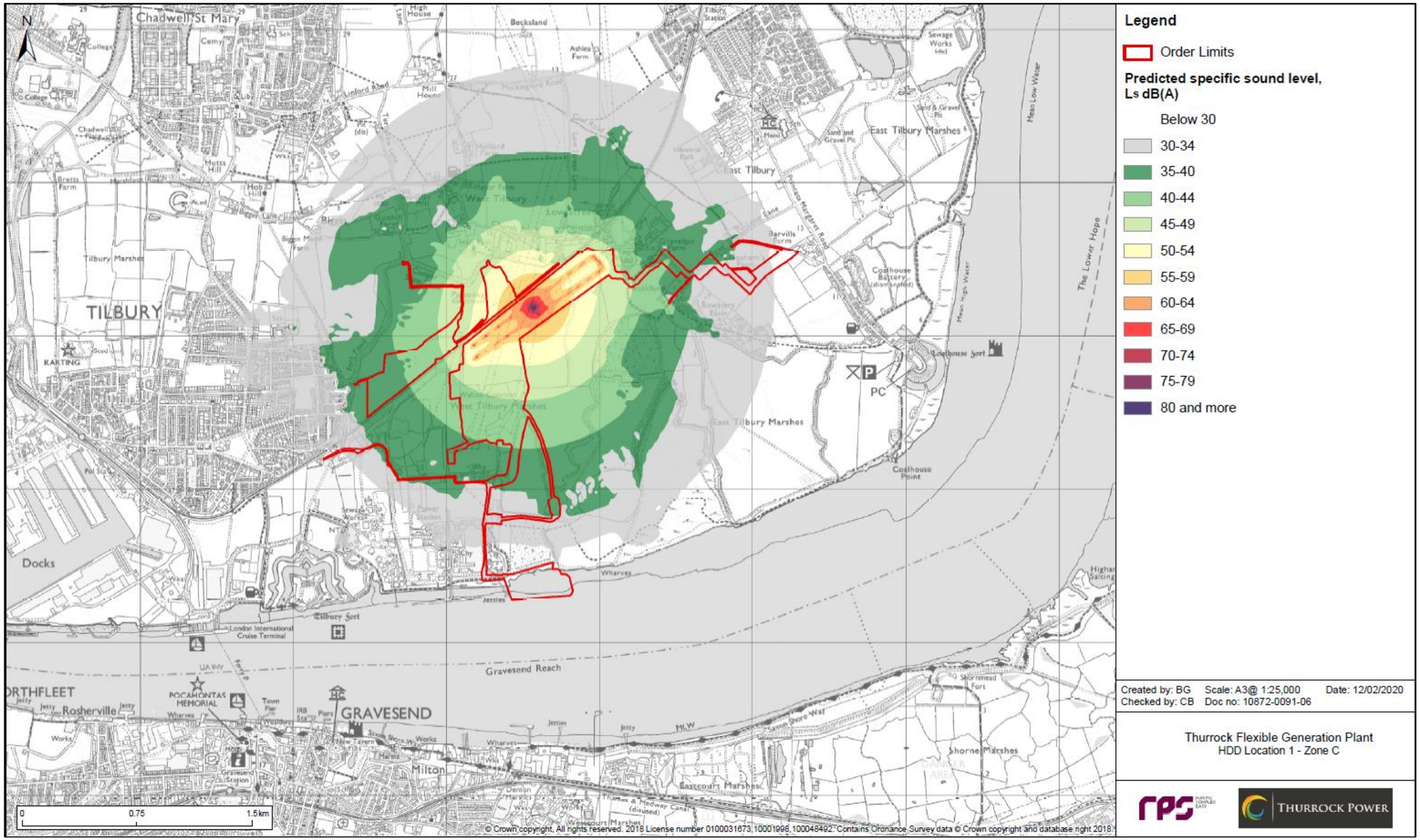

Figure 4.11: Construction – HDD in Zone C Location 1.

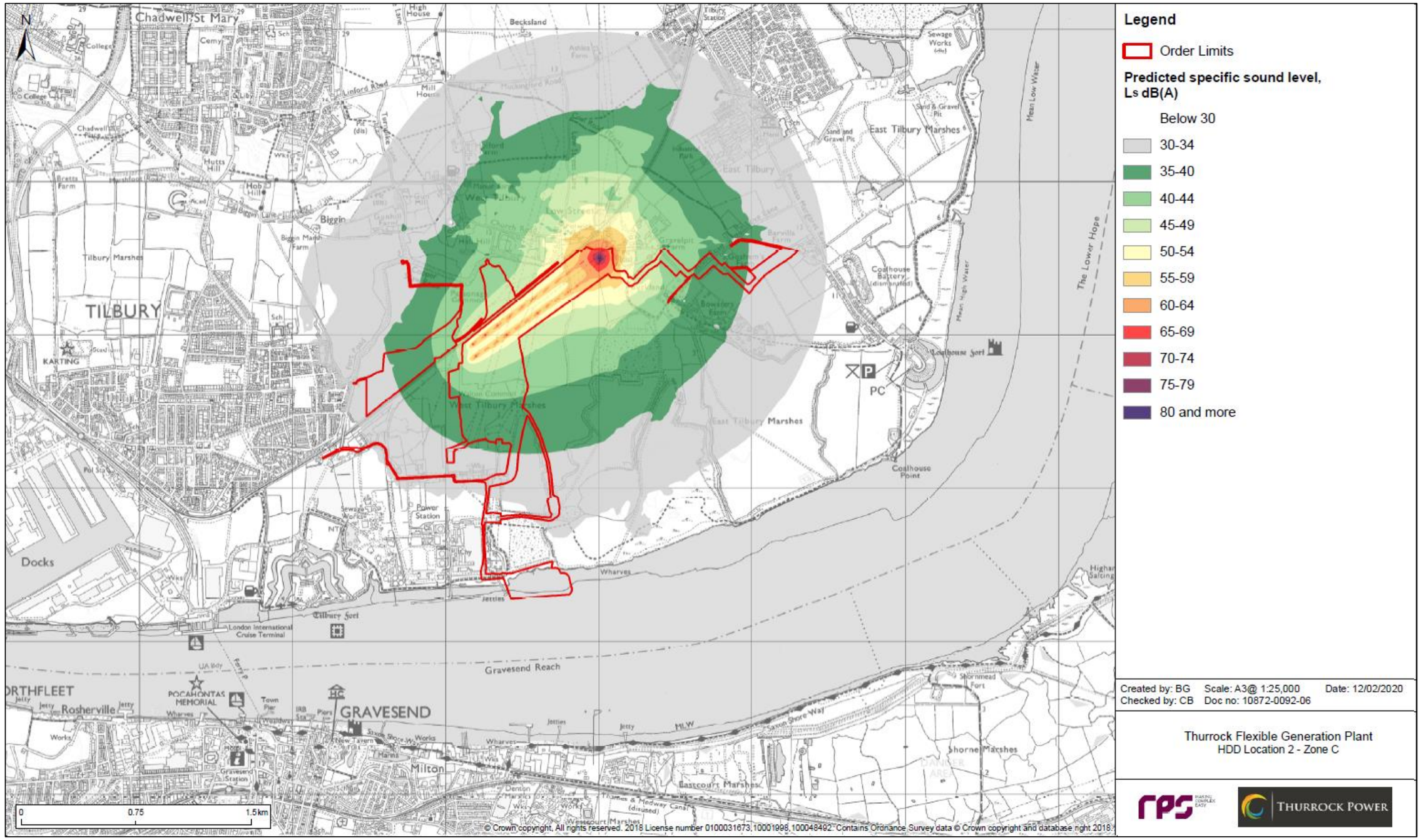

Figure 4.12: Construction – HDD in Zone C Location 2 and Zone D.

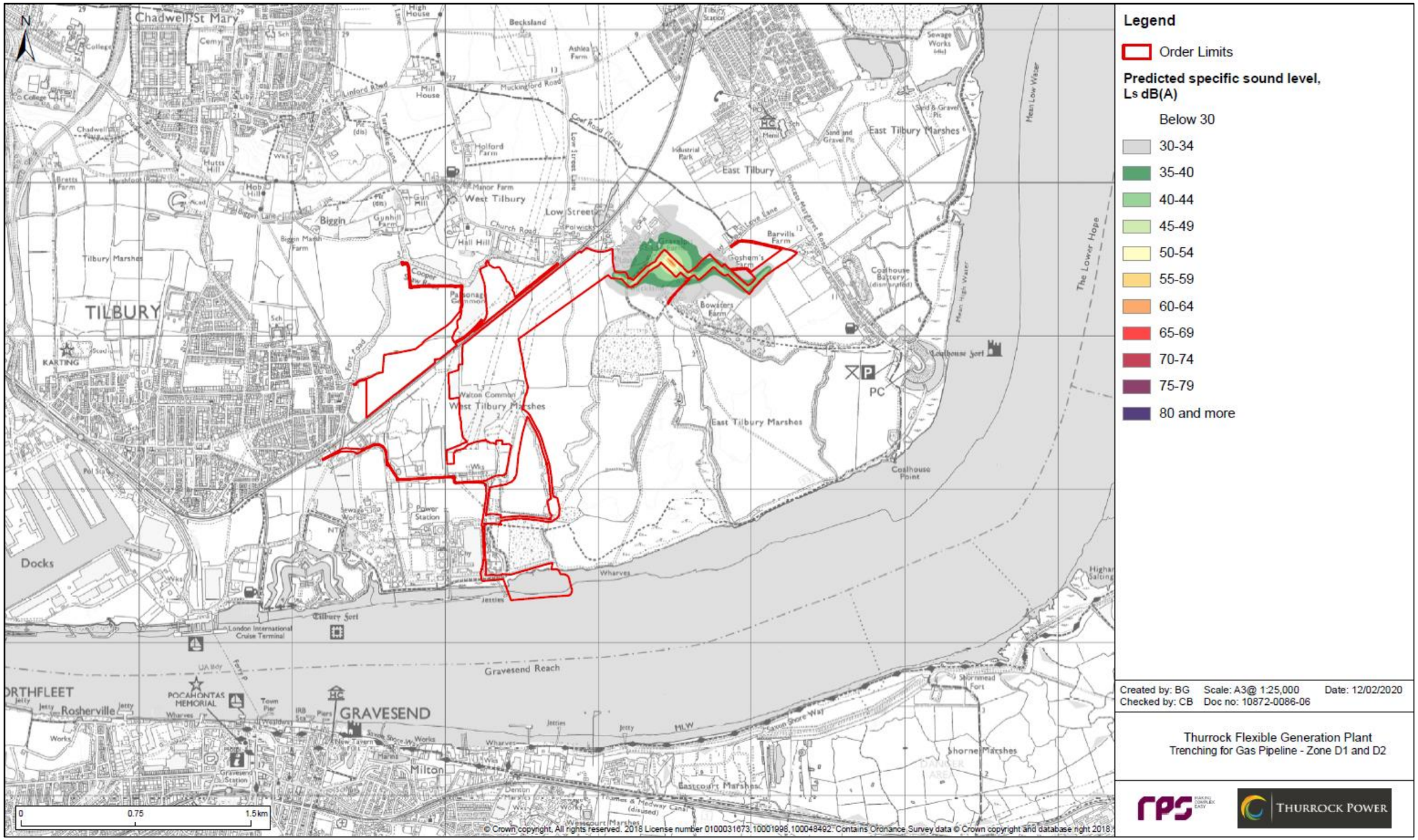

Figure 4.13: Construction – Trenching for Gas Pipeline in Zone D1.

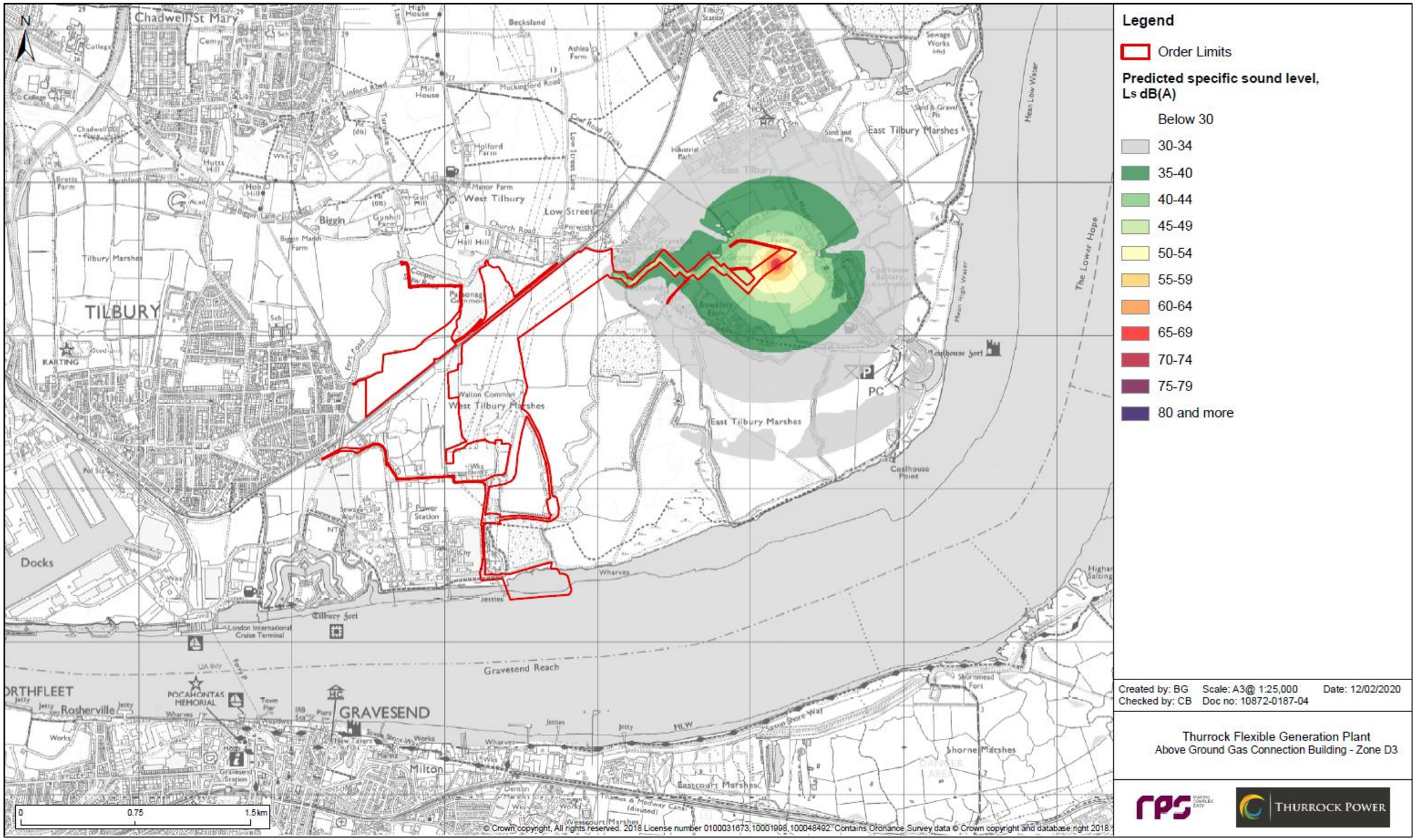

Figure 4.14: Construction – Construction of Above Ground Gas Connection Building.

4.2 Operational phase

4.2.1 The impacts of the operation of Thurrock Flexible Generation Plant have been assessed with regards to noise sources in accordance with the maximum design envelope parameters as described in Table 2.9.

Magnitude of impact

4.2.2 The noise modelling assumptions, predictions, context and results of the BS 4142:2014+A1:2019 assessment and noise change assessment are presented in Volume 6, Appendix 11.4: Operational Noise Assessment Methodology and Results. A summary of the outcome is provided below. Operational noise contours are provided in Figure 4.15 and Figure 4.16 for the daytime and night-time periods respectively. It should be noted that the proposed development is not expected to operate frequently during the night-time due to its nature as a facility satisfying peak power demands (which tend to occur in the daytime and evening).

4.2.3 The results of the BS 4142:2014+A1:2019 assessment have shown that during the day, a negligible impact is predicted at all NSRs. During the evening, a moderate impact is predicted at the most-affected residential NSRs, Byron Gardens and Galsworthy Road. Both NSRs have a rating level difference of +6 dB and combined ambient levels greater than the 55 dB WHO Guideline level for external amenity spaces, as described in Table 2.5. During the night, a moderate to major impact is predicted at the most-affected residential NSR, Havers Lodge, with a rating level difference of +11 dB.

4.2.4 The final determination of the significance of any effect is based on further consideration of the context of the sound: both the change in sound levels above the baseline ambient sound level, and consideration of the WHO guideline levels.

4.2.5 It has been established that sound arising from the operation of the proposed development will result in ambient sound level increases of only 1 dB during the daytime, a maximum of 3 dB during the evening and 4 dB at two receptors during the night-time, Buckland (39 dB baseline ambient during the night-time, increasing to 43 dB combined sound level), and St James' Church (41 dB to 45 dB). When considering a steady sound source with no discernible impulsive or tonal characteristics, a 3 dB change is generally taken as the minimum change which is perceptible to most people. As such, an increase above baseline residual sound levels of 4 dB is likely to be just perceptible, but not intrusive. These noise changes are low due to the high baseline ambient levels.

4.2.6 During the daytime and evening time periods, when Thurrock Flexible Generation Plant is most likely to operate, the maximum noise change predicted is an increase of 3 dB: this is below the threshold of perception. It is therefore considered that the results of the noise change assessment show that the operation of the proposed development is unlikely to seriously affect the health or quality of life at the most-affected residential receptors.

4.2.7 In terms of the absolute noise level assessment, sound from the proposed development will not contribute to, or give rise to, adverse impacts on NSRs during the daytime or evening.

4.2.8 The level for the onset of sleep disturbance during the night-time (i.e. lowest observed adverse effect level) contained in the WHO Guidance is 45 dB L_{Aeq} (façade), equivalent to a free-field level of 42 dB L_{Aeq}. While the combined sound level exceeds this threshold level at all receptors detailed in Appendix 11.4, the baseline residual sound level already exceeds the WHO level at the majority of receptors (of those detailed in the appendix, baseline ambient levels exceed WHO levels at Byron Gardens (49 dB), Galsworthy Road (49 dB), Havers Lodge (45 dB) and Clarendon Road (45 dB) during the night-time period). In the unlikely event of the proposed development operating for significant periods at night, the flexible generation plant in operation will make a negligible contribution, if any, to ambient noise levels. At the two most affected receptors in terms of night-time disturbance, Buckland and St James' Church, it is considered that this, combined with a rating level difference of less than 10 dB, means that the noise change will not be intrusive. At all other receptors, it is considered that the operation of the proposed development will not result in any significant impact based on WHO absolute noise criteria, as it is unlikely to result in any increased sleep disturbance over what is already present.

4.2.9 Taking both the change in noise levels and the absolute sound levels during the day and night into consideration, it is considered that sound from the facility will not result in any adverse impacts on the quality of life of residents nearby.

4.2.10 It is considered that noise impacts from the operation of the proposed development on users of PRoWs would be negligible. While users of these PRoWs might experience elevated noise levels for short periods when walking within these areas, this is not considered a mechanism for significant effect. Users of the PRoWs would only experience transitory exposure to elevated noise levels from operational noise emissions from Thurrock Flexible Generation Plant.

4.2.11 Noise impacts from the operation of the proposed development on sensitive ecological receptors are considered in Volume 3, Chapter 9: Onshore Ecology.

Sensitivity of the receptor

4.2.12 All NSRs identified within the operational assessment have a sensitivity considered to be **medium**. As discussed in paragraph 2.3.3, the nearest NSRs identified for the assessment of operational noise impacts are considered representative of the most affected receptors likely to be affected by the operation of the proposed development.

Significance of effect

4.2.13 At **medium** sensitivity receptors in the vicinity of Buckland and St James' Church, the predicted **moderate** impact would result in a **moderate adverse** effect. However, while the noise level is predicted to just exceed the LOAEL (as described in paragraph 2.5.20), it will not exceed the SOAEL, and therefore although the significance effect according to the assessment matrix in Table 2.8 is moderate, this is **not a significant effect** in the context of this assessment.

4.2.14 At all other receptors, it is predicted that a **minor** impact on **medium** sensitivity receptors would result in a **minor adverse** effect, which is **not significant** in EIA terms. This is equivalent of noise levels below the LOAEL.

Further mitigation or enhancement

4.2.15 No significant adverse effects have been predicted. It is therefore recommended that the noise levels assessed from Thurrock Flexible Generation Plant serve as limits for the most affected NSRs.

Future monitoring

4.2.16 It is recommended that noise monitoring be undertaken following commissioning of the development to ensure compliance with the levels reported in this ES.

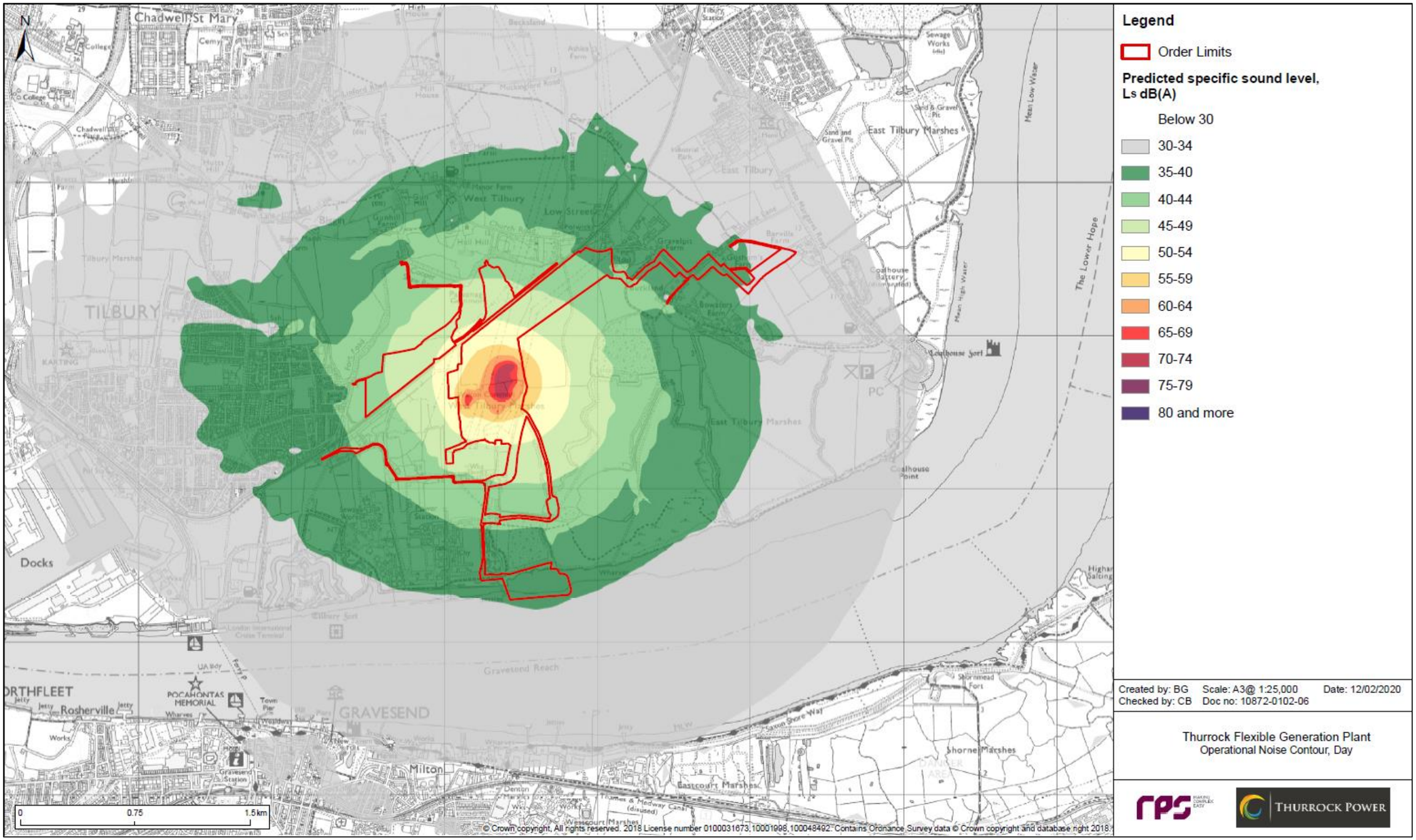

Figure 4.15: Operational noise contour, day.

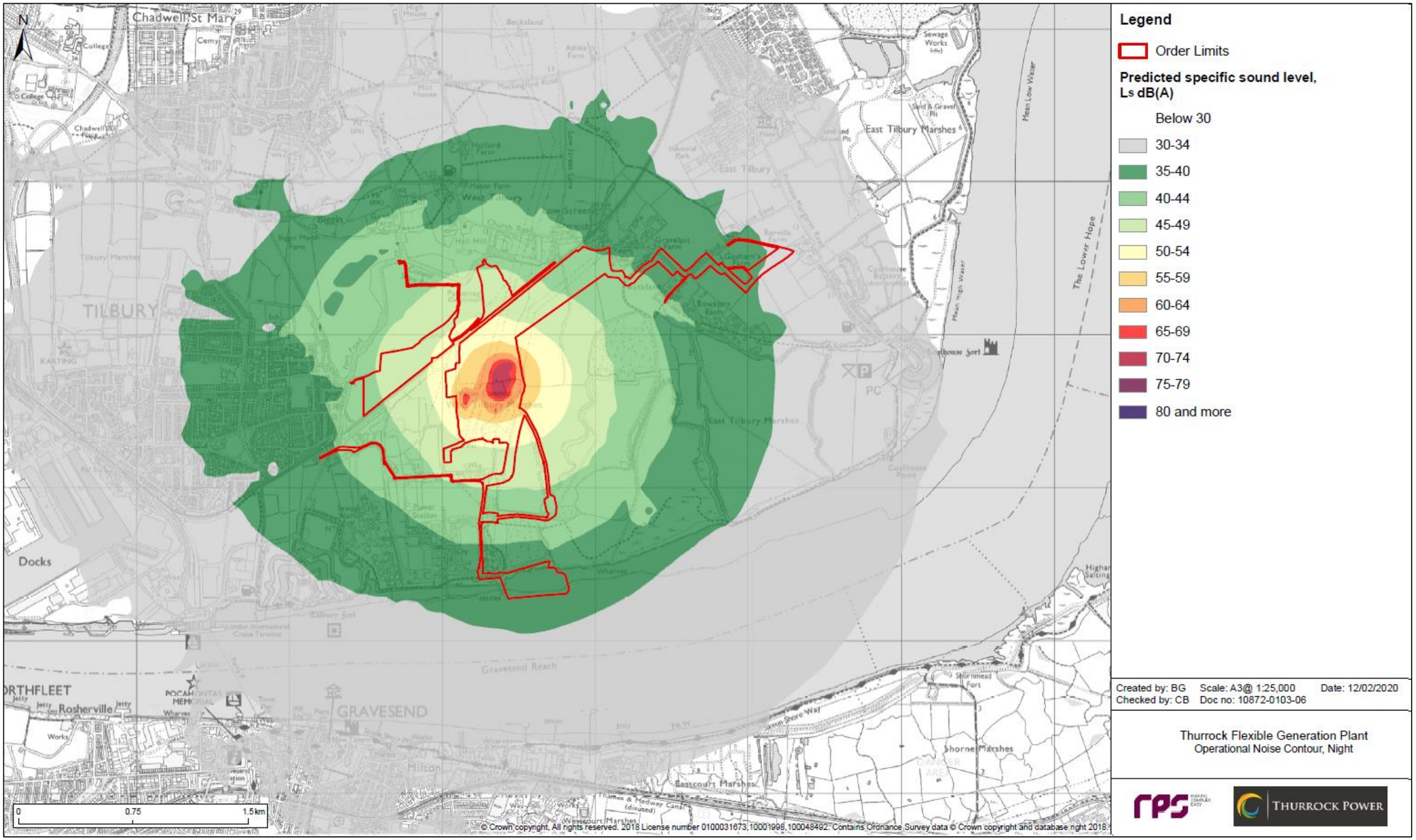

Figure 4.16: Operational noise contour, night.

4.3 Decommissioning phase

4.3.1 The impacts of the decommissioning of Thurrock Flexible Generation Plant have been assessed with regards to noise in accordance with the maximum design envelope parameters as described in Table 2.9.

4.3.2 During decommissioning, the equipment and activities used are likely to be broadly similar to those used during construction. It is possible that technology advances will result in quieter equipment being available for these tasks.

Magnitude of impact

4.3.3 It is anticipated that noise impacts would be no greater than those predicted during the construction phase. As such, the magnitude of impact at the most-affected NSRs is predicted to be **negligible**, as predicted for construction.

Sensitivity of the receptor

4.3.4 The noise sensitive receptors identified within the decommissioning assessment are the same as those within the construction assessment. All receptors are considered to be **medium** sensitivity.

Significance of effect

4.3.5 Overall, it is predicted that a **negligible** impact on the most affected **medium** sensitivity residential receptors would result in a **negligible** adverse effect.

4.3.6 A negligible to minor adverse effect is **not significant** in EIA terms.

Further mitigation or enhancement

4.3.7 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Future monitoring

4.3.8 Given the low noise levels predicted in the construction assessment, relative to the threshold levels detailed in BS 5228 (BSI, 2014), no noise monitoring is considered necessary during the decommissioning phase.

4.4 Cumulative effects

4.4.1 Cumulative effects are those arising from impacts of the proposed development in combination with impacts of other proposed or consented development projects that are not yet built or operational. An assessment of cumulative effects for noise and vibration has been made and is reported in Volume 4, Chapter 24.

4.5 Transboundary effects

4.5.1 A screening of transboundary impacts has been carried out and is presented in Volume 6, Appendix 4.1: Transboundary Impacts Screening Note. This screening exercise identified that there was no potential for significant transboundary effects with regard to noise and vibration from Thurrock Flexible Generation Plant upon the interests of other EEA States.

4.6 Inter-related effects

4.6.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the construction, operation or decommissioning of Thurrock Flexible Generation Plant on the same receptor. The following assessments have been made and a description of the likely inter-related effects on noise and vibration is provided in Volume 5, Chapter 31: Summary of Inter-Related Effects.

Project lifetime effects

4.6.2 Assessment of the potential for effects that occur during more than one stage of the development's lifetime (construction, operation or decommissioning) to interact such that they may create a more significant effect on a receptor than when assessed in isolation for each stage

Receptor-led effects

4.6.3 Assessment of the potential for effects via multiple environmental or social pathways to interact, spatially and temporally, to create a greater inter-related effect on a receptor than is predicted for each pathway (in its respective topic chapter) individually.

5. Conclusion

Assessments undertaken

5.1.1 An assessment of the potential effects of noise from construction activity, construction traffic and the operation of the proposed development has been undertaken. The methodology and results are detailed in Volume 6, Appendix 11.3: Construction Noise Assessment Methodology and Results and Appendix 11.4: Operational Noise Assessment Methodology and Results.

5.1.2 The results have been summarised and the significance of effects has been described in this chapter.

Construction noise

5.1.3 Predictions have shown that noise from construction activity will result in a negligible magnitude of impact at the most-affected receptors. The most-affected residential receptors are considered to be of medium sensitivity.

5.1.4 A negligible impact on the medium sensitivity receptors would result in a negligible to minor adverse effect, which is not significant in EIA terms.

Construction traffic

5.1.5 Predictions show that noise change on the local highway network associated with the proposed development will result in a minor magnitude of impact at receptors located closest to links 11 (Cooper Shaw Road / Church Road / Station Road, between Gun Hill Road and EMR East Tilbury junction), 20 (Consented Tilbury 2 Road, between A1089 St Andrews Road and Fort Road) and 21 (Fort Road between Brennan Road and Cooper Shaw Road).

5.1.6 Receptors along affected routes have been identified as medium sensitivity. Overall, it is predicted that a minor impact on the most-affected medium sensitivity receptors would result in a minor adverse effect. This is not considered significant in EIA terms.

5.1.7 All other receptors experience a negligible impact which results in a negligible adverse effect.

Operational noise

5.1.8 Predictions have shown that noise from the operation of the proposed development will result in a minor to moderate magnitude of impact at the most affected receptors, which are considered to be of medium sensitivity.

5.1.9 The minor to moderate impacts are considered to result in minor to moderate adverse effects. Based on the noise environment context, it is determined that this will tend towards a minor adverse effect, which is not significant in EIA terms.

Decommissioning noise

5.1.10 It is considered that the noise effects from decommissioning activity will be similar to those during the construction phase and therefore are not significant.

Table 5.1: Summary of potential environment effects, mitigation and monitoring – most affected receptors.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction							
Noise from construction activity	In-built mitigation as detailed in Table 2.11	Negligible	Medium	Negligible to minor adverse (not significant in EIA terms)	None	Negligible to minor adverse (not significant in EIA terms)	None
Construction traffic noise	-	Minor	Medium	Minor adverse (not significant in EIA terms)	None	Minor adverse (not significant in EIA terms)	None
Operation							
Operation of the proposed development	In-built mitigation as detailed in Table 2.11	Minor to moderate	Medium	Minor to moderate adverse (determined not be significant in EIA terms)	None	Minor to moderate adverse (determined not be significant in EIA terms)	Noise monitoring following commissioning to ensure compliance with the levels reported in this ES
Decommissioning							
Noise from decommissioning activity	In-built mitigation as detailed in Table 2.11	Negligible	Medium	Negligible to minor adverse (not significant in EIA terms)	None	Negligible to minor adverse (not significant in EIA terms)	None

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