



Immingham Green Energy Terminal

TR030008

Volume 6

6.2 Environmental Statement
Chapter 7: Noise and Vibration

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009 (as
amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.2 Environmental Statement

Chapter 7: Noise and Vibration

Regulation Reference	APFP Regulation 5(2)(a)
Planning Inspectorate Case Reference	TR030008
Application Document Reference	TR030008/APP/6.2
Author	Associated British Ports Air Products BR

Version	Date	Status of Version
Revision 1	21 September 2023	DCO Application

Table of contents

Chapter	Pages
7. Noise and Vibration.....	7-1
7.1 Introduction	7-1
7.2 Consultation and Engagement	7-1
7.3 Legislation, Policy and Guidance	7-7
7.4 Assessment Methodology	7-12
7.5 Limitations and Assumptions.....	7-28
7.6 Study Area	7-29
7.7 Baseline Conditions.....	7-30
7.8 Development Design and Impact Avoidance.....	7-37
7.9 Assessment of Likely Impacts and Effects	7-40
7.10 Mitigation Measures	7-57
7.11 Assessment of Residual Effects.....	7-63
7.12 Summary of Assessment	7-64
7.13 References.....	7-68

Tables

Table 7-1: Consultation Summary Table.....	7-3
Table 7-2: Relevant legislation, policy and guidance regarding noise and vibration	7-7
Table 7-3: Construction noise thresholds at residential dwellings.....	7-13
Table 7-4: Construction noise magnitude of impact for residential receptors.....	7-15
Table 7-5: Magnitude of impact at noise sensitive receptors from construction traffic	7-16
Table 7-6: Construction vibration threshold at residential dwellings.....	7-16
Table 7-7: Transient vibration guide values for cosmetic damage	7-18
Table 7-9: Magnitude of impact for industrial sound	7-21
Table 7-10: Categorising the magnitude of the noise change.....	7-22
Table 7-12: Sensitivity/value of receptors	7-26
Table 7-13: Classification of effects	7-27
Table 7-14: Daytime measurement details	7-30
Table 7-15: Night-time measurement details	7-31
Table 7-16: Daytime sound levels during survey periods.....	7-32
Table 7-17: Night-time sound levels during survey periods	7-34
Table 7-18: Representative ambient (L_{Aeq}) and background (L_{A90}) sound levels	7-36
Table 7-19: List of embedded mitigation used within the operational noise model	7-39
Table 7-20: Predicted worst-case daytime construction noise levels - residential NSRs	7-44
Table 7-21: Resultant PPV for percussive and vibratory piling	7-48
Table 7-22: Predicted change in construction road traffic noise levels	7-49
Table 7-23: Predicted worst-case operational specific sound levels.....	7-50
Table 7-24: Daytime BS4142 assessment (without additional specific mitigation).....	7-52
Table 7-25: Night-time BS4142 assessment (without additional specific mitigation)	7-53
Table 7-26: Comparison of ambient sound levels without additional mitigation	7-55
Table 7-27: Overall attenuation (dB) required to achieve operational sound criteria (Full site operational)	7-58
Table 7-28: Attenuation required (dB) from individual plant items.	7-59

Table 7-29: Summary of potential impact, mitigation measures and residual effects7-65

7. Noise and Vibration

7.1 Introduction

7.1.1 This Chapter presents the findings of the assessment regarding the likely significant noise and vibration effects of the Project on human Noise Sensitive Receptors (“NSRs”). The Chapter also details the datasets used to inform the assessment, provides an overview of baseline conditions, and sets out how the likely significant effects have been assessed.

7.1.2 The potential noise effects on ecological receptors are assessed in the following Chapters **[TR030008/APP/6.2]**:

- a. **Chapter 8: Nature Conservation (Terrestrial Ecology).**
- b. **Chapter 9: Nature Conservation (Marine Ecology).**

7.1.3 The daily traffic flows from the transport assessment (**Chapter 11: Traffic and Transport [TR030008/APP/6.2]**) have been used in the road traffic noise assessment.

7.1.4 This Chapter is supported by the following figures and appendices:

- a. **Figure 7.1: Sound Monitoring Locations [TR030008/APP/6.3].**
- b. **Appendix 7.A: Baseline Sound Survey [TR030008/APP/6.4].**
- c. **Appendix 7.B: Construction Sound Levels and Assumptions for landside construction works [TR030008/APP/6.4].**
- d. **Appendix 7.C: Operational Noise Information (Landside) [TR030008/APP/6.4].**

7.2 Consultation and Engagement

7.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the materials and waste assessment, and the approach and methods to be followed. The Scoping Report (**Appendix 1.A [TR030008/APP/6.4]**) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on noise and vibration. A Scoping Opinion was adopted by the Secretary of State on 10 October 2022 **[TR030008/APP/6.4]**.

7.2.2 The first period of Statutory Consultation took place between 9 January and 20 February 2023 in accordance with the Planning Act 2008 (“2008 Act”). The Applicant prepared a Preliminary Environmental Information Report (“PEI Report”), which was publicised at the consultation stage.

- 7.2.3 Through consideration of the responses to the first Statutory Consultation, the developing environmental assessments and through ongoing design-development and assessment, a series of changes within the Project were identified. In light of these design changes, a second Statutory Consultation took place between 24 May and 20 July 2023 in accordance with the 2008 Act and a PEI Report Addendum was publicised to support the consultation.
- 7.2.4 Both consultation events undertaken with statutory consultees to inform this Chapter, including a summary of comments raised via the formal scoping opinion (**Appendix 1.A [TR030008/APP/6.4]**) and in response to the formal consultation events and other pre-application engagement are summarised in **Table 7-1**:. The full responses to consultation comments are included within the **Summary of Consultation Responses Document [TR030008/APP/5.1]**.
- 7.2.5 The Environmental Health Department at North East Lincolnshire Council (“NELC”) was initially consulted via email on 14 April 2023 prior to undertaking additional baseline sound surveys. No response was received, and a follow up email was sent on 26 June 2023. The Environmental Protection Officer responded on 27 June 2023, a copy of which is included in **Table 7-1**:.

Table 7-1: Consultation Summary Table

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this Chapter
Scoping Report August 2022	Planning Inspectorate	<p>Description: Construction and decommissioning vibration effects from the Work Area No. 7 on residential NSRs represented by NSR2 and NSR3 (now NSR 3 and NSR4 in this Chapter).</p> <p>The Scoping Report states that given the significant distance (over 450m) from the Work Area No. 7 to residential NSRs represented by NSR2 and NSR3 now NSR 3 and NSR4 in this Chapter) significant vibration effects are not expected to result from the proposed construction works (or decommissioning works) and seeks to scope out further assessment on these grounds. Given the distance from the Development Consent Order (“DCO”) site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the ES.</p>	Noted - no response required.
		<p>Description: Effects on residential NSRs due to noise and vibration from works in the Work Area No. 5 and at the new Jetty during construction and decommissioning.</p> <p>The Scoping Report proposes to scope out this matter owing to the large distance to identified sensitive receptors. As noted above, given the distance from the DCO site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the Environmental Statement (“ES”).</p>	<p>Noted.</p> <p>The changes to the design since the scoping assessment have been reviewed, including the addition of the concrete batching plant in Work Area No 5a during Phase 1 of construction. Due to the large distance to the nearest NSRs the impact will be negligible and can be scoped out.</p> <p>The potential vibration impacts on Immingham Oil Terminal (“IOT”) during the piling operations for the marine works have been assessed in Paragraph 7.9.26 to Paragraph 7.9.34.</p>

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this Chapter
		<p>Description: Effects on existing nearby buildings due to vibration from on-site operations during operation</p> <p>The Scoping Report states that no sources of vibration are expected that could significantly affect buildings, however the assessment would be scoped back in where such sources are identified during the EIA. The Inspectorate agrees that this matter can be scoped out of the ES providing a detailed description of the Proposed Development demonstrates that no significant effects from vibration sources from on-site operations would not have any significant effects.</p>	<p>There are no sources of vibration from the operation of the Project which could significantly affect buildings. The distance between Work Area 7 and the nearest NSRs is over 460m, therefore operational vibration impacts have been scoped out of this assessment as stated in Paragraph 7.4.35.</p>
		<p>Description: Potential Effects</p> <p>The Scoping Report refers broadly to “construction activities on-site” but it is not clear whether this includes noise associated with construction vessel movements. Construction vessel noise should be included as a pathway for effects within the assessment.</p>	<p>An assessment of traffic noise on the local highway network is included within Paragraph 7.9.35.</p> <p>However, given the large distance between residential receptors and the quayside (Work Area No.1) (~1.5 km) acknowledged in the second response above, and the nature of the sound of additional vessel movements being part of the established sound character of the area, it is considered unlikely that a significant effect would result and therefore an assessment of sea vessel noise is not required. A review of the number of vessel movements during construction is undertaken in Paragraph 7.4.3</p>
	Environment Agency	<p>Although written for environmental permitting, guidance entitled Noise and vibration management: environmental permits - GOV.UK (www.gov.uk) is not discussed in this Chapter, but will also be useful.</p>	<p>Noted. As stated in Paragraph 7.8.11, the hydrogen production facility will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency.</p>

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this Chapter
	North East Lincolnshire Council	The proposed methodology for the assessment of both vibration and noise impact on nearest residential receptors is satisfactory.	Noted.
Statutory Consultation January 2023	Local Resident (living within approx. 10km of the project)	What noise will be made which may affect life in Immingham? Concern for noise at night-time disturbing sleep. Concern that the environmental effects of the project will only be known when it is too late.	Section 7.9 of this Chapter presents an assessment of the impacts and effects of noise during the construction, operational and decommissioning phases of the Project on local NSRs, including the closest receptors in Immingham. The operational assessment in Section 7.9 covers both daytime and night-time periods. Measures to avoid significant adverse effects, and minimise and mitigate other adverse effects at NSRs, in accordance with national noise policy, is presented in Section 7.10 of this Chapter as appropriate.
	Local Resident (living within approx. 10 km of the project)	The new development will bring noise with the operational phase and contributed to an inhabited area which already suffers poor air quality.	Section 7.9 of this Chapter presents an assessment of the impacts and effects of noise during the construction, operational and decommissioning phases of the Project on local NSRs, including the closest receptors in Immingham. The operational assessment in Section 7.9 covers both daytime and night-time periods. Measures to avoid significant adverse effects, and minimise and mitigate other adverse effects at NSRs, in accordance with national noise policy, is presented in Section 7.10 of this Chapter as appropriate. Potential air quality effects are covered in Chapter 6: Air Quality [TR030008/APP/6.2] .
	Local Resident (living within)	Concern for increased dust and noise, especially traffic noise. Concern for the environment.	Section 7.9 of this Chapter presents an assessment of the impacts and effects of noise during the construction, operational and decommissioning phases of the Project on local NSRs, including from project related road traffic. Measures to avoid significant adverse effects, and minimise

Reference/Date	Consultee	Summary of Response	How comments have been addressed in this Chapter
Statutory Consultation June 2023	approx. 10 km of the project)		and mitigate other adverse effects at NSRs, in accordance with national noise policy, is presented in Section 7.10 of this Chapter as appropriate. Potential dust effects are covered in Chapter 6: Air Quality [TR030008/APP/6.2] .
	Local Resident (sea angler who fishes in area)	Concern for predicted noise level increases in specific locations within Immingham. Would like more information related to noise levels during operation of plant and increased road transport.	Section 7.9 of this Chapter presents assessment of the impacts and effects of noise during the construction, operational and decommissioning phases of the Project on local NSRs, including from project related road traffic. Measures to avoid significant adverse effects, and minimise and mitigate other adverse effects at NSRs, in accordance with national noise policy, is presented in Section 7.10 of this Chapter as appropriate.
	Environmental Protection Officer, North East Lincolnshire Council	Reviewed the methodology, monitoring locations and measurement durations and find all to be satisfactory.	Noted. Details of the method, duration and locations of the baseline sound surveys are described in Section 7.4 and Appendix 7.A [TR030008/APP/6.4] .

7.3 Legislation, Policy and Guidance

7.3.1 **Table 7-2** presents the legislation, policy and guidance relevant to the noise and vibration assessment and details how their requirements have been addressed in the assessment.

Table 7-2: Relevant legislation, policy and guidance regarding noise and vibration

Legislation/Policy/Guidance	Consideration within this ES Chapter
Environmental Noise (England) Regulations 2006 (Ref 7-19)	
<p>The UK Government Environmental Noise (England) Regulations 2006 (as amended 2008, 2009, 2010) were introduced in England to implement European Union, Assessment and Management of Noise Directive 2002/49/EC (the “END”) (The European Parliament and Council of the European Union, 2002). The aims of the END are to define a common approach in order to avoid, prevent or reduce the harmful effects of environmental noise. Under the END, strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England and Round 3 results were published in 2019.</p>	<p>The location of Noise Important Areas (“NIA”) defined under the END have been identified in Paragraph 7.4.52 and referenced with respect to assessment of changes in road traffic noise.</p>
Environmental Protection Act 1990 (Ref 7-20)	
<p>The Environmental Protection Act 1990 (“EPA”) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.</p>	<p>Reference is made in Section 7.11 to the EPA with respect to operational noise control. A Statutory Nuisance Statement forms part of the DCO application [TR030008/APP7.5]</p>
Control of Pollution Act 1974 (Ref 7-6)	
<p>Sections 60 and 61 of Control of Pollution Act 1974 (“CoPA”) provide the principal legislation regarding demolition and construction site noise and vibration. If noise complaints are received by the local planning authority from local residents, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific conditions to reduce noise have been adopted.</p> <p>Section 61 of the CoPA 1974 provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.</p> <p>The CoPA requires that ‘Best Practicable Means’ (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to BS5228 as Best Practicable Means.</p>	<p>Reference is made in Section 7.11 to the CoPA with respect to construction noise control.</p>
Noise Policy Statement for England (“NPSE”) (Ref 7-7)	
<p>The NPSE (Ref 7-7) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The</p>	<p>NPSE is considered in Sections 7.3 and 7.9</p>

Legislation/Policy/Guidance	Consideration within this ES Chapter
<p>NPSE (Ref 7-7) applies to all forms of noise, including environmental noise, neighbour noise and neighborhood noise.</p> <p>The statement sets out the long-term vision of the government’s noise policy, which is to:</p> <ul style="list-style-type: none"> a) “promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development”. b) This long-term vision is supported by three aims: c) “avoid significant adverse impacts on health and quality of life; d) mitigate and minimise adverse impacts on health and quality of life; and e) where possible, contribute to the improvements of health and quality of life.” <p>The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.</p> <p>The ‘Explanatory Note’ within the NPSE (Ref 7-7) provides further guidance on defining ‘significant adverse effects’ and ‘adverse effects’ using the concepts:</p> <ul style="list-style-type: none"> a) No Observed Effect Level (“NOEL”) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established; b) Lowest Observable Adverse Effect Level (“LOAEL”) - the level above which adverse effects on health and quality of life can be detected; and c) Significant Observed Adverse Effect Level (“SOAEL”) - the level above which significant adverse effects on 15 and quality of life occur. <p>The three aims can therefore be interpreted as follows:</p> <ul style="list-style-type: none"> a) the first aim is to avoid noise levels above the SOAEL; b) the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and c) the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim. <p>The NPSE (Ref 7-7) recognises that it is not possible to have uniform objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and times of the day.</p>	<p>with respect to assessing significant adverse and other adverse noise effects and defining LOAELs and SOAELs for the different potential effect types.</p>
<p>National Policy Statement for Ports (“NPSfP”) (Ref 7-8)</p>	

<p>The National Policy Statement for Ports (“NPSfP”) (Ref 7-8) states in paragraph 5.10.4 to 5.10.7:</p> <p>5.10.4 Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:</p> <ol style="list-style-type: none"> a) a description of the noise-generating aspects of the development proposal leading to noise impacts on the marine and terrestrial environment, including the identification of any distinctive tonal, impulsive or low-frequency characteristics of the noise; b) identification of noise-sensitive premises and areas and noise-sensitive species that may be affected; c) the characteristics of the existing marine and terrestrial noise environment; d) a prediction of how the noise environment will change with the proposed development: - in the shorter term during the construction period; - in the longer term during the operating life of the infrastructure; and - at particular times of the day, evening and night as appropriate. e) an assessment of the effect of predicted changes in the noise environment on any noise sensitive areas and noise sensitive species; and f) measures to be employed in mitigating the effects of noise. <p>The nature and extent of the noise assessment should be proportionate to the likely noise impact.</p> <p>5.10.5 The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should be considered</p> <p>5.10.6 Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards which also give examples of mitigation strategies</p> <p>5.10.7 The applicant should consult the Environment Agency and Natural England, or the Countryside Council for Wales, and the Marine Management Organisation in relation to marine protected species in England, as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.</p> <p>NPSfP paragraph 5.10.9 also repeats the aims given in the NPSE discussed above.</p> <p>It provides at paragraph 5.10.12 and 5.10.13 that:</p> <p><i>“Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:</i></p> <ol style="list-style-type: none"> a) <i>engineering: reduction of noise at point of generation and containment of noise generated;</i> 	<p>A staged approach to assessing the operational noise has, therefore, been undertaken. Where potentially significant adverse effects have been identified based upon preliminary higher-level assessment, further, more detailed assessments have been undertaken. The assessments have been undertaken in accordance with the principles of the relevant British Standards and guidance documents as set out in Section 7.3 and 7.4.</p> <p>NPSfP provides further guidance on the approach to noise assessment, specifically related to port projects.</p> <p>Section 7.9 of this Chapter provides a description of the noise generating aspects for both construction and operational phase.</p> <p>The NSRs are identified in Section 7.7 of this Chapter. The noise sensitive species are assessed in Chapter 8: Nature Conservation (Terrestrial Ecology) and Chapter 9: Nature Conservation (Marine Ecology) [TR030008/APP/6.2].</p> <p>The effects of the Project on human NSRs are assessed in Section 7.7 of this Chapter and ecological receptors in Chapter 8: Nature Conservation (Terrestrial Ecology) and Chapter 9: Nature Conservation (Marine Ecology).</p>
---	---

Legislation/Policy/Guidance	Consideration within this ES Chapter
<p>b) <i>lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural barriers or other buildings; and</i></p> <p>c) <i>administrative: limiting operating times of source; restricting activities allowed on the site; specifying acceptable noise limits; and taking into account seasonality of wildlife in nearby designated sites.</i></p> <p><i>In certain situations, and only when other forms of mitigation have been exhausted, it may be appropriate for the decision maker to consider requiring noise mitigation through improved sound insulation to dwellings, or in extreme cases, compulsory purchase of affected properties, as a means of consenting otherwise unacceptable development.”</i></p>	<p>Ecology) [TR030008/APP/6.2].</p> <p>The characteristic of the existing environment is taken into account in the construction and operational assessments in Section 7.9</p> <p>The mitigation measures are set out in Sections 7.8 and 7.10.</p> <p>The impact of ancillary operations (road traffic noise) is assessed in Section 7.9.</p>
National Planning Policy Framework (“NPPF”) (Ref 7-16)	
<p>Whilst not the primary policy document for a Nationally Significant Infrastructure Project (“NSIP”) Harbour development, the National Planning Policy Framework (NPPF) (Ref 7-16) contains policy on noise and vibration that has relevance to this Chapter. It sets out the Government’s planning policies for England and how these are expected to be applied. The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from being adversely affected by unacceptable levels of noise pollution.</p> <p>The NPPF states in paragraph 185 that planning policies and decisions should:</p> <p><i>“Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life”; and</i></p> <p><i>“identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.</i></p>	<p>Consideration has been given to NPPF as the overarching framework for mitigating the adverse and significant adverse effects of noise and vibration, and has been used in conjunction with NPSE and The Planning Practice Guidance for Noise (“PPG-N”) to define the assessment approach as set out in Section 7.4 of this Chapter.</p>
Planning Practice Guidance – Noise (PPG-N) (Ref 7-15)	
<p>The PPG-N (Ref 7-15) aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. The PPG was last updated for noise in July 2019.</p> <p>The guidance advises that local planning authorities should take account of the acoustic environment and consider:</p> <ul style="list-style-type: none"> a) whether or not a significant adverse effect is occurring or likely to occur; b) whether or not an adverse effect is occurring or likely to occur; and c) whether or not a good standard of amenity can be achieved. 	<p>PPG-N has been referenced to provide supplementary guidance to NPPF with respect to mitigation of adverse and significant adverse effects of noise and vibration. As such it has been used to define the assessment approach as set out in Section 7.4 of this Chapter.</p>

Legislation/Policy/Guidance	Consideration within this ES Chapter
<p>This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level).</p> <p>The NPSE and PPG recognise that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that is applicable to all sources of noise in all situations. The levels are likely to be different for different sound sources, receptors and at different times of the day.</p> <p>To determine appropriate LOAEL and SOAEL values in the context of the Project, reference has been made to methodologies and criteria presented in various British Standards and guidance documents.</p> <p>Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.</p> <p>With particular regard to mitigating noise impacts on residential development, the guidance highlights that impacts may be partially offset if residents have access to a relatively quiet façade as part of their dwelling, or a relatively quiet amenity space (private, shared or public).</p>	
<p>Local Planning Policy - North East Lincolnshire Local Development Plan 2013 to 2032 (adopted 2018) (Ref 7-17)</p>	
<p>The North East Lincolnshire Local Plan (“LP”) (2013 to 2032) was adopted in 2018 and sets out a strategic vision for the area. The plan is centred around set challenges for NELC and policy which has been implemented to solve them and support local economic sectors.</p> <p>Paragraph 6.38 of the LP states:</p> <p><i>“The Borough’s economy is heavily reliant on good rail and road freight links, along with sea traffic. The LTP3 outlines a number of freight transport related issues, which have a direct bearing on the Borough’s economic performance:</i></p> <ol style="list-style-type: none"> 1. local access to sites such as ports, affecting their day-to-day operations; 2. transit routes that affect communities through high levels of HGV traffic and the severance, noise and pollution this can bring; 3. access to main trunk routes, especially the motorway network; 4. capacity constraints some distance from the area, such as constraints on the M1, A1 and East Coast Mainline; and, 5. rail freight capacity in terms of train paths, line speeds and height restrictions.” <p>Policy 5 of the LP states:</p> <p><i>“ Policy 5 – Development boundaries</i></p> <ol style="list-style-type: none"> 1. Development boundaries are identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to: 	<p>Local planning policies have been reviewed to ensure the assessment approach set out in Section 7.4 of this Chapter incorporates consideration of local authority requirements.</p>

Legislation/Policy/Guidance	Consideration within this ES Chapter
<i>D. impact upon neighbouring land uses by reason of noise, air quality, disturbance or visual intrusion</i>	
Local Planning Policy - North Lincolnshire Council Planning for Health and Wellbeing- Supplementary Planning Document (November 2016) (Ref 7-18)	
<p>The NLC Planning for Health and Wellbeing - Supplementary planning document was adopted in July 2016. It builds on policies in the Core Strategy and North Lincolnshire Local Plan and sets out our planning policy towards Health and Wellbeing and is used to make decisions on planning applications.</p> <p>Policy 3 – Well designed places states that when considering the detail of development, proposals should:</p> <p><i>“Seek to reduce noise and air pollution through ensuring planning applications include a Noise Impact Assessment and Air Quality Assessment in areas of concern.”</i></p> <p>Paragraph 4.15 states “the design of places also needs to take account of transport which has a direct impact on health and safety. Air pollution, noise, traffic and congestion all have a negative impact on people’s ability to enjoy their environment.”</p>	<p>Local planning policies are reviewed to ensure the assessment approach set out in Section 7.4 incorporates consideration of local authority requirements.</p>

7.4 Assessment Methodology

Construction Phase Impacts

- 7.4.1 To determine the potential temporary noise and vibration impacts that may arise during the construction phase of the Project, the following matters have been considered:
- a. Noise and vibration caused by construction of Work Area No. 7 activities.
 - b. Noise caused by increases in traffic on the existing highway network, as a result of construction traffic.
- 7.4.2 Vibration from traffic on the highway network during the construction phase has been scoped out. Former DMRB document HD 213/11 Rev 1 (Ref 7-24) reports that extensive research on a wide range of buildings found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage. It was also stated that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances.
- 7.4.3 As detailed in **Chapter 2: The Project [TR030008/APP/6.2]**, a small number of sea vessel movements will be required during the construction phase. In particular, the ammonia storage tank is likely to be transported in large sections to site via sea vessel, before being transported within the Port to Work Area No. 5 for installation.

7.4.4 However, given the large distance between the nearest residential NSRs on Queens Road and the quayside (Work Area No. 1, ~1.5km), and the nature of the sound of a small number of additional vessel movements in an area where this source is an established part of the sound character of the area, it is considered unlikely that additional sea vessel noise would be perceptible and therefore a significant effect is considered unlikely. As a result, noise from sea vessel movements has been scoped out of this assessment.

Noise from Construction Sites

7.4.5 The potential noise impacts arising from construction activities for Work Area No. 7 have been assessed using the data and procedures given in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (Ref 7-2). Details of the construction plant and assumptions used for the construction assessment for the landside works can be found in **Appendix 7.B Construction Noise Information [TR030008/APP/6.4]**.

7.4.6 The assessment involves the calculation of sound emissions from the construction site based on the sound power levels associated with the plant or equipment to be used, and the propagation from sound source to the NSR locations. Sound power levels are taken from manufacturers data and/or archive data given in BS 5228 Part 1. The calculated levels are then compared to nominated criteria to determine whether an adverse impact is expected.

7.4.7 For residential NSRs, the 'ABC' method (detailed in BS 5228 Part 1 Section E.3.2) sets construction noise thresholds for residential NSRs for different time periods (e.g. day, evening, night and weekends) based on the existing ambient noise levels. For the appropriate period (day, evening, night, weekend etc.), the existing ambient noise level is determined and rounded to the nearest 5 dB and the appropriate threshold value is then derived. The predicted construction noise level is then compared with this construction noise threshold value.

7.4.8 The ABC method has then been used as a basis to define criteria that constitutes a potential significant effect at residential receptors. The ABC method is reproduced in **Table 7-3**.

Table 7-3: Construction noise thresholds at residential dwellings

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
<p>NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.</p> <p>NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.</p> <p>NOTE 3: Applies to residential receptors only.</p>			
<p>(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</p> <p>(b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.</p> <p>(c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.</p> <p>(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.</p>			

- 7.4.9 Based upon the BS 5228 ABC method (Ref 7-2), the criterion adopted for the determination of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be equivalent to the SOAEL, although as stated in BS 5228, other project-specific factors, such as the number of NSRs affected and the duration and character of the impact, should also be considered by the assessor when determining if there is a potentially significant effect.
- 7.4.10 For residential receptors and other high sensitivity human receptors, the criterion for the LOAEL – see **Table 7-2** for further details - is a predicted construction noise level equal to the existing ambient noise level at each NSR i.e. resulting in a 3 dB increase in noise level when combined with the existing ambient noise level (decibels are measured on a logarithmic scale so noise levels cannot be summed arithmetically – two sounds of equal level combine to raise the overall sound level by 3 dB).
- 7.4.11 In accordance with planning policy, significant adverse effects (at or above the SOAEL) should be avoided and other adverse effects (at or above the LOAEL) should be mitigated and minimised, where possible. The assessment focuses on the effects at the nearest existing residential NSRs on Queens Road and the eastern edge of Immingham’s main urban residential area to the west (the closest NSRs to the works). If adverse effects can be avoided at these NSRs, the effects will be less at greater distances.
- 7.4.12 Based on the above, the magnitude of construction noise impacts on residential receptors has been classified in accordance with the criteria in **Table 7-4**.

Table 7-4: Construction noise magnitude of impact for residential receptors

Magnitude of Impact	Comparison with Threshold Value $L_{Aeq,T}$ dB
High	Exceedance of ABC Threshold Value (the SOAEL) by $\geq +5$ dB
Medium	Exceedance of ABC Threshold Value (the SOAEL) by up to +5 dB
Low	Equal to or below the ABC Threshold Value (the SOAEL) by up to -5 dB
Very Low	Below the ABC Threshold Value (the SOAEL) by ≥ -5 dB

7.4.13 A quantitative assessment of construction noise has been undertaken to identify potentially significant effects and this has been based upon the available information regarding construction activities and plant requirements.

Noise from construction traffic on existing roads

7.4.14 The noise impacts of construction traffic along existing roads have been assessed with reference to the National Highways document DMRB LA111 (Ref 7-12).

7.4.15 The change in noise level for relevant road links is predicted based on the Calculation of Road Traffic Noise (“CRTN”) (Ref 7-9) Basic Noise Level (“BNL”) methodology.

7.4.16 The relevant links assessed represent the relevant highway routes that would be taken by Project construction traffic between the Site and the A180. Noise impacts along the construction traffic routes are considered only where there are NSRs along those routes.

7.4.17 BNL predictions have been undertaken for both “with” and “without” construction traffic scenarios for each road link expected to be used by construction vehicles, using daily traffic flows from the transport assessment (**Chapter 11: Traffic and Transport [TR030008/APP/6.2]**).

7.4.18 The criteria for the assessment of traffic noise changes arising from construction road traffic are taken from Table 3.17 of DMRB LA111 (Ref 7-12) as reproduced in **Table 7-5**. Magnitude of impact descriptors corresponding to the terminology used in this impact assessment methodology are provided in parenthesis where they differ from DMRB terminology.

Table 7-5: Magnitude of impact at noise sensitive receptors from construction traffic

Magnitude of impact	Change in traffic noise level $L_{A10,18h}$ dB
Major (High)	≥ 5
Moderate (Medium)	3 to <5
Minor (Low)	1 to <3
Negligible (Very Low)	<1

Construction vibration impacts on humans - annoyance

- 7.4.19 Vibration due to construction activities has the potential to result in adverse impacts at nearby human receptors. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228-2: 2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (Ref 7-2) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings/structures and annoyance to occupiers.
- 7.4.20 Table E.1 of BS 5228-2 contains a general method for calculation of Peak Particle Velocity ("PPV") from percussive piling. This method is designed for use on any percussive piling with limited consideration of ground conditions so risks producing exaggerated worst-case levels. For the landside piling in Work Area No.7, Work Area No.5 and Work Area No.3, pile design is not yet complete, but a low noise approach to terrestrial piling, such as the use of bored or cast in situ piles, would be adopted to minimise noise and vibration during piling activities. The final piling method will be determined once the contractor has been appointed and will be confirmed in the final CEMP.
- 7.4.21 **Table 7-6** sets out PPV vibration levels and provides a semantic scale for the description of demolition and construction vibration impacts on human receptors, based on guidance contained in BS 5228-2, for reference where assessment of construction vibration impacts on human receptors is required.

Table 7-6: Construction vibration threshold at residential dwellings

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
≥ 10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High
1.0 to < 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
0.3 to < 1.0 mm/s	Vibration might be just perceptible in residential environments.	Low
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very low

- 7.4.22 For residential receptors, the LOAEL is defined as a PPV of 0.3 mm/s (millimetres per second); this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level at which construction vibration can be tolerated with prior warning.
- 7.4.23 At receptors above the SOAEL, further consideration of whether an effect is significant has been undertaken using professional judgement, taking account of the duration and frequency of the effect, as well as the time of day/evening/night that the effect would be experienced.
- 7.4.24 Given the significant distance from Work Area No. 7 to residential NSRs represented by NSR3 and NSR 4 (NSR 2 and NSR 3 in the scoping report) (see **Table 7-11**) significant vibration effects are not expected to result from the proposed construction or decommissioning activities associated with the Project, as acknowledged in the Scoping Opinion (**Appendix 1.A [TR030008/APP/6.4]**), and therefore further assessment is scoped out.

Construction vibration impacts on buildings and structures

- 7.4.25 Buildings and structures may be damaged by high levels of vibration. The closest point between the existing NSRs and the Site is approximately 16 m and therefore there is the potential for significant effects depending upon the construction works required in the vicinity of existing buildings.
- 7.4.26 The principal concern is generally transient vibration, for example due to piling or significant earthworks such as ground compaction.
- 7.4.27 BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration' (Ref 7-22) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014 (Ref 7-2, Ref 7-3). Guide values for transient vibration, above which cosmetic damage could occur, are given in **Table 7-7**.

Table 7-7: Transient vibration guide values for cosmetic damage

Peak Particle Velocity (PPV) level	Description Magnitude of impact	
	4 Hz to 15Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Values referred to are at the base of the building

Note 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

7.4.28 Percussive impact piling is classed as transient vibration as it comprises of discreet individual events. BS 7385-2 (Ref 7-22) states that the probability of building damage tends to be zero for transient vibration levels less than 12.5 mm/s PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

7.4.29 It is noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 (Ref 7-23) defines three different categories of building damage:

- a. Cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions.
- b. Minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block.
- c. Major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

7.4.30 BS 7385-2:1993 (Ref 7-22) defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in **Table 7-8** for both transient and continuous vibration.

Table 7-8: Magnitude of impact – construction vibration building damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mm/s		Transient Vibration Level PPV mm/s	
		Unreinforced or light framed structures	Reinforced or framed structures	Unreinforced or light framed structures	Reinforced or framed structures
High	Major	≥30	≥100	≥60	≥200
Medium	Minor	15 to <30	50 to <100	30 to <60	100 to <200
Low	Cosmetic	6 to <15	25 to <50	12 to <30	50 to <100
Very low	Negligible	<6	<25	<12	<50

7.4.31 These values for construction vibration building damage are applied within this Chapter where activities of a significant vibration producing nature are likely to be required at the development site during construction.

Operational Phase Impacts

7.4.32 To determine the potential noise and vibration impacts that may arise during the operational phase of the Project, the following matters have been considered:

- a. Noise from mechanical plant associated with the Work Area No. 3, Work Area No. 5 Area and Work Area No. 7.
- b. Noise from traffic movements on the local highways associated with export of liquified hydrogen product.

7.4.33 As stated in **Chapter 2: The Project [TR030008/APP/6.2]**, as a worst case there will be 292 vessel movements per year. However, given the large distance between the nearest residential NSRs in Immingham and the quayside (~2.5km), and the nature of the sound of a small number of additional vessel movements in an area where this source is an established part of the sound character of the area, it is considered unlikely that additional sea vessel noise would be perceptible and therefore a significant effect is considered unlikely.

7.4.34 Due to the low number (approximately four an hour) of HGV movements over a 24 hour period and typical noise levels produced by tanker filling operations on-site, the predictions for Heavy Goods vehicles (“HGV”) movements operating within the site have been excluded from the operational noise assessment due to the negligible impact on the overall operational noise level.

7.4.35 There are no sources of vibration from the operation of the Project which could significantly affect buildings, this includes both vibrations from operational plant on site and vibrations from on-site traffic movements. The distance between the Work Area No. 7 and the nearest NSRs is over 460m, therefore operational vibration impacts have been scoped out of this assessment.

Noise from operation of the Project (on-site sound sources)

- 7.4.36 Noise emissions from the operation of the Project have been predicted using CadnaA® noise modelling software which implements the calculation procedures of ISO 9613 ‘Acoustics – Attenuation of Sound During Propagation Outdoors’, (Ref 7-14) (as appropriate), and based upon information regarding the operating conditions and levels of sound generated by the mechanical and process plant on-site.
- 7.4.37 The assessment has been undertaken using BS 4142 (Ref 7-5) but a combination of methods, depending upon the applicability of the method relative to the sound source, have been used, as set out below.

BS 4142

- 7.4.38 An assessment of potential noise impact at nearby NSRs has been undertaken, where applicable, using the guidance in BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ (Ref 7-5).
- 7.4.39 A key aspect of the BS 4142 (Ref 7-5) assessment procedure is a comparison between the *background sound level* in the vicinity of residential locations and the rating level of the sound source under consideration. The relevant parameters in this instance are as follows:
- a. *Background sound level* – $L_{A90,T}$ – defined in the Standard as the “A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T , measured using time weighting F and quoted to the nearest whole number of decibels”;
 - b. *Specific sound level* – $L_s (L_{Aeq,Tr})$ – the “equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr ”; and
 - c. *Rating level* – $L_{Ar,Tr}$ – the “specific sound level plus any adjustment made for the characteristic features of the sound”.
- 7.4.40 BS 4142 (Ref 7-5) allows for corrections to be applied based upon the presence or expected presence of the following:
- a. *Tonality: up to +6 dB penalty* (ranging between a sound that is not tonal and one that is prominently tonal (i.e. containing a discreet frequency/frequency band), at the NSR location).
 - b. *Impulsivity: up to +9 dB penalty* (ranging between a sound that has no impulsive character and one that is highly impulsive (i.e. containing short pulses of high frequency components), at the NSR location) (this can be summed with tonality penalty).
 - c. *Other sound characteristics (neither tonal nor impulsive but still distinctive): +3 dB penalty.*
- 7.4.41 Once any adjustments have been made, the background sound level and the rating level are compared. The standard states that:
- a. “Typically, the greater the difference, the greater the magnitude of impact.

- b. *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c. *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- d. *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. 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.”*

7.4.42 Importantly, the context of the surrounding sound environment has been taken into consideration, as required by BS 4142 (Ref 7-5) when defining the overall significance of the impact.

7.4.43 Based on BS 4142 (Ref 7-5) guidance a one-hour assessment period during the day and a 15-minute assessment period at night has been used in this assessment.

7.4.44 **Table 7-9** illustrates the magnitude of impact scale to be used in the EIA based upon the numerical level difference. For BS 4142 (Ref 7-5) assessment purposes, the SOAEL is set at a rating level above the *background sound level* of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 7-9: Magnitude of impact for industrial sound

Magnitude of impact	BS 4142 descriptor	Rating level minus background sound level (dB)
High	No BS 4142 descriptor for this magnitude level	>15
Medium	Indication of a significant adverse impact, depending upon context	+10 approx.
Low	Indication of an adverse impact, depending upon context	+ 5 approx.
Very low	Indication of low impact, depending upon context	≤ 0

IEMA ‘Guidelines for Environmental Noise Impact Assessment’

7.4.45 The Institute of Environmental Management and Assessment’s (“IEMA”) ‘Guidelines for Environmental Noise Impact Assessment’ (Ref 7-13) have been used to assess the impact of changes in ambient sound level at NSRs due to the operation of the Project. On the impact of noise level changes, paragraph 2.7 of the guidelines state:

“For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions, and a 10 dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1 dB may be perceptible under some circumstances.”

7.4.46 The IEMA Guidelines (Ref 7-13) provide criteria for the magnitude of impacts due to noise level changes from a project, as shown in **Table 7-10**, and these have been used within the assessment.

Table 7-10: Categorising the magnitude of the noise change

Magnitude of Impact	Noise Change, dB
No change	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	>5

Noise from operation of the Project (road traffic noise)

7.4.47 An assessment of noise from road traffic during the operational phase of the Project has been undertaken using guidance provided in DMRB LA 111 (Ref 7-12), as set out earlier under the subsection “Noise from construction traffic on existing roads.”

Data and information sources

7.4.48 Baseline sound monitoring survey results (see **Section 7.7**) have been used to characterise the sound climate at the nearest NSRs to the Site Boundary. The sound survey data have been supplemented by a desk-based review of other available baseline information. The main desk-based sources of information that have been reviewed to assist in determining the baseline environment within the vicinity of the Site include:

- a. Satellite imagery (Google Maps)
- b. Ordnance Survey (“OS”) mapping.
- c. UK environmental noise mapping undertaken as per the requirements of the Environmental Noise Directive (“END”) Directive (Ref 7-10) viewed on Extrinsic England Noise and Air Quality Viewer (Ref 7-11).

7.4.49 The following sources of information have been reviewed and inform the assessment of likely significant effects of noise and vibration generated by the Project:

- a. Baseline sound monitoring surveys results.

- b. Construction plant and equipment data from similar installations.
- c. Construction noise data referenced in BS 5228 2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 1: Noise' (Ref 7-2).
- d. Works plans (**Figure 2.3 [TR030008/APP/6.3]**).
- e. Operational on-site plant and equipment data sound power level data from similar installations.
- f. OS mapping and aerial photography of the Site and surrounding area.
- g. Visit to the area around the Site Boundary.
- h. Project description and construction information in **Chapter 2: The Project [TR030008/APP/6.2]**.
- i. Construction traffic flow data from the transport assessment (see **Chapter 11: Traffic and Transport [TR030008/APP/6.2]**).

Determining baseline conditions and noise and vibration sensitive receptors

- 7.4.50 The location of potential NSRs in proximity to the Site Boundary has been considered when assessing the effects associated with noise and vibration levels from the construction, operational (including maintenance) and decommissioning phases of the Project.
- 7.4.51 Key NSR locations which are considered representative of the nearest and potentially most sensitive existing receptors to the Site have been identified, based upon knowledge of the local area and professional judgement. It is considered that if noise and vibration levels are suitably controlled at these receptors, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area, but which are more distant. The NSRs are described in **Table 7-11** and illustrated **on Figure 7.1 [TR030008/APP/6.4]**. The classification of sensitivity is taken from **Table 7-12**.

Table 7-11: Representative noise sensitive receptors

Description	Sensitivity/ value of receptors	Distance and Direction from the Site Boundary (m)
Residential properties between 1-31 Queens Road. Two representative receptors have been selected as follows: - 31 Queens Road, I(“ NSR1 ”) and represents other NSRs at eastern end of row of properties - 1 Queens Road, (“ NSR2 ”) and represents other NSRs at western end of row of properties (Note: not all premises on Queens Road are residential NSRs as these premises also include business uses, which are classified as lower sensitivity – see Table 7-12)	High	Within the Work Area No. 7, immediately adjacent to the western Site Boundary

Description	Sensitivity/ value of receptors	Distance and Direction from the Site Boundary (m)
NSR1 and NSR2 are only being considered during the construction phase as they will not be occupied during the operational phase as explained in Chapter 2: The Project (TR030008/APP/6.2) .		
Residential properties at Chestnut Avenue, Waterworks Street and Spring Street (eastern extent of Immingham's residential urban area) Properties in this area are grouped together with the above and later referred to as NSR3 for the purpose of this assessment.	High	480m north-west of the Site Boundary
Residential properties at Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, Talbot Road and Kendal Road (eastern extent of Immingham's residential urban area) Properties in this area are later referred to as NSR4 for the purpose of this assessment.	High	460 m west of the Site Boundary

7.4.52 NIAs are those areas identified through strategic UK environmental noise mapping (Ref 7-11) where the top 1% of the population are affected by the highest noise levels in England. The nearest NIA is located in Great Coates on the A1136 around the junction with Aylesby Road. This is approximately 5.6km from the Site Boundary and beyond the study area (as set out in **Section 7.6**) over which noise effects are considered likely - noise impacts from the Project at this location are unlikely.

7.4.53 A description of the study areas for ecological receptors is presented in **Chapter 8: Nature Conservation (Terrestrial Ecology)** and **Chapter 9: Nature Conservation (Marine Ecology)** [TR030008/APP/6.2] which describe the key noise sensitive ecological receptors and presents an assessment of noise impacts on those receptors as relevant.

Baseline sound data collection

7.4.54 In order to help define existing sound conditions at these NSRs, ambient sound measurements have been undertaken following the requirements of BS 7445 1: 2003 'Description and measurement of environmental noise. Guide to quantities and procedures' (Ref 7-1), in particular regarding instrumentation and monitoring methodology. Attended sound measurements surveys were undertaken in October 2022 at two representative residential locations in the vicinity of the Site Boundary, as follows:

- a. **ML1** – outside 31 Queens Road, Immingham (representing NSR1 at the eastern end of Queens Road).

- b. **ML2** – on land off Worsley Road (representing NSR4 on the eastern edge of Immingham).

7.4.55 In addition, unattended sound measurements surveys were undertaken in April 2023 at two further representative residential locations in the vicinity of the Site to supplement the attended monitoring which was undertaken in October 2022. The unattended sound monitoring locations are as follows:

- a. **ML3** – inside garden of 17 Spring Street, Immingham (representing NSR3 on the eastern edge of Immingham).
- b. **ML4** – inside garden of 29 Talbot Road, Immingham (representing NSR4 on the eastern edge of Immingham).

7.4.56 All monitoring locations are presented on **Figure 7.1 [TR030008/APP/6.3]**. The surveys at ML1 and ML2 included a minimum of one-hour measurements during the daytime (between the hours 07:00 to 23:00) and 30-minutes during the night-time (between the hours of 23:00 to 07:00). The surveys at ML3 and ML4 included a minimum of seven days of baseline sound level data collection. Each sound level meter was set to log the L_{AF10} , L_{Aeq} , L_{AF90} and L_{AFmax} parameters.

7.4.57 All measurements were taken at approximately 1.4 m above ground level and were positioned at least 3.5m from any reflecting surface, other than the ground (i.e. free-field). Details of ongoing activities and noise sources in the area were recorded whilst in attendance at the monitoring locations and around the Site.

7.4.58 The weather conditions during the attended survey periods were all within the parameters set out in the relevant guidance documents including BS 7445 (Ref 7-1) and BS 5228-1 (Ref 7-2). During the unattended survey period, some meteorological conditions fell outside the acceptable range and therefore baseline data collected at these times have been excluded from use in this assessment.

7.4.59 The sound level meters and associated microphones were field calibrated at the beginning and end of their respective measurement periods in accordance with recommended practice. No significant drift in calibration was observed. The accuracy of the calibrator can be traced to the National Physical Laboratory Standards.

7.4.60 Details of the survey locations, equipment used and conditions recorded within the Site Boundary can be found in **Appendix 7.A Baseline Sound Survey [TR030008/APP/6.4]**.

7.4.61 In addition to the baseline surveys undertaken in April 2023 and October 2022 for the Project, baseline data was collected during 2021-22 for the Applicant's separate 'Immingham Eastern Ro-Ro Terminal' ("IERRT") project (on Port land to the east and north of the Site Boundary). The attended monitoring for IERRT was undertaken over a 24 hour period and is used in this assessment as additional baseline sound data to determine construction noise thresholds for NSRs on Queens Road. The sound monitoring location of relevance to this Project is:

- a. **I_ML5** – opposite Queens Road Café, Queens Road, Immingham (referred to as location M2 in IERRT Environmental Statement and representing the western end of Queens Road NSR2).

Defining Significance of Effect

Sensitivity/value of receptors

7.4.62 Noise and vibration effects have been classified based on the relevant magnitude of the impact (as outlined above for the various potential impacts during construction, operation and decommissioning) and the sensitivity or value of the affected receptor. The scale of receptor sensitivity presented in **Table 7-12** has been based on professional judgement and classifications adopted for other recent EIAs for DCO applications.

Table 7-12: Sensitivity/value of receptors

Sensitivity/ Value of Resource/ Receptor	Description	Example of Receptor Usage
Very high	Receptors where noise or vibration will significantly affect the function of a receptor	<ul style="list-style-type: none"> a. Auditoria/studios. b. Specialist medical/teaching centres, or laboratories with highly sensitive equipment.
High	Receptors where people or operations are particularly susceptible to noise or vibration	<ul style="list-style-type: none"> a. Residential. b. Quiet outdoor areas used for recreation. c. Conference facilities. d. Schools/educational facilities in the daytime. e. Hospitals/residential care homes. f. Libraries.
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	<ul style="list-style-type: none"> a. Offices. b. Restaurants/retail. c. Sports grounds when spectator or noise is not a normal part of the sports event and where quiet conditions are necessary (e.g.: tennis, golf).
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	<ul style="list-style-type: none"> a. Residences and other buildings not occupied during working hours. b. Factories and working environments with existing high noise levels. c. Sports grounds when spectator or noise is a normal part of the sports event.

Classification of effects

- 7.4.63 Impacts are defined as changes arising from the Project, and consideration of the result of these impacts on environmental receptors enables the identification of associated effects, and their classification (major, moderate, minor and negligible, and adverse, neutral or beneficial). Each effect has been classified after embedded and standard mitigation measures have been applied. The residual effects are then assessed after additional mitigation (if required) has been applied as set out in **Chapter 5: The EIA Process [TR030008/APP/6.4]**.
- 7.4.64 The following terminology has been used in the assessment to define effects:
- a. Adverse – detrimental or negative effects to an environmental resource or receptor.
 - b. Neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial.
 - c. Beneficial – advantageous or positive effect to an environmental resource or receptor.
- 7.4.65 The effect resulting from each individual potential impact type detailed above has been classified according to the relevant magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in **Table 7-13**. Where necessary the context of the acoustic environment has also been considered in determining the classification of effect.

Table 7-13: Classification of effects

Sensitivity/Value of Resource/Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
Very high	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

- 7.4.66 Where adverse or beneficial effects are identified, these have been assessed against the following significance scale, derived using the matrix presented in **Table 7-13**:
- a. Negligible – imperceptible effect of no significant consequence.
 - b. Minor – slight, very short or highly localised effect of no significant consequence.
 - c. Moderate – limited effect (by extent, duration or magnitude), which may be considered significant.

- d. Major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

7.4.67 For the purposes of this assessment, negligible and minor effects are considered to be not significant, whereas moderate and major effects are considered to be significant. Where necessary, the context of the existing acoustic environment has also been taken into account in determining the classification of effect.

7.5 Limitations and Assumptions

Applicable to all Project Phases

7.5.1 The information presented in this assessment is based on the Works plans (**Figure 2.3 [TR030008/APP/6.3]**) for the Project and the maximum likely extents of land required for its construction and operation, and subsequent decommissioning (of the hydrogen production facilities and the jetty topside infrastructure) within each work plan.

7.5.2 The construction and operational traffic noise assessment is based on the 18 hour Average Annual Weekday Traffic (AAWT) data provided by the traffic team. The vehicle speeds have been based on the speed limit of the roads.

Operation

7.5.3 A 'reasonable worst case' operational layout has been assessed which is defined as follows:

- a. The operational layout of Work No. 7 ('West Site') and Work No. 5 ('East Site') are configured such that the noisiest possible configuration of Hydrogen Production Units ("HPUs") and Hydrogen Liquefiers has been assessed, in the context of the NSRs at the eastern edge of Immingham to the west. The HPUs are noisier and this configuration therefore assumes a HPU at the western edge of Work Area 7b. This is also the case for Work No. 7a, where two HPUs are placed at the western edge of the Work Area boundary.
- b. The HPUs and Hydrogen Liquefiers are themselves comprised of a number of individual plant elements, some of which generate noise. The items of plant are spatially separated as determined by their process function. The assessment assumes the noisiest possible configuration for an individual HPU or Hydrogen Liquefier in the context of the NSRs at the eastern edge of Immingham. The noisiest plant element is the Flue Stack (ID Fan) for a HPU and the Two N2 Componders for a Hydrogen Liquefier.
- c. This approach means that in future a different configuration could be brought forward and the noise effects at the NSRs on the Eastern edge of Immingham would be no worse than that assessed in the ES.

7.5.4 Details of the operational plant and noise modelling assumptions can be found in **Appendix 7.C Operational Noise Information [TR030008/APP/6.4]**. The operational assessment has assumed that operational plant with potential sound of a tonal, impulsive or intermittent nature (according to BS4142: 2014) will be designed out of the Project during the detailed design phase.

Construction

- 7.5.5 The final construction methods and plant requirements will not be available until the construction contractor is appointed. The construction noise assessment, whilst quantitative, is based primarily on construction plant which is likely to be used, and professional judgement and is therefore considered robust.
- 7.5.6 The construction noise assessment has been carried out assuming the construction plant are operating in Work Area No. 7 are located at the realistic closest approach to the NSRs. Therefore, this is a realistic worst-case scenario, as not all the plant will be at the realistic closest approach for the full duration, and the construction plant is likely to spread across the Work Area No.7. Construction noise thresholds (limit values) are based upon existing ambient sound levels at NSRs. Details of the construction plant and assumptions used for the construction assessment can be found in **Appendix 7.B Construction Noise Information [TR030008/APP/6.4]**.
- 7.5.7 The final piling rigs for the marine works are not yet confirmed. Different piling rigs may be used during construction but the pile hammer energy and noise levels associated with CG300 used in this assessment in **Paragraphs 7.9.26 to 7.9.34** is considered a realistic worst-case.
- ## 7.6 Study Area
- 7.6.1 There is no change to the overall study area set out in the Scoping Report (**Appendix 1.A [TR030008/APP/6.4]**).
- 7.6.2 The study area covers the spatial extents over which potential direct and indirect airborne noise and vibration effects of the Project may occur during construction, operation and decommissioning at human receptors.
- 7.6.3 For construction noise and vibration on-site, the consideration of NSRs within up to 300 m of the Site Boundary is considered to be adequate to capture all significant effects, although additional residential receptors approximately 460m – 500m from the Site Boundary at the south-eastern edge of Immingham have also been considered for completeness. This includes residential NSRs on Queens Road as the residents of these properties may be present during construction.
- 7.6.4 For operational noise on-site, the study area extends to NSRs up to approximately 500m from the Site Boundary, which includes the residential NSRs at the south-eastern edge of Immingham. However residential NSRs on Queens Road are excluded from the operational assessment as the residential use of these buildings would need to cease for the hydrogen production facility to become operational, given the requirements of the Control of Major Accidents Hazards (“COMAH”) regulations.
- 7.6.5 For the assessment of changes in road traffic noise, NSRs within 50m of the roads which would be used by vehicles associated with construction and operational phase activities define the study area. Again, residential NSRs on Queens Road have been considered where appropriate during the construction phase, but not during the operational phase.

7.7 Baseline Conditions

Existing Baseline

- 7.7.1 The typical sources of sound contributing to the baseline sound environment at NSRs along Queens Road (in the vicinity of ML1 and I_ML5, and represented by NSR1 and NSR2 – as detailed in **Paragraphs 7.4.54** and **7.4.61**, and **Table 7-11**) are road traffic and industrial/commercial/port activities. More specifically, sound sources comprise road traffic on Queens Road outside the front of the residential properties, more distant road traffic from the A1173 to the west, industrial/commercial activities from premises to the north side of the Queens Road (Knauf Plant) and more general distant sound from industrial premises including power production, manufacturing, waste, port facilities in the wider area, and occasional distant aircraft.
- 7.7.2 At NSRs to the west of the Project on the eastern edge of Immingham (in the vicinity of ML2, ML3 and ML4 and represented by NSR3 and NSR4) sources likely to influence/dominate the baseline sound environment are the road traffic on the A1173 and A180, more distant industrial/commercial premises to the east of the A1173 (associated with power production, manufacturing, waste and port facilities) and occasional distant aircraft.
- 7.7.3 Descriptions of noise sources observed on site during the measurements for the Project at ML1, ML2 and I_ML3 during the daytime are included in **Table 7-14** and night-time noise sources are included in **Table 7-15**.

Table 7-14: Daytime measurement details

Location	Date	Time of day	Description of sound environment
ML1	04/10/2022	11:46-12:46	Dominated mainly by traffic noise from Queens Road. Other sources comprised a continuous, tonal sound from a factory north of Queens Road and distant traffic.
ML2	04/10/2022	11:30-13:00	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant traffic on A1173, drive-bys of vehicles turning around, distant playground noise from nearby schools.
ML3	19/04/2023 – 26/04/2023	15.45 – 14.00	Alarm from east Port. Port noise, neighbouring dogs, A180 road noise, birdsong.

Location	Date	Time of day	Description of sound environment
ML4	19/04/2023 – 27/04/2023	14.00-11.45	Alarm from east Port. Occasional noise from footpath, A180 road noise, birdsong.
I_ML5	17/11/2022 24/03/2022 25/03/2022 03/03/2022	07.00 – 23.00 (number of visits undertaken to cover the full daytime period)	Dominated by road traffic noise from Queens Road with some contribution from a welding and fabrication workshop in the vicinity. Other sources include a steady industrial hum, and birdsong.

Table 7-15: Night-time measurement details

Location	Date	Time of day	Noise Description
ML1	04/10/2022	01:00-02:00	Dominated mainly by continuous, tonal sound from a factory north of Queens Road. Other sources comprised of traffic passing on Queens Road, the occasional release of steam from the factory in the north, distant industry, distant road noise from A1173 or A180.
ML2	04/10/2022	02:30-03:30	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant road noise from A1173 or A180, unidentified whirring from west.
ML3	19/04/2023 – 26/04/2023	23.00-07.00	Unattended monitoring.
ML4	19/04/2023 – 27/04/2023	23.00-07.00	Unattended monitoring.
I_ML5	22/03/2022 23/03/2022	23.00 – 07.00	Dominated by a hum from a building to the northwest, intermittent and irregular high frequency bursts. Contribution from road traffic noise on Queens Road and other local roads.

7.7.4 A summary of the daytime sound levels for monitoring locations are presented in **Table 7-16**.

Table 7-16: Daytime sound levels during survey periods

Measurement Location	Start Time	Duration/ End Time	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	11:46	15 min	69	50	92	72
	12:01	15 min	70	49	89	73
	12:16	15 min	69	48	87	73
	12:31	15 min	69	49	88	73
ML2	11:30	15 min	41	48	68	53
	11:45	15 min	50	47	61	52
	12:00	15 min	49	46	58	51
	12:15	15 min	53	46	77	52
	12:30	15 min	51	46	74	53
	12:45	15 min	49	46	62	51
ML3	07:00 (20/4/23)	23:00	66	45	83	52
	07:00 (21/4/23)	23:00	50	45	75	50
	07:00 (22/4/23)	23:00	48	43	79	50
	07:00 (23/4/23)	23:00	47	40	73	49
	07:00 (24/4/23)	23:00	48	42	82	49
	07:00 (25/4/23)	23:00	47	41	76	48
ML4	07:00 (20/4/23)	23:00	62	45	83	50
	07:00 (21/4/23)	23:00	49	45	72	49
	07:00 (22/4/23)	23:00	46	38	75	47

Immingham Green Energy Terminal
Environmental Statement Chapter 7: Noise and Vibration

Measurement Location	Start Time	Duration/ End Time	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
	07:00 (23/4/23)	23:00	45	40	78	46
	07:00 (24/4/23)	23:00	48	43	80	48
	07:00 (25/4/23)	23:00	47	41	76	48
I_ML5	07:12	1 hour	70	46	80	62
	08:12	1 hour	70	51	85	75
	09:12	1 hour	69	51	87	73
	10:12	1 hour	70	51	97	74
	11:12	1 hour	69	49	84	74
	12:09	1 hour	69	47	85	73
	12:41	1 hour	71	51	87	75
	13:09	1 hour	70	48	97	74
	13:41	1 hour	71	53	86	75
	14:09	1 hour	70	48	88	74
	14:41	1 hour	70	52	86	74
	15:09	1 hour	70	47	88	74
	16:24	1 hour	71	50	86	75
	17:24	1 hour	71	45	87	75
	18:23	1 hour	68	45	87	72
	19:23	1 hour	66	44	88	68
	20:23	1 hour	65	44	84	67
21:00	1 hour	61	46	85	58	
22:00	1 hour	62	46	85	63	

All values are in A-weighted dB re 20 μ Pa, Free-field

7.7.5 A summary of the night-time sound levels for the monitoring locations are presented in **Table 7-17**.

Table 7-17: Night-time sound levels during survey periods

Measurement Location	Start Time	Duration/End Time	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	01:00	15 min	58	41	84	47
	01:15	15 min	60	42	87	47
	01:30	15 min	62	42	90	48
	01:45	15 min	54	41	81	45
ML2	02:30	15 min	41	38	51	53
	02:45	15 min	41	37	51	53
	03:00	15 min	40	36	51	53
	03:15	15 min	41	38	51	53
ML3	23:00 (19/4/23)	07:00	55	44	67	48
	23:00 (20/4/23)	07:00	45	41	70	45
	23:00 (21/4/23)	07:00	43	37	69	43
	23:00 (22/4/23)	07:00	43	38	67	45
	23:00 (23/4/23)	07:00	41	36	76	41
	23:00 (24/4/23)	07:00	41	38	71	41
	23:00 (25/4/23)	07:00	49	43	74	48

Immingham Green Energy Terminal
Environmental Statement Chapter 7: Noise and Vibration

Measurement Location	Start Time	Duration/End Time	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML4	23:00 (19/4/23)	07:00	57	44	71	48
	23:00 (20/4/23)	07:00	47	41	70	46
	23:00 (21/4/23)	07:00	44	36	69	43
	23:00 (22/4/23)	07:00	45	36	69	44
	23:00 (23/4/23)	07:00	44	38	71	43
	23:00 (24/4/23)	07:00	46	40	73	45
	23:00 (25/4/23)	07:00	49	40	74	47
I_ML5	23:00	1 hour	61	46	84	59
	00:00	1 hour	57	46	82	49
	01:00	1 hour	56	46	80	49
	02:00	1 hour	54	45	80	48
	03:00	1 hour	56	45	82	50
	04:00	1 hour	58	45	81	50
	05:00	1 hour	64	46	92	64
	06:00	1 hour	65	46	83	68

All values are in A-weighted dB re 20 μ Pa, Free-field

Representative Baseline Sound Levels

7.7.6 Representative baseline sound levels have been established for daytime and night-time periods. **Table 7-18** summarises the defined ambient sound levels and background sound levels taken forward within this ES for the NSRs in the vicinity of each noise monitoring location within the BS 5228 (Ref 7-2) construction noise assessment and the BS 4142 (Ref 7-5) operational sound assessment, respectively.

Table 7-18: Representative ambient (L_{Aeq}) and background (L_{A90}) sound levels

Assessment Period	NSR1 (eastern end of Queens Road) / ML1	NSR2 (western end of Queens Road) / I_ML5	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue) / ML3	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road) / ML2, ML4
Daytime L_{Aeq} dB (07.00 – 23.00)	69-70	69	58	55
Daytime L_{Aeq} dB (07.00 – 19.00)	69-70	70	51	50
Evening and Weekend L_{Aeq} dB *	N/A	65	46	45
Night-time L_{Aeq} dB (23.00 – 07.00)	54-62	60	48	50
Daytime L_{A90} dB (07.00 – 23.00)	49	47	41	39
Night-time L_{A90} dB (23.00 – 07.00)	41	46	39	37
* 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.				

Future Baseline

7.7.7 Much of the Site Boundary bounds the operational Port of Immingham, which has been in active use for port purposes for a number of decades. The A1173 provides a major route for traffic to and from the A180 to the south and A160 to the northwest. Queens Road provides a key access to the eastern side of the Port and other industrial premises to the east and south off the A1173.

7.7.8 In the absence of the Project, the sound environment at NSRs in the vicinity would continue to be influenced/dominated by road traffic noise and port/commercial/industrial activity.

7.7.9 Future (2028) ‘without’ Project traffic (which included committed developments) as set out in **Chapter 11: Traffic and Transport [TR030008/APP/6.2]** has been reviewed to determine the potential change in future baseline sound levels at NSRs, with respect to road traffic noise. There is anticipated to be an increase in noise levels of between 1 to 3 dB on the roads within the traffic study area. However, as a worst case, the construction and operational assessment have been based on current baseline sound data.

7.8 Development Design and Impact Avoidance

7.8.1 The following mitigation measures for construction phase are standard mitigation measures that the construction contractor would follow as best practice and based on the guidance in BS 5228 (Parts 1 and 2) (Ref 7-2, Ref 7-3) as stated in the Outline Construction Environmental Management Plan (“CEMP”). For the operation phase the embedded mitigation measures are included as part of the design of the Project.

Construction Phase Noise and Vibration - Standard Mitigation

7.8.2 The core landside and marine construction working hours are stated in **Chapter 2: The Project [TR030008/APP/6.2]**. As stated in Chapter 2, some construction activities, such as major concrete pours, often take longer than the core construction hours. Where on-site works are to be conducted outside these core hours, they would comply with any restrictions agreed with the local planning authority. Any such works would be minimised and be carefully managed to reduce effects on local people.

7.8.3 Measures to mitigate noise and vibration would be implemented during the construction phase in order to minimise impacts at local NSRs, particularly with respect to any activities required outside of core working hours. Mitigation included the **Outline CEMP [TR030008/APP/6.5]** includes:

- a. Ensuring that processes are in place to minimise noise and vibration before works begin and ensuring that best practical means (“BPM”) are being achieved throughout the construction programme, including the use of localised screening around the main noise producing plant and activities.
- b. All contractors will be familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (Ref 7-2; Ref 7-3), which will be a prerequisite of their appointment.
- c. Ensuring that modern plant is used, complying with applicable UK noise emission requirements, and selection of inherently quiet plant where possible.
- d. All pneumatic percussive tools will be provided with effective silencers/ acoustic covers.
- e. Acoustic covers to engines will be kept closed when the engines are in use and idling.
- f. Hydraulic techniques for breaking to be used, where practical, in preference to percussive techniques where reasonably practicable.

- g. Use of lower noise and vibration piling (e.g. rotary bored or hydraulic jacking) rather than driven piling techniques, where reasonably practicable.
- h. No start-up or shut down of vibratory rollers near to receptors.
- i. Off-site pre-fabrication for components of the Project, where reasonably practicable.
- j. All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and vibration and switched off when not in use.
- k. Machines such as cranes that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum. Machines will not be left running unnecessarily.
- l. Where reasonably practicable, the contractor will use quieter working methods, the most suitable plant and reasonable hours of working for noisy operations.
- m. Where possible, the noisiest items of plant will be located the furthest distance from the nearby NSRs. Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from NSRs.
- n. Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Site to be conducted in such a manner as to minimise noise and vibration generation, as far as reasonably practicable.
- o. No employees, subcontractors and persons employed on the Site will cause unnecessary noise from their activities e.g. excessive 'revving' of vehicle engines, shouting and other noisy behaviour. No radios or other audio equipment will be allowed on site.
- p. Electrically powered plant will be used over diesel power generators where possible and feasible.
- q. Audible warning systems (including reversing alarms) will be switched to the minimum setting required by the Health and Safety Executive.
- r. Any tannoy system on site will be used for emergency use only.
- s. All contractor communication devices will be used at a minimum audible level.
- t. Appropriate routing of construction traffic on public roads and along access tracks, to reduce construction traffic noise, as far as reasonably practicable, as set out in the **Construction Traffic Management Plan ("CTMP") [TR030008/APP/6.7]**.
- u. Monitoring of noise and vibration complaints and reporting to the contractor for immediate investigation.

- 7.8.4 Regular communication with the local community throughout the construction period will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise and vibration may occur during specific operations, and providing lines of communication where complaints can be addressed.
- 7.8.5 Final CEMP(s) would be prepared by the Construction Contractor, based on the measures outlined above and detailed in the **Outline CEMP [TR030008/APP/6.4]** which accompanies the DCO Application. The Final CEMP(s) are secured by a Requirement in Schedule 2 of the **draft DCO [TR030008/APP/2.1]**. The Final CEMP(s) would include provisions to ensure that the noise and vibration impacts relating to construction activities are reduced, as far as reasonably practicable. The need for monitoring of noise levels during construction will be determined through the detailed assessment undertaken in the Final CEMP(s).

Operational Phase Noise and Vibration – Embedded Mitigation

- 7.8.6 For the operational phase, embedded mitigation includes (but is not limited to) items on site that are required for the operation of the site but are not explicitly used for acoustic attenuation. Examples include concrete fire walls which will provide a level of screening of plant noise from different areas on site, such as from HPUs, Hydrogen Liquefiers and utility areas.
- 7.8.7 Design decisions, such as the lagging of pipework for on-site plant have also been applied within the operational noise model and form part of embedded mitigation.
- 7.8.8 **Table 7-19** describes the items of plant within the operational noise model that have embedded mitigation attenuation values assigned to them.

Table 7-19: List of embedded mitigation used within the operational noise model

Embedded Mitigation	Item of Plant attenuated by embedded mitigation	Level of attenuation provided. (dB)
Concrete Fire Walls	H2 Refueling Station – Reciprocating Pumps (Work Plan No. 7)	10
Lagging of pipework in accordance with ISO 15665	Intercooler Skids/Oil Removal Skids (all) (Work Plan No. 7a and 7b)	5

- 7.8.9 Details of the operational plant sound power level data, sound insulation performance and breakout noise from on-site buildings can be found in **Appendix 7.C Operational Noise Information [TR030008/APP/6.4]**.
- 7.8.10 The control and monitoring of noise during operation will be secured by a requirement in the **draft DCO [TR030008/APP/2.1]**.

- 7.8.11 The Site will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency. This will require operational noise from the hydrogen production facility to be controlled through the use of Best Available Techniques (“BAT”), which will be determined through the Environmental Permit application.

Decommissioning Phase Noise and Vibration

- 7.8.12 The full details of decommissioning of the hydrogen production facility are uncertain at this time. However, the mitigation measures set out in this section for construction noise and vibration are also expected to be appropriate during the decommissioning stage.
- 7.8.13 Appropriate best practice mitigation measures to control noise effects will be applied during decommissioning works for the hydrogen production facility and are outlined in an outline **Decommissioning Environmental Management Plan** (“DEMP”) [TR030008/APP/6.4] which accompanies the application). The Final DEMP is secured by a requirement in the **draft DCO** [TR030008/APP/2.1]. The need for monitoring of noise levels during decommissioning will be determined through the detailed assessment undertaken in the Final DEMP.

7.9 Assessment of Likely Impacts and Effects

- 7.9.1 This section contains an assessment of the impacts and effects on NSRs as a result of the construction, operational and decommissioning phases of the Project. The main focus of the assessment is on the landside operations for the hydrogen production facilities on Work Area No. 7, Work Area No. 5 and Work Area No. 3.
- 7.9.2 This is the part of the Project closest in proximity to residential NSR1 and NSR2 at Queens Road and residential NSR3 and NSR4 at the eastern edge of Immingham to the west and is also most likely to be impacted by the Project related road traffic on local roads.
- 7.9.3 The following impact pathways have therefore been assessed:
- Potential noise and vibration impacts associated with activities on-site, during construction.
 - Potential vibration impacts on existing jetties and structures during marine piling.
 - Potential noise impacts associated with traffic movements on local highways, during construction.
 - Potential noise impacts from mechanical plant associated with the Work Area No. 7, Work Area No. 5, Work Area No.3, Hydrogen Liquefiers and HPUs activities, during operation.
 - Potential noise impacts associated with traffic movements on the local highways associated with export of liquified hydrogen product, during operation.

- f. Potential noise and vibration impacts associated with activities on-site, during decommissioning of the hydrogen production facilities.
- g. Potential noise impacts associated with traffic movements on the local highways, during decommissioning of the hydrogen production facility.

7.9.4 To summarise, the following pathways have been scoped out of the assessment:

- a. Noise and vibration impacts on residential NSRs from works in the Work Area No. 5 and Work Area No. 1 during construction and decommissioning.
- b. Vibration impacts on NSR 3 and NSR 4 from works in the Work Area No.7 during construction and decommissioning.
- c. Vibration impacts from on-site operations.
- d. Noise impacts from marine sea vessel movements (as explained in **Para 7.4.33**).

Construction Phase

7.9.5 Information regarding the construction works and programme are detailed in **Chapter 2: The Project [TR030008/APP/6.2]**.

Construction Noise Limits

7.9.6 Construction noise levels are likely to vary during different construction phases, depending on the location of work sites and proximity to NSRs. The nearest residential NSRs to the Site Boundary are on Queens Road (NSRs 1 and 2) and on the eastern edge of Immingham (NSRs 3 and 4). Based on the current ambient available noise levels at monitoring locations in both of these areas and the BS 5228 ABC category guidance in **Table 7-3**, construction noise limits based upon the measured data are:

- a. **NSR1 and NSR2** – representative of residential NSRs on Queens Road:
 - i. 75 dB $L_{Aeq,12hr}$ during week day daytime (07:00-19:00) and Saturdays (07:00-13:00).
 - ii. 65 dB $L_{Aeq,12hr}$ during evening and weekends (19:00-23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 -23:00 Sundays)
 - iii. 55 dB $L_{Aeq,8hr}$ during the night-time.(23:00-07:00 all nights)
- b. **NSR3 and NSR 4** – residential NSRs on the eastern edge of Immingham:
 - i. 65 dB $L_{Aeq,12hr}$ during week day daytime (07:00-19:00) and Saturdays (07:00-13:00).
 - ii. 55 dB $L_{Aeq,12hr}$ during evening and weekends (19:00-23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 -23:00 Sundays)
 - iii. 50 dB $L_{Aeq,8hr}$ during the night-time.(23:00-07:00 all nights).

7.9.7 Provided these noise limits, are not exceeded, the construction noise levels will be below the SOAEL.

Construction noise predictions from on-site works

- 7.9.8 The likely construction activities and the typical plant likely to be used during construction works have been considered based upon current information and using professional judgement.
- 7.9.9 The landside construction works have been broadly categorised into:
- a. Site clearance
 - b. Piling and foundations
 - c. Underground drainage and services
 - d. Roads and hardstanding
 - e. Buildings and plant installation
- 7.9.10 Typical plant for the landside works in the Work Area No. 7 are likely to include:
- a. Cranes
 - b. Telehandlers
 - c. Diesel generators
 - d. Hydraulic excavators
 - e. Dump trucks
 - f. Wheeled/front loaders
 - g. Tippers
 - h. Rollers
 - i. Asphalt/concrete plant
 - j. Concrete mixers and pumps
 - k. Compressors
 - l. Continuous flight auger piling rig
- 7.9.11 The noise levels generated by construction activities and experienced by nearby NSRs, such as residential properties, will depend upon a number of variables, the most important of which are:
- a. The noise generated by plant or equipment used on site, generally expressed as sound power levels.
 - b. The periods of operation of the plant on the site, known as its 'on-time'.
 - c. The distance between the noise source and the receptor.
 - d. The attenuation due to ground absorption, air absorption and barrier effects.
 - e. The existing noise environment and noise levels at the time of the works.

- 7.9.12 The construction noise predictions reported in this chapter have been undertaken using noise data for items of plant and calculation methodologies from BS 5228-1 and been based on construction methods used for similar projects. This gives an indication of where, at what stage, and during which construction activities, construction noise is at risk of leading to potentially adverse and significant adverse effects.
- 7.9.13 The predictions relate to construction activities being undertaken at the realistic closest location to each NSR irrespective of the phase of development i.e. the predicted noise level could occur at some stage during the full six phase build-out for NSRs 3 and 4. However, for NSR1 and NSR 2, the construction predictions are for Phase 1 only, as once Phase 1 becomes operational, NSR 1 and NSR 2 are will not be in residential use. The removal of residential use during the operational phase is secured by a requirement in Schedule 2 of the **draft DCO [TR030008/APP/2.1]**. Predictions have also been carried out assuming that all of the above construction activities occur concurrently. This gives an indication of whether, during a potential worst-case scenario, construction noise is at risk of leading to significant adverse effects at residential NSRs.
- 7.9.14 The predicted levels apply to the weekday daytime and Saturday morning construction limits and evening and weekend construction limits (as listed in **Paragraph 7.9.6**) to cover the core construction hours as detailed in **Chapter 2: The Project [TR030008/APP/6.2]**. The predicted construction levels could also be applied to other time periods where working at the same rate and intensity is proposed. Details regarding the noise prediction methodology, including a full list of indicative construction plant and associated sound power levels for each construction phase and assumptions, are presented in **Appendix 7.B [TR030008/APP/6.4]**.
- 7.9.15 A summary of indicative daytime noise level predictions at the NSR locations associated with the Work Area No. 7 construction is presented in **Table 7-20**. The indicative predicted noise levels include 5 dB to 10 dB attenuation (based on guidance in BS 5228 Table B.1 (Ref 7-2) due to the standard mitigation as detailed in **Section 7.7**.
- 7.9.16 As advised by BS 5228-1, noise levels predicted at distances over 300m (i.e. at NSRs 3 and 4 - residential NSRs at the eastern edge of Immingham) should be treated with caution due to the increasing importance of meteorological effects and therefore represent an overestimate.

Table 7-20: Predicted worst-case daytime construction noise levels - residential NSRs

Activity	Predicted construction noise level $L_{Aeq, T}$ dB (free-field)							
	NSR1 (eastern end of Queens Road)	Magnitude of Impact*	NSR2 (western end of Queens Road)	Magnitude of Impact*	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	Magnitude of Impact*	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	Magnitude of Impact*
Site clearance	73-78	Low-Medium (High)	71-76	Low-Medium (High)	52-57	Very Low (Low- Medium)	47-52	Very Low (Very Low- Low)
Piling and foundations	61-66	Very Low (Low- Medium)	67-72	Very Low- Low (Medium- High)	41-46	Very Low (Very Low)	36-41	Very Low (Very Low- Low)
Underground drainage and services	63-68	Very Low (Low- Medium)	67-72	Very Low- Low (Medium- High)	44-49	Very Low (Very Low)	38-43	Very Low (Very Low)
Roads and hard standing	73-78	Low-Medium (High)	70-75	Low (High)	49-54	Very Low (Very Low- Low)	44-49	Very Low (Very Low)

Activity	Predicted construction noise level $L_{Aeq, T}$ dB (free-field)							
	NSR1 (eastern end of Queens Road)	Magnitude of Impact*	NSR2 (western end of Queens Road)	Magnitude of Impact*	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	Magnitude of Impact*	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	Magnitude of Impact*
Buildings and plant installation	65-70	Very Low (Low-Medium)	69-74	Very Low (High)	44-49	Very Low (Very Low)	39-44	Very Low (Very Low)
All values are in A-weighted dB re 20 μ Pa, free-field * Magnitude of impact in brackets are for the Saturday afternoon period.								

- 7.9.17 Based on the above, and using professional judgement for Work Area No. 7 construction works, there is the potential for short-term temporary medium adverse impacts to arise if significant construction works for site clearance, and construction of site roads and hardstanding are undertaken at the closest location within the Site Boundary to the nearest NSRs on Queens Road. Based on the sensitivity of the NSRs (high) as shown in **Table 7-12** of this Chapter, this could result in up to **moderate adverse** effects which are **significant**.
- 7.9.18 For construction activities undertaken on Saturday afternoons (between 13:00 and 19:00), there is the potential for short-term temporary high adverse impacts to arise if significant construction works for site clearance, piling and foundations, construction of site roads and hardstanding and building and plant installation are undertaken at the closest location within the Work Area No. 7 Boundary to the nearest NSRs on Queens Road. Based on the sensitivity of the NSRs (high) as shown in **Table 7-12** of this Chapter, this could result in up to **major adverse** effects which are **significant**.
- 7.9.19 At the NSR3 and NSR4 on the eastern edge of Immingham, for example around Spring Street, Waterworks Road, Chestnut Avenue, Talbot Road Worsley Road, and Somerton Road, due to the much greater separation distance of between 460 – 530 m from the construction activities, predicted worst-case daytime construction noise levels would result in short-term temporary very low adverse impacts. Based on the sensitivity of the NSRs (high) as shown in **Table 7-12** of this Chapter, this could result in negligible effects which are not significant.
- 7.9.20 For construction activities undertaken on Saturday afternoons (between 13:00 and 19:00), there is the potential for short-term temporary medium adverse impacts to arise if significant construction works for site clearance, are undertaken at the closest location within the Work Area No. 7 Boundary to the nearest NSRs on Spring Street, Waterworks Road, and Chestnut Avenue. Based on the sensitivity of the NSRs (high) as shown in **Table 7-12** of this Chapter, this could result in up to **moderate adverse** effects which are **significant**.
- 7.9.21 Additional mitigation measures outlined in **Section 7.8** would further assist in minimising construction noise impacts.

Construction vibration impacts on humans from on-site activities

- 7.9.22 The level of impact at different receptors will be dependent upon a number of factors, including distance between the works and receptors, ground conditions, the nature and method of works required close to receptors and the specific activities being undertaken at any given time.
- 7.9.23 Typically construction works requiring piling or heavy machinery such as vibratory rollers can be associated with potentially significant levels of vibration. Piling is currently expected to be required on the Work Area No. 7; however, rotary bored or continuous flight auger piling is currently proposed, rather than impact driven piling. As stated in BS 5228 (Ref 7-2) vibration associated with continuous flight auger piling is minimal “as the processes do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions”.

- 7.9.24 Road rollers are currently proposed to be used at the Work Area No. 7, but it has been confirmed that vibratory rollers will not be used in close proximity of receptors on Queens Road, therefore, there would be no significant adverse effects in terms of vibration annoyance to occupants.
- 7.9.25 Due to large distances (minimum of 460m) between residential receptors on the east edge of Immingham and Work Area No. 7, vibration effects on both humans and buildings would be negligible.

Construction vibration impacts on the Immingham Oil Terminal Pipeline

- 7.9.26 As detailed in **Chapter 2: The Project [TR030008/APP/6.2]** and **Chapter 9: Nature Conservation (Marine Ecology) [TR030008/APP/6.2]**, piling will be required for the marine works; it is anticipated that this would likely use vibro/percussive techniques.
- 7.9.27 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receiver and the activities being undertaken.
- 7.9.28 To provide an initial assessment of likely vibration impacts on the IOT jetty empirical formulae derived by Hiller and Crabb (2000) has been used to predict a resulting PPV based on various piling parameters. The equations are summarised in Table E.1 in BS 5228 Part 2 (Ref 7-3) and the relevant ones shown below.
- 7.9.29 The equation used to predict PPV for percussive piling is:

$$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}} \right]$$

a. where:

- i. k_p is the scaling factor which is dependent on ground conditions. A value of 3 has been used (pile toe to be driven through: very stiff cohesive soils, dense granular soils, fill containing obstructions which are large relative to pile cross section).
- ii. W is the nominal hammer energy. 300,000 J have been used for this assessment (based on GC 300 piling rig).
- iii. r is the slope distance from the pile toe in metres, the closest distance from the IOT jetty to the piling area for IGET Jetty is approximately 178m.

- 7.9.30 Predicted PPV for vibratory piling in mm/s:

$$v_{res} = \frac{k_v}{x^\delta}$$

- a. k_v is the scaling factor for vibratory piling, and for a worst-case assessment 266 has been used.
- b. x is the distance measured along the ground surface in metres from the piling rig to the receptor. The closest distance from the IOT jetty to the piling area for IGET jetty is approximately 178 m.

c. δ is 1.3 for all operations.

7.9.31 The resultant predicted PPV for percussive and vibratory piling is shown in **Table 7-21** below together with the resultant magnitude of impact based upon **Table 7-8**. The existing jetties and pipelines are considered to be reinforced structures.

Table 7-21: Resultant PPV for percussive and vibratory piling

Receptor	Percussive Piling (300000 J)		Vibratory Piling	
	Predicted ppv Levels mm/s	Magnitude of Impact	Predicted ppv Levels mm/s	Magnitude of Impact
IOT Jetty	2.0	Very Low	0.3	Very Low

7.9.32 This initial vibration assessment shows the predicted PPV levels for percussive piling using a piling rig with 300000 J hammer energy are likely to result in a very low magnitude of impact (based on **Table 7-8** of this Chapter) for building damage, which will result in a **negligible adverse** effect (not significant).

7.9.33 Different piling rigs may be used during construction, but the pile hammer energy associated with the CG300 rig (300000J) is considered a worst case.

7.9.34 The predicted PPV levels for vibratory piling are likely to result in a very low magnitude of impact (based on **Table 7-8** of this Chapter), resulting in a **negligible adverse** effect (not significant).

Construction traffic on the local highway network

7.9.35 Construction traffic data has been provided from the assessment reported in **Chapter 11: Traffic and Transport [TR030008/APP/6.2]** for the traffic scenario 'without' and 'with' IGET construction traffic for 2026, which is the peak year for construction activity for all roads within the scope of the transport assessment as follows:

- a. Scenario 1- 'without' IGET construction traffic: 2026 base flows + committed developments.
- b. Scenario 2 –'with' IGET construction traffic: 2026 base flows + committed developments.

7.9.36 The traffic speed used is based on the road speed limit for each road link, and it has been assumed that traffic speeds will remain the same for all scenarios. Based on the 18hr AAWT flows, % HGVs and speed, the potential changes in road traffic noise from these road links as a result of the IGET construction traffic (i.e. by comparing the with and without IGET scenarios) have been considered by calculating the CRTN BNL at 10m from each road link.

7.9.37 **Table 7-22** below presents the results of the assessment together with the magnitude of impact classifications as set out in **Table 7-5** of this ES Chapter.

Table 7-22: Predicted change in construction road traffic noise levels

Road Link	Short-Term Change in BNL, (dB $L_{A10,18hr}$)	Magnitude of Impact
A180 E - Between East of A180/A1173 Junction	0.1	Negligible (Very Low)
A1173 - Between A1173/Kiln Lane and A1173/Kings Road	0.3	Negligible (Very Low)
Queens Road (WORK AREA NO. 7) - between A1173/Kings Road and Queens Road/Laporte Road	0.9	Negligible (Very Low)
Queens Road (WORK AREA NO. 5) - between A1173/Kings Road and Queens Road/Laporte Road	0.4	Negligible (Very Low)
Kings Road - between A1173/Kings Road and Kings Road/Pelham Road	0.1	Negligible (Very Low)
Manby Road - between A160/Manby Road and Kings Road/Pelham Road	0.0	Negligible (Very Low)
A160 - Between Manby Road/A160 and A160/A1077 Roundabout	0.0	Negligible (Very Low)
A160 - Between A160/A1077 Roundabout and A160/A180	0.0	Negligible (Very Low)
A180 W - Between A180/A1173 and A180/A160	0.1	Negligible (Very Low)
Laporte Road	0.1	Negligible (Very Low)

7.9.38 **Table 7-22** above shows predicted changes in traffic noise on all road links will result in a negligible magnitude of impact at nearby NSRs in both short-term and long-term scenarios. These predicted changes in construction traffic noise level will result in negligible effects (not significant) at all NSRs along the road links.

Operational Phase

Operational sound predictions from on-site plant

- 7.9.39 The operational facilities and equipment associated with the hydrogen production facility are located within Work Area No. 3, Work Area No.5 and Work Area No. 7, as shown in **Figure 2.3 [TR030008/APP/6.3]**.
- 7.9.40 On site plant been modelled as part of a “reasonable worst case” scenario based on the noisiest possible configuration of HPUs and Hydrogen Liquefiers within each applicable Work area as described in **Paragraph 7.5.5**.
- 7.9.41 Several models have been produced to seek out the potential worst-case scenario and highest noise levels at NSR. This has been through modelling different layouts of HPUs and Hydrogen Liquefier units across the Work Plan areas, and changes in unit orientation.
- 7.9.42 In analysing the different model variations that have been produced, the highest predicted noise levels at NSR have been used within the assessment.
- 7.9.43 There is limited scope for substantive change in layout of plant items within the HPUs and Hydrogen Liquefier areas across Work Area No. 3, Work Area No. 5 and Work Area No.7 due to the necessary process function.
- 7.9.44 This modelling of the Project layout is undertaken without additional noise mitigation above that is considered as embedded or standard as described in **Paragraph 7.8.6** and is therefore considered a reasonable worst-case assessment scenario.
- 7.9.45 The operational noise modelling comprises two main scenarios: Phase 1 operation of the associated development, potentially representative of the first three years after opening, and then full operation of Phases 1-6 thereafter.
- 7.9.46 Further details of the sound source sound power level data, the settings used in the noise modelling software and the list of assumptions used are presented in **Appendix 7.C [TR030008/APP/6.4]**.
- 7.9.47 In the absence of additional mitigation, the predicted free-field operational specific sound levels at the NSRs around the Site Boundary are presented in **Table 7-23**.

Table 7-23: Predicted worst-case operational specific sound levels

Phase	Predicted operational specific sound level $L_{Aeq,Tr}$ dB free-field	
	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)
Phase 1 Only	43-47	44-47
Phases 1-6 (full operation)	46-49	47-50

7.9.48 The NSRs presented represent the worst affected within the study area. It is anticipated that once constructed, the plant on-site will operate 24/7 and therefore the predicted sound levels could apply to both the 1-hour daytime or 15-minute night-time BS 4142 (Ref 7-5) assessment periods.

BS4142 assessment results

- 7.9.49 The magnitude of impact and effect classification has been included in **Table 7-24** and **Table 7-25**, to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in **Table 7-10**, **Table 7-11** and **Table 7-12**.
- 7.9.50 The values presented are the differences between the representative background sound level at each NSR (**Table 7-18**) and the predicted rating level (the specific sound level $L_{Aeq,T}$ presented in **Table 7-23** plus the character correction). Positive values in the table indicate an excess of the rating level over the background sound level. The representative background sound levels have been taken from **Table 7-18**.
- 7.9.51 The assessment has assumed that potential noise of a tonal, impulsive or intermittent nature will be designed out of the Project during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, inclusion of a +3 dB correction for other distinctive character has been included at this stage as a conservative approach for NSR with the potential to identify the new sound source in their existing acoustic environment.

Table 7-24: Daytime BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only		Phase 1-6 (full operation)	
	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)
Specific sound level $L_s (L_{Aeq,T})$, dB	43-47	44-47	46-49	47-50
Acoustic feature correction, dB	+3	+3	+3	+3
Rating level ($L_{Ar,T}$), dB	46-50	47-50	49-52	50-53
Representative <i>background sound level</i> ($L_{A90,T}$), dB	41	39	41	39
Excess of <i>rating level over background sound level</i> ($L_{Ar,T} - L_{A90,T}$), dB	+5 - +9	+8 - +11	+8- +11	+11 - +14
Magnitude of impact (assigned from Table 7-9)	Low - Medium	Low/Medium - Medium	Low/Medium - Medium	Medium - High
Initial BS 4142 classification of effect (assigned from Table 7-13)	Minor/Moderate adverse	Minor/Moderate - Moderate adverse	Minor/Moderate - Moderate adverse	Moderate - Major adverse

Receptor	Phase 1 only		Phase 1-6 (full operation)	
	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)
Uncertainty: The sound source data used within the operational noise model is based on data captured at existing sites and from available manufacture data				

Table 7-25: Night-time BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only		Phase 1-6 (full operation)	
	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)
Specific sound level $L_s (L_{Aeq,T})$, dB	43-47	44-47	46-49	47-50
Acoustic feature correction, dB	+3	+3	+3	+3
Rating level ($L_{Ar,T}$), dB	46-50	47-50	49-52	50-53
Representative <i>background sound level</i> ($L_{A90,T}$), dB	39	37	39	37

Receptor	Phase 1 only		Phase 1-6 (full operation)	
	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)	NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue))	NSR4 (vicinity of Talbot Road, Worsley Road & Somerton Road)
Excess of <i>rating level over background sound level</i> ($L_{Ar,Tr} - L_{A90,7}$), dB	+7 - +11	+10 - +13	+10 - +13	+13 - +16
Magnitude of impact (assigned from Table 7-9)	Low/Medium - Medium	Medium – Medium/High	Medium – Medium/High	Medium / High - High
Initial BS 4142 classification of effect (assigned from Table 7-13)	Minor/Moderate – Moderate adverse	Moderate – Major adverse	Moderate – Major Adverse	Major Adverse
Uncertainty: The sound source data used within the operational noise model is based on data captured at existing sites and from available manufacture data				

7.9.52 In accordance with **Table 7-10**, the values presented in **Table 7-24** and **Table 7-25** produce a range of impact magnitudes resulting in effects ranging between **minor adverse** (not significant, and below the LOAEL) to **major adverse** (significant, and at or above the SOAEL), before consideration of context as below.

Consideration of context

7.9.53 The Site is adjacent to the operational area of the Port of Immingham, one of the busiest ports in the UK, operating 24 hours a day, 365 days a year. The area surrounding the Port is also primarily industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Beyond the industrial facilities, the wider area is largely agricultural.

7.9.54 The landside elements of the Project will replace some temporary storage activities currently operating on parts of the Project site and also use areas zoned for future employment enterprise zone. This, as well as the existing operational port traffic using Queens Road, Laporte Road and other nearby access routes is likely to mean that many residents in the local communities are already accustomed to an industrial sound environment.

7.9.55 **Table 7-26** presents existing and future predicted ambient sound levels (assuming constant operation of the Project) and compares them to the BS8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h}$, which would be equivalent to an external criterion of 45 dB $L_{Aeq,8h}$ assuming open bedroom windows for ventilation. The predicted change in ambient sound levels can also be contextualised in accordance with **Table 7-10**.

Table 7-26: Comparison of ambient sound levels without additional mitigation

Receptor	Time Period	Existing ambient sound level $L_{Aeq,T}$, dB	Predicted specific sound level, $L_{Aeq,Tr}$, dB	Sum of existing ambient sound level and predicted specific sound level $L_{Aeq,Tr}$, dB	Predicted increase in existing ambient sound level due to the Project, $L_{Aeq,Tr}$, dB
NSR3 (vicinity of Spring Street, Waterworks Street & Chestnut Avenue)	Daytime (16 hour)	58	46 – 49	58-59	0 - +1
	Night-time (8 hour)	48	46 – 49	50-52	+2 - +4
NSR4 (vicinity of Talbot)	Daytime (16 hour)	55	47 – 50	56	+1

Receptor	Time Period	Existing ambient sound level $L_{Aeq,T}$, dB	Predicted specific sound level, $L_{Aeq,Tr}$, dB	Sum of existing ambient sound level and predicted specific sound level $L_{Aeq,Tr}$, dB	Predicted increase in existing ambient sound level due to the Project, $L_{Aeq,Tr}$, dB
Road, Worsley Road & Somerton Road))	Night-time (8 hour)	40	47 – 50	47-50	+8 --+10

7.9.56 As shown in **Table 7-26**, ambient sound levels increase due to the predicted levels from the Project, and all are above the BS8233:2014/WHO external criterion of 45 dB $L_{Aeq,8h}$. The predicted levels of increase in ambient sound level would be classified as Low during the daytime period for NSR 3 and NSR 4 in accordance with **Table 7-10**. During the night-time period the predicted levels of increase in ambient sound level would be classified as Medium for NSR 3 and High for NSR 4 in accordance with **Table 7-10**.

7.9.57 On this basis of the above BS 4142 assessment, and that there is likely to be a desire to reduce noise levels to the LOAEL (no greater than +5 dB excess of rating level over background sound level) or lower, potential additional mitigation options to reduce noise levels are discussed in **Section 7.10**.

Operational Road Traffic

7.9.58 As stated in **Chapter 11: Traffic and Transport [TR030008/APP/6.2]** the operational daily flows are lower than during construction. Given that the construction traffic noise assessment (see **Table 7-22**) concludes that there are negligible effects, the operational traffic noise effects will be negligible or no change. As stated in **Paragraph 7.6.4**, the closest NSRs to the Work Area No. 7 on Queens Road will not be occupied during the operational phase.

Decommissioning of the hydrogen production facility

7.9.59 The effects of decommissioning the hydrogen production facilities are considered to be comparable to, or less than, those assessed for construction activities and given the distance to the nearest NSRs (NSR 3 and 4) the potential for adverse noise effects is unlikely and would result in Not Significant adverse effects.

7.9.60 Decommissioning would require submission of a Final DEMP to NELC for its approval, this is secured by a requirement in the **draft DCO [TR030008/APP/2.1]** and the DEMP is in Schedule 2 of the **draft DCO [TR030008/APP/2.1]** secured by a requirement of the draft DCO. The Final DEMP would be prepared in accordance with the **Outline DEMP [TR030008/APP/6.6]** which is submitted as part of the application. Appropriate best practice mitigation measures will be applied during any decommissioning works, as described in **Section 7.8**, and documented in the DEMP; no additional mitigation for decommissioning of the

Project beyond such best practice specified in BS 5228 and **Section 7.8** mitigation is considered necessary to specify at this stage.

7.10 Mitigation Measures

7.10.1 Further consideration will be given to the potential options to minimise noise and vibration during the detailed design of the Project. Nevertheless, at this stage, measures to mitigate construction noise and vibration and operational sound, in addition to those set out in **Section 7.7** are discussed below.

Construction Phase

7.10.2 Based upon the current assessment, noise effects of up to major adverse (significant, and above the SOAEL) are predicted at Queens Road (represented by NSR1 and NSR2) during site clearance, and construction of roads and hardstanding on weekday daytime/Saturday mornings and up to major adverse for construction activities on Saturday afternoons. Moderate adverse (significant) effects are predicted at NSR3 if significant site clearance works takes place on Saturday afternoons.

7.10.3 The preferred approach for controlling construction noise and vibration is to reduce levels at source, where reasonably practicable. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

7.10.4 In addition to the noise control measures presented within **Section 7.8** of this Chapter, when plant is operating near the Queens Road NSRs and NSRs on Spring Street, Waterworks Road, and Chestnut Avenue during site clearance on Saturday afternoons, additional noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs and cranes will be implemented. The use of temporary barriers or screens can also provide additional mitigation. These additional mitigation measures can provide up to 15 to 20 dB sound reduction (based on Table B.1 in BS 5228 (Ref 7-2)). These additional methods will be detailed in the Final CEMP once the final construction plant and methods have been confirmed.

7.10.5 The need for monitoring of noise levels during construction will also be determined through the detailed assessment undertaken at the Final CEMP.

7.10.6 Residual effects after mitigation are described in **Section 7.11**.

Operational sound from on-site plant

7.10.7 Based upon the current assessment, for NSRs on the eastern edge of Immingham to the west (NSR3 and NSR 4), predicted effects range between negligible/minor adverse, minor/moderate adverse (potentially significant, with some NSRs being at or above the LOAEL and approaching the SOAEL) to major adverse (significant, and above the SOAEL) depending upon time period and phase of Project buildout.

- 7.10.8 As stated in **Section 7.4** the operational assessment has assumed that potential sound of a tonal, impulsive or intermittent nature (according to BS4142: 2014) will be designed out of the Project during the detailed design phase through the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. This is secured by a requirement in the **draft DCO [TR030008/APP/2.1]**. Based on the worst-case results presented in **Section 7.8**, additional mitigation would be required to achieve the operational daytime and night-time LOAEL criterion of a rating level no greater than +5 dB above the defined representative background sound level at each NSR.
- 7.10.9 The potential mitigation measures and general principles to achieve this may include, but are not limited to, the following measures, depending upon the potential benefits achieved from such measures:
- a. Reducing the breakout noise from plant through the use of enhanced enclosures, or potentially containing them within a building.
 - b. Reducing air inlet noise emissions by the addition of further in-line attenuation.
 - c. Reducing Flare Stack outlet noise emissions by the addition of silencers or sound proofing panels.
 - d. Reducing fan noise emissions by screening, re-sizing, fitting low noise fans or attenuation.
 - e. Screening or enclosing the compressors or other equipment.
 - f. Orientation of plant within the site to provide screening of low-level noise sources by other buildings and structures, or orientating fans and the air inlets away from sensitive receptors.
- 7.10.10 **Table 7-27** outlines the overall attenuation required to achieve the daytime and night-time operational sound criteria i.e. the rating level to be no greater than +5 dB above the defined representative background sound level at each NSR.

Table 7-27: Overall attenuation (dB) required to achieve operational sound criteria (Full site operational)

Receptor	Required attenuation to achieve daytime +5 dB criterion	Required attenuation to achieve night-time +5 dB criterion
NSR 3	+9	+11
NSR 4	+11	+14

- 7.10.11 The sound contribution at each NSR from each modelled sound source across the Project has been ranked. The potential attenuation required from the source sound power levels of the key noise emitting plant in order to meet a rating level of no greater than +5 dB above the defined representative background sound level at each NSR is listed in **Table 7-28**. These reductions could be achieved either through reduction of sound power level at source or by application of the mitigation measures listed above.
- 7.10.12 During detailed design stage it may be more practical to apply higher attenuation to some plant items/buildings than the attenuation levels listed in **Table 7-10** in order to reduce the attenuation applied to other plant items/ buildings and still achieve the +5dB criterion. It is also possible that changes will be proposed to plant specification or the number of plant required on-site for normal process function. It is envisaged that the Operational Noise Management Plan which is secured by a requirement in the **draft DCO [TR030008/APP/2.1]** would set out the appropriate mitigation. The residual effects after additional mitigation has been implemented are described in **Section 7.11**.

Table 7-28: Attenuation required (dB) from individual plant items.

Plant	Location	Quantity	Required attenuation to achieve a <i>rating level</i> no greater than +5 dB above defined <i>background sound level</i>
Individual Items of Plant			
H2 Refueling Station - Reciprocating Pumps	Work Area No. 7 (HRS) Hydrogen Refueling Station	2	30* (10 dB embedded, 20 dB additional)
Two N2 Componders + Lube Oil System	Work Area No. 7 (LHY35) Hydrogen Liquefiers Areas	4	20
HP Tube Fill Compressor – Glycol Circuit Air Cooler	Work Area No. 7 Compression Area	6	15
HP Tube Fill Compressor – Hydraulic Oil Pump Motor	Work Area No. 7 Compression Area	6	15
LP Tube Fill Compressor	Work Area No. 7 Compression Area	2	15

Immingham Green Energy Terminal
Environmental Statement Chapter 7 Noise and Vibration

Plant	Location	Quantity	Required attenuation to achieve a <i>rating level</i> no greater than +5 dB above defined <i>background sound level</i>
LP Tube Fill Compressor Motor	Work Area No. 7 Compression Area	2	15
Cooling Tower - Cooling Water Motor Pump	Work Area No. 7	6	15
Cooling Tower - Cooling Water Pump Motor	Work Area No. 7	6	15
Cooling Tower Fan Air Outlet	Work Area No. 7	6	5
Air-Cooled Intercooler	Work Area No. 7 Compression Area	8	10
Chiller for K400A/B/C/D Aftercooler	Work Area No. 7 Compression Area	1	10
Common Air-Cooled Cylinder Jacket Water Cooler	Work Area No. 7 Compression Area	1	10
Intercooler Skids/Oil Removal Skids	Work Area No. 7 Hydrogen Liquefiers Areas	18 x 4 Liquefier Areas	10* (5 dB embedded, 5 dB additional)
Common Air-Cooled Cylinder Jacket Water Cooler	Work Area No. 7 Compression Area	1	10
Intercooler Skids/Oil Removal Skids	Work Area No. 7 Hydrogen Liquefiers Areas	18 x 4 Liquefier Areas	10* (5 dB embedded, 5 dB additional)
Nitrogen Generator (24HPN) Package Expanders Vacuum Can S218	Work Area No. 7	1 of each item as part of the 24HPN package	10

Immingham Green Energy Terminal
Environmental Statement Chapter 7 Noise and Vibration

Plant	Location	Quantity	Required attenuation to achieve a <i>rating level</i> no greater than +5 dB above defined <i>background sound level</i>
Compressor Inlet Filter Compressor with on skid close-fit enclosure Tepsa Skid C182A/B U004 Process Container U004 Vent			
H2 PSA (Work Area No. 7 Only)	Work Area No. 7 HPU Area	3 x Work Area No. 7	10
Air Inlet – FD Fan	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	10
Flue Stack (ID Fan)	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	10
ID Fan	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5
FD Fan	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5
FD Fan Motor	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5
ID Fan Motor	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5

Plant	Location	Quantity	Required attenuation to achieve a <i>rating level</i> no greater than +5 dB above defined <i>background sound level</i>
ID Fan Inlet Ducting (Insulated)	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5
FD Fan Inlet Ducting (Insulated)	Work Area No. 7 and Work Area No. 5 HPU Area	3 x Work Area No. 7 3 x Work Area No. 5	5
NH3 Hydrogen Production Unit – (Work Area No. 7 Only) Burner Pipes: West Wall Only	Work Area No. 7 HPU Area	3 x Work Area No. 7	5
East Ammonia Storage Boil Off Gas Compressor Package with Enclosure	Work Area No. 5	2	10
Buildings			
LHY35 Compressor Building - 4 Walls and Roof	Work Area No. 7 Hydrogen Liquefiers Area	4 x Work Area No. 7	10
Cooling Tower Air Inlet Face Side A	Work Area No. 7	1 x Work Area No. 7	10
Cooling Tower Air Inlet Face Side B	Work Area No. 7	1 x Work Area No. 7	10

**The level of attenuation includes “embedded mitigation” which takes into account attenuation that has been already considered and implemented during the initial design phases of the Project.*

7.11 Assessment of Residual Effects

Construction

- 7.11.1 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific measures to be secured in the final CEMP, which will help minimise the risk of noise complaints and potential enforcement action under the CoPA by NELC, this assessment concludes that residual construction noise effects at residential NSRs on Queens Road (represented by NSR1 and NSR2) is likely to be of Minor adverse not significant from on-site works. However, as explained in **Chapter 2: The Project** and **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**, it is considered that the continued residential use of the residential properties (the residential NSRs) on the west side of Queens Road is considered incompatible with the operation of the hydrogen production facility. Discussions are ongoing with the owners and occupiers with a view to negotiating their acquisition by agreement. Where it is not possible to acquire those properties through negotiation, compulsory acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the construction commencing, the adverse effect would not arise.
- 7.11.2 At residential NSRs to the west at the eastern edge of Immingham (represented by NSR3 and NSR 4), residual construction noise effects are likely to be of **negligible** significance (**not significant**, and below the LOAEL).

Operation

- 7.11.3 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific mitigation measures as outlined within the Schedule of Mitigation **[TR030008/APP/7.2]**, which will help minimise the risk of noise complaints and potential enforcement action under the EPA by NELC, this assessment concludes that residual effects at residential NSRs at the eastern edge of Immingham (represented by NSR3 and NSR 4), residual effects of operational sound are likely to be minor adverse significance (not significant, and not exceeding the LOAEL) once mitigation measures have been deployed.
- 7.11.4 During detailed design, an operational noise management plan will be prepared, and this is secured by a requirement in the **draft DCO [TR030008/APP/2.1]**. It is expected that that when the operational noise management plan is prepared, discussions with NELC will be required to agree the appropriate baseline(s) for future project phases (The assessment within this chapter uses current baseline data, obtained in 2022 and 2023).

Decommissioning

- 7.11.5 Residual effects for NSR 3 and NSR 4 during decommissioning of the hydrogen production facilities are expected to be equivalent to those presented above for construction.

7.12 Summary of Assessment

- 7.12.1 A summary of the impact pathways that have been assessed, and the identified residual effects and level of confidence are presented in **Table 7-29**.

Table 7-29: Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Residential NSRs on Queens Road (NSR 1 and NSR 2)	Construction Noise - Landside works	<p>Potentially up to moderate adverse (significant) (daytime)</p> <p>Potentially up to major adverse (significant) (Saturday afternoons)</p>	<p>Standard impact avoidance construction noise and vibration mitigation measures.</p> <p>Additional specific measures where possible (use of noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs and cranes), temporary acoustic barriers and screens.</p>	Minor adverse (not significant)	Medium
Residential NSRs on eastern edge of Immingham (NSR 3 and NSR 4)	Construction Noise - Landside works	<p>Negligible adverse (not significant) (daytime)</p> <p>Potentially up to moderate adverse (significant) (Saturday afternoons)</p>	<p>Standard impact avoidance construction noise and vibration mitigation measures.</p> <p>Additional specific measures where possible during site clearance works on Saturday afternoon e.g. use of noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on and cranes, temporary acoustic barriers and screens.</p>	Negligible-Minor adverse (not significant)	Medium
Residential NSRs on Queens Road (NSR 1 and NSR 2)	Construction vibration (landside works)	Minor Adverse (not significant)	Use of non-vibratory rollers	Minor adverse (not significant)	Medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Residential NSRs on adjacent to construction traffic routes	Construction Traffic	Negligible (not significant) (daytime)	CTMP	Negligible (not significant)	Medium
Immingham Oil Terminal Jetty/ Pipeline	Construction/Piling Vibration (Marine Works)	Negligible (not significant)	N/A	Negligible (not significant)	Medium
Residential NSRs	Construction noise impacts from sea vessel movements	Negligible adverse (not significant)	N/A	Negligible adverse (not significant)	Medium
Operational Phase*					
Residential NSRs on eastern edge of Immingham	On-site plant noise and operations	Up to moderate/major adverse (significant) (daytime) and up to major adverse (significant) (night-time)	Limits on noise emissions from plant and equipment at source, including the use of silencers/attenuators on items of plant where applicable. Acoustic barriers/screens local to the items of plant and equipment to reduce transmission of noise from the Site to NSRs.	Minor adverse (not significant)	Medium/High
Residential NSRs adjacent to operational traffic routes	Project traffic on local roads	Negligible adverse (not significant)	N/A	Negligible (not significant)	Medium
Decommissioning Phase – as per construction phase					

* As explained in **Chapter 22: Major Accidents and Disasters [TR030008/APP/6.2]**, it is considered that the residential use of the residential properties (the residential NSRs) on the west side of Queens Road (numbers 1-6, flats above 7-8 and 18 and 31) is incompatible with the hydrogen production facility and therefore that residential use of those properties would need to be cease. The Applicant is currently in discussions with the landowners / occupiers with a view to negotiating acquisition of the properties and acquisition powers are sought through the draft DCO. In the event of acquisition of the properties ahead of either construction or operation commencing, the adverse effect would not arise.

7.13 References

- Ref 7-1 British Standards Institute (BSI). (2003). BS 7445-1 – Description and measurement of environmental noise. Guide to quantities and procedures
- Ref 7-2 British Standards Institute (BSI). (2014). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site– Part 1: Noise’.
- Ref 7-3 British Standards Institute (BSI). (2014). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site – Part 2: Vibration’.
- Ref 7-4 British Standards Institute (BSI). (2014). BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’.
- Ref 7-5 British Standards Institute (BSI). (2019). BS 4142:2014+A1:2019: ‘Methods for rating and assessing industrial and commercial sound’.
- Ref 7-6 Control of Pollution Act 1974 (c. 40). Available online: <https://www.legislation.gov.uk/ukpga/1974/40>.
- Ref 7-7 Department for Environment, Food and Rural Affairs (Defra). (2010). Noise Policy Statement for England.
- Ref 7-8 Department for Transport (DfT). (2012). National Policy Statement for Ports.
- Ref 7-9 Department of Transport (DfT)/ Welsh Office. (1998). Calculation of Road Traffic Noise.
- Ref 7-10 European Commission (2002). Directive 2002/49/EC Environmental Noise Directive -END.
- Ref 7-11 Extrinsic, England Noise and Air Quality Viewer
- Ref 7-12 Highways England. (2020). Design Manual for Roads and Bridges LA111 Noise and vibration – Version 2.
- Ref 7-13 Institute of Environmental Management and Assessment (IEMA). (2014). Guidelines for Environmental Noise Impact Assessment.
- Ref 7-14 International Standards Organization (Part 1: 1993, Part 2: 1996) ISO 9613 – Acoustics – Attenuation of sound during propagation outdoors, ISO.
- Ref 7-15 Ministry of Housing, Communities and Local Government (MHCLG). (2019). Planning Practice Guidance.
- Ref 7-16 Ministry of Housing, Communities and Local Government (MHCLG). (2021). National Planning Policy Framework.

- Ref 7-17 North East Lincolnshire Council. (2018). North East Lincolnshire Local Plan.
- Ref 7-18 North Lincolnshire Council (2016) North Lincolnshire Council Planning for Health and Wellbeing-Supplementary Planning Document.
- Ref 7-19 Secretary of State, H. M. Government (2006, as amended). The Environmental Noise (England) Regulations 2006. Statutory Instrument 2006 No. 2238.
- Ref 7-20 UK Government (1990) The Environmental Protection Act 1990 (c. 43).
- Ref 7-21 TRL (2006) Method for converting the UK road traffic noise index $L_{A10,18h}$ to the ES noise indices for road noise mapping.
- Ref 7-22 British Standards Institute (1993) BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'.
- Ref 7-23 International Organization for Standardization (ISO) (2010) ISO 4866:2010.
- Ref 7-24 Highways Agency (2011) Design Manual for Roads and Bridges Volume 11 Section 2 Part 7 (HD 213/11) Noise and vibration.