Kintore Hydrogen Plant

Environmental Impact Assessment Report
Chapter 10: Noise and Vibration

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Kintore Hydrogen
A STATERA COMPANY

Environmental Impact Assessment Report

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Chapter 10

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1 Introduction

1.1 Purpose of this chapter

1.1.1 This noise and vibration chapter of the Environmental Impact Assessment Report (EIAR) presents the findings of Environmental Impact Assessment (EIA) work undertaken concerning impacts associated with the construction and operation of the Kintore Hydrogen Plant on potentially affected noise and vibration sensitive receptors (NVSRs).

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

1.1.3 Further information is contained within technical appendices in Volume 3:

- Appendix 10.1: Baseline Sound Monitoring Report;
- Appendix 10.2: Construction Noise Assessment Methodology and Results; and
- Appendix 10.3: Operational Noise Assessment Methodology and Results.

1.1.4 This EIAR chapter:

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

1.2 Planning policy context

National Planning Framework 4

1.2.1 National Planning Framework 4 (NPF4) [1] is the national spatial strategy for Scotland. It sets out our spatial principles, regional priorities, national developments and national planning policy.

1.2.2 Policy 23 of the NPF4 states that:

"…

b) Development proposals which are likely to have a significant adverse effect on health will not be supported. A Health Impact Assessment may be required.

…

e) Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely."

Aberdeenshire Local Development Plan

1.2.3 The Aberdeenshire Local Development Plan (LDP) [2] sets out the policies Aberdeenshire Council (AC) uses for determining planning applications.

1.2.4 Policy P4 'Hazardous and Potentially Polluting Developments and Contaminated Land' of the LDP states that:

"P4.1 We will refuse development, even infill development, if there is a risk that it could cause significant pollution, create a significant nuisance (for example through impacts on air quality or noise), or present an unacceptable danger to the public or the environment. This includes developments we are told by the Health and Safety Executive or the Competent Authority to be near facilities they have identified as hazardous. Pipelines, agricultural buildings, wastewater treatment plants, waste disposal/treatment facilities and heavy industrial uses are all examples of development that could create a nuisance, pollution or hazard. In any circumstances where development of this kind is, on balance, considered acceptable by the appropriate authorities, satisfactory steps must be taken to mitigate any residual negative development impacts.

...

P4.5 Where an Air Quality Assessment or a Noise Impact Assessment indicates that a proposed development could have a significant detrimental impact on air quality or noise levels, appropriate mitigation measures must be provided."

1.3 Legislation

Control of Pollution Act

1.3.1 Section 60, Part III of the Control of Pollution Act 1974 (CoPA) [3] refers to the control of noise (including vibration) on construction sites. It provides legislation by which local planning authorities can control noise from construction sites, by stopping activities if necessary, to prevent noise disturbance occurring. It states that local authorities, acting under this section, all have regard to the need for ensuring that the best practicable means (BPM) are employed to minimise noise.

1.3.2 In addition, Section 60 states that local authorities shall have regard to the relevant provisions of any code of practice issued under Part III of the 1974 Act. In this respect, guidance provided by British Standard (BS) 5228:2014 'Code of practice for noise and vibration control on construction and open sites – Parts 1&2' (British Standards Institute, 2014) is relevant to implemented to aid in showing compliance with Section 60.

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

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

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

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

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

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

Environmental Protection Act 1990, Part III (EPA)

1.3.8 The Environmental Protection Act 1990 (EPA) [4] deals with statutory nuisance, including noise.

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

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

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

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

1.4 Consultation

1.4.1 Key issues raised during scoping and consultation specific to noise and vibration are listed in Table 1.1, together with details of how these issues have been considered in the production of this EIAR and cross-references to where this information may be found.

Consultation undertaken included formal input into the EIA Scoping Request and subsequent consultation regarding proposed assessment criteria.

Table 1.1: Key points raised during scoping and consultation to date

Date	Consultee and type of response	Points raised	How and where addressed
29 September 2023	Aberdeenshire Council Environmental Health Officer – Scoping Opinion	General agreement to the proposed scope of the EIAR. Noise-specific comments made were as follows. No specific comment was made on the proposed scoping out of vibration assessment, which is therefore agreed.	As set out below.
29 September 2023	Aberdeenshire Council Environmental Health Officer – Scoping Opinion	1. It would be expected that operational noise from the proposal and the associated impact or cumulative impact is assessed mainly using NR Curves inside receptors with a noise criteria of NR25 or NR20 depending on the location. It would also be expected that the effects of other infrastructure development also be considered in terms of the cumulative impact. BS4142 should also be considered as per the documentation provided. 2. The significance of effects appears to be considered under English guidance describing the LOAEL and SOAEL. It would be expected that, if significance of effects is considered the Scottish equivalent would be used. However, it would be recommended that the BS4142 criteria is the main consideration in this respect.	1. Section 4.2 and Appendix 10.3 provide this assessment. In terms of internal noise levels, NR20 would be achieved with the current design. Other infrastructure development is considered in Section 5. 2. Section 4.2 of this chapter and Appendix 10.3 provide this assessment with consideration to BS 4142 criteria.
09 May 2024	Aberdeenshire Council Environmental Health Officer, response to a further consultation letter concerning proposed Rating Levels (ref. '636497_Kintore_Scoping_Noise_20240508')	The letter proposed that Rating Levels not exceeding 40 dB $L_{A,Tr}$ would not result in significant impact/effect and would therefore be acceptable. This was primarily based on Rating Levels of 40 dB $L_{Ar,Tr}$ considered to be low and, if resultant ambient sound levels would also be below 40 dB $L_{Aeq,T,}$ sleep disturbance would be unlikely to result.	Section 4.2 and Appendix 10.3 assess the impacts of a Rating Level of 40 dB $L_{Ar,Tr}$. In terms of internal noise levels, NR20 would be achieved with the current design.

2 Assessment Approach

2.1 Guidance and standards

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

- British Standard (BS) 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' – Part 1: Noise [5];
- BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' – Part 2: Vibration [6];
- BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142) [7];
- Design Manual for Roads and Bridges (DMRB) Sustainability and Environment Appraisal LA 111 Noise and Vibration (May 2020) (LA 111) [8];
- Calculation of Road Traffic Noise [9];
- Night Noise Guidelines for Europe [10]; and
- International Standard (ISO) 9613-2:1996 'Acoustics: Attenuation of sound during propagation outdoors. Part 2: General method of calculation' [11].

2.2 Assessment methodology

2.2.1 In order to determine the specific sound levels resulting from the construction and operation of the proposed development, a noise model has been built using SoundPLAN v9.0 noise modelling software. The model predicts noise levels under light down-wind conditions based on hemispherical propagation, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996[1].

2.2.2 Details of the modelling setup, inputs and outputs are provided in Appendices 10.2 and 10.3 for construction and operational phases respectively.

2.3 Study area

2.3.1 There is no national government guidance or legislation on the extent of the study area to adopt for the assessment of noise effects from the construction or operation of industrial facilities on NVSRs. The study areas in this chapter have therefore been chosen on the basis of professional judgment of the distances over which significant noise effects may occur and consideration of the likely magnitude and duration of impact and the sensitivity of receptors.

2.3.2 In the case of noise emissions from the electrolysis plant site itself, the study area has been selected to include the nearest potentially affected NVSRs to the north, east, south and west of the site boundary, as determined from Ordnance Survey and other mapping data together with site visits. The sensitivity of all NVSRs within the chosen study area has been determined and predictions made at the most affected receptors. The nearest NVSRs are where site noise levels would be highest.

2.3.3 For the water abstraction and discharge point, and blending point for export into the existing National Transmission System (NTS), similarly the nearest NVSRs have been selected.

2.3.4 Construction and operational road traffic noise levels have been considered for all road links where the increase in road traffic movements is 10% above baseline flows, on the basis that increases of less than 10% would result in no noise change.

2.3.5 In the case of vibration emissions, given that levels of vibration attenuate very rapidly through the ground within a few metres and the approximate distance to the nearest receptors to significant construction work is circa 400 m, it is considered that the construction and operation of plant items will be very unlikely to cause significant adverse effect at any receptor due to vibration. Whilst some NVSRs are located in closer proximity to certain works (>30 m), activities that would be undertaken around

[1] Note this ISO 9613-2:1996 was updated in 2024 (SO 9613-2:2024 Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors), but as of the date of this EIAR the revised Standard has not been incorporated in the software.

these NVSRs are unlikely to generate significant levels of vibration or be at significant depths, for example works to trench and lay the water pipeline along its route corridor, or works to create the electrolysis plant access road and tree planting in the south of the electrolysis plant site.

2.3.6 Based on the above, it is considered appropriate to scope vibration effects out of further assessment. As such, study areas for vibration have not been assigned. This has been agreed through the EIA scoping process, as set out in Table 1.1.

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

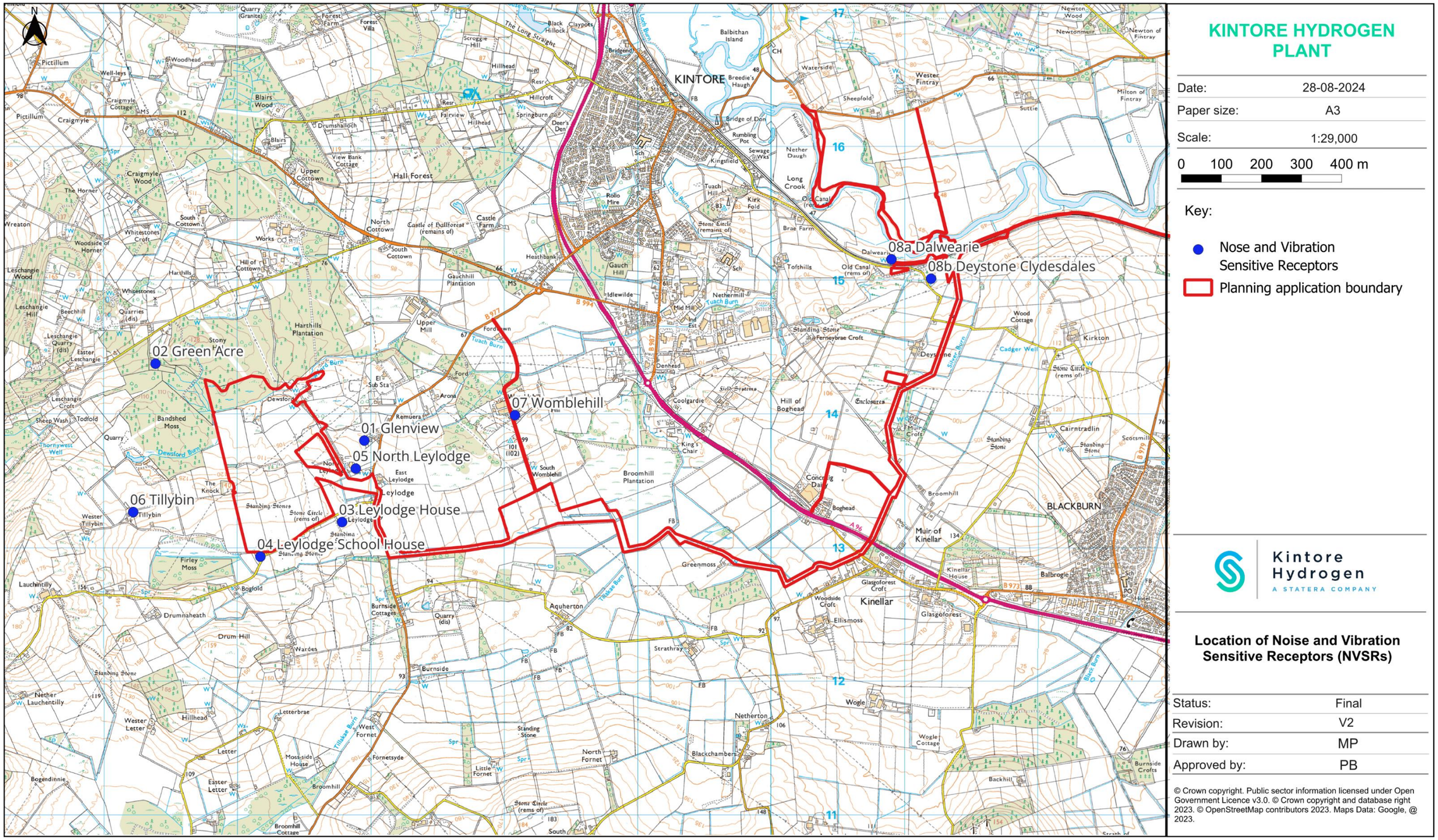

Figure 2.1: Most-affected NVSRs

2.4 Baseline study

Desktop study

2.4.1 Information on potential NSRs within the surrounding area of the proposed development was collected through desktop review of the data sources summarised within Table 2.1 below.

Table 2.1: Summary of desktop study sources

Title	Source	Year
OS Open Data Mapping & Terrain	Ordnance Survey	2024
Google Earth Imagery	Google Earth	2024

Site specific surveys

2.4.2 In order to inform the noise assessment, the site-specific surveys, listed in Table 2.2 below, were undertaken in October 2023 and February 2024 to establish baseline sound levels in the vicinity of the proposed development. Survey locations and results are summarised in Section 3.

2.4.3 Details of the survey scope and methodology were discussed and agreed with Aberdeenshire Council prior to deployment of the monitoring equipment. The scope, methodology, results of the survey, and figures showing survey locations are set out in Appendix 10.1: Baseline Sound Monitoring Report.

Table 2.2: Summary of site-specific surveys undertaken

Survey	Extent of survey	Overview of survey	Survey provider	Year	Reference to further information
Baseline sound level survey	Representative locations for the nearest NSRs to the proposed development.	Unattended surveys at six locations using a sound level meter. Measurements were undertaken between 18 October and 31 October 2023.	Savills	2023	Appendix 10.1 Baseline Sound Monitoring Report
Baseline sound level survey	Representative locations for the nearest NSRs to the proposed development.	Unattended survey at one location and attended survey at one location using a sound level meter. Measurements were undertaken between 01 February and 02 February 2024.	Savills	2024	Appendix 10.1 Baseline Sound Monitoring Report

2.5 Uncertainties and/or data limitations

Baseline sound survey data

2.5.1 Ambient and background baseline sound levels are subject to seasonal variations due to a number of factors (e.g. wind and rain); however, the metrics derived from the noise monitoring reduce the effects of seasonal variations. Baseline sound monitoring was undertaken in October 2023 and February 2024. As detailed in Section 3, a background L_{A90} sound level has been adopted, which is considered to be 'representative' of the background sound level during calm weather conditions (e.g. with little or no wind or precipitation) when background sound levels are likely to be lower. No significant seasonal variation in noise attenuation occurs.

2.5.2 It should be noted that, during the first two days of the October 2023 survey period, wind speeds were elevated; however, removal of this data does not affect the overall determination of representative baseline sound levels, which have been derived through statistical analysis.

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

Construction methodology

2.5.4 Details of the indicative construction activities are provided in Chapter 2: Project Description. While the specific number and type of plant and working methods cannot be specified at this stage, assumptions have been made based on professional judgement and experience with similar developments. The assessment has been based on typical construction activities for this type of infrastructure, using sound source terms from BS 5228-1:2009+A1:2014 and professional judgement. This is a standard approach and is considered to be an acceptable and robust method. Details on the assumed plant items are provided in Appendix 10.2: Construction Noise Assessment Methodology and Results.

Operational sound source data

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

Prediction methods and assessment

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

2.5.7 With regard to subjective response, the noise standards adopted for the assessment have been based upon the subjective response of the majority of the population. This is considered to be the best that can be achieved in a population of varying sensitivity.

2.6 Impact assessment criteria

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

Magnitude of impact

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

Construction activity

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

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

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

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

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

*Subject to duration and where ambient noise levels are low

2.6.5 The calculation method of BS 5228-1:2009+A1:2014 takes account of the duration of an activity per hour (the 'on-time') and the attenuation of sound due to distance, ground

attenuation and barrier effects. The assessment is based on reasonably expected construction phases, as well as plant items and on-times based on the information provided within BS 5228-1:2009+A1:2014. The average percentage on-time comes from estimates of the time that the construction plant will be operating at full power.

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

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

Construction traffic

2.6.8 The noise changes identified in Table 2.4 have been used in the assessment of noise impacts associated with construction traffic on the local road network and from temporary diversion routes resulting from construction of the Kintore Hydrogen Plant. These are based on the guidance in DMRB LA 111 for the classification of magnitude of noise impacts in the short term. These DMRB criteria best reflect the temporary nature of the construction impacts; and allow for a robust, worst case assessment of response to construction traffic noise.

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

Noise change, dB $L_{A10,18hr}$	Magnitude of impact
0	No change
0.1 – 0.9	Negligible
1.0 - 2.9	Minor
3.0 – 4.9	Moderate
5.0+	Major

Operational noise

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

2.6.10 The magnitude of impacts on the receptors has been defined in Table 2.5, taking into account both the absolute ambient noise level and resultant internal sound levels. The rationale for this is based on the assumption that a given noise level would have a greater impact if the end absolute noise level exceeds the criteria in World Health Organisation Guidance and BS 8233 for annoyance or sleep disturbance (Stage 2).

2.6.11 Thus, if the end noise level is less than the absolute noise level criteria for the onset of sleep disturbance, then it is unlikely that even a large difference would result in a severe impact unless the criteria for sleep disturbance or annoyance were also exceeded.

Table 2.5: Initial evaluation of operational noise magnitude of impact

Stage 1		Stage 2	
Difference between Rating Level and background noise level	BS 4142 semantic description	Operational ambient sound level (baseline ambient plus specific level)	Magnitude of impact
>10 dB	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.	Daytime >=55 dB L_{Aeq} Night-time >=40 dB L_{Aeq}	Major
		Daytime <55 dB L_{Aeq} Night-time <40 dB L_{Aeq}	Moderate
+5 to +10 dB	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.	Daytime >=55 dB L_{Aeq} Night-time >=40 dB L_{Aeq}	Moderate
		Daytime <55 dB L_{Aeq} Night-time <40 dB L_{Aeq}	Minor
0 to +5 dB	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Daytime >=55 dB L_{Aeq} Night-time >=40 dB L_{Aeq}	Minor
		Daytime <55 dB L_{Aeq} Night-time <40 dB L_{Aeq}	Negligible
≥-5 to 0 dB	-	Daytime/evening >=55 dB L_{Aeq} Night-time >=40 dB L_{Aeq}	Negligible
		Daytime <55 dB L_{Aeq} Night-time <40 dB L_{Aeq}	No change
<-5 dB	-	Daytime/evening >=55 dB L_{Aeq}	No change

Stage 1		Stage 2	
		Night-time >=40 dB L_{Aeq}	
		Daytime <55 dB L_{Aeq} Night-time <40 dB L_{Aeq}	No change

2.6.12 Following on from the magnitudes derived from Table 2.5 of the noise impact from the proposed development at the nearest NSRs, further consideration has been given to the context of the sound, including discussions of the outcomes.

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

- absolute sound levels in comparison with World Health Organisation guideline levels; and
- whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

2.6.14 These considerations comprise the context of any potential impact identified and have informed the overall outcome of further assessment.

2.6.15 The operational noise magnitude of impact criteria presented in Table 2.5 are derived from BS 4142 and, as such, are representative of noise impacts on residential premises only.

Sensitivity

2.6.16 There is no nationally adopted guidance on how the sensitivities of NVSRs should be determined. Therefore, for this chapter, the sensitivity of classes of receptor is defined through consideration of the vulnerability, recoverability and value/importance of that receptor class. The criteria for defining sensitivity in this chapter are outlined in Table 2.6.

Table 2.6: Criteria for receptor sensitivity

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

2.6.17 The significance of the effect is determined based on the magnitude of the impact and the sensitivity of the receptor, as shown in Table 2.7. Where a range of significance of effect is presented in Table 2.7, the final assessment for each effect is based upon expert judgement.

Table 2.7: Matrix used for the assessment of the significance of an effect

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

2.6.18 The definitions for each of the significance levels are shown in Table 2.8. Effects of **moderate** and higher will be defined as **significant** effects.

Table 2.8: Significance of effect

Significance	Description
Substantial	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively,

Significance	Description
	associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

2.7 Maximum design envelope parameters for assessment

2.7.1 The maximum design envelope parameters identified in Table 2.9 have been selected as those having the potential to result in the greatest effect on an identified receptors or receptor groups. These parameters have been identified based on the overview description of the development provided in Chapter 2: Project Description and Site Setting. Figure 2.2 provides an illustration of one potential electrolysis plant site layout. This has been used as a representative potential design for assessment of noise impacts, within the overall envelope of the Planning Parameters Plan in Chapter 2.

2.7.2 Effects of greater adverse significance are not predicted to arise should other development designs, within the project design envelope parameters, be taken forward.

Table 2.9: Maximum design envelope parameters assessed

Potential impact	Maximum design parameter	Justification
Construction phase		
Construction plant noise	Normal construction working hours Mon to Sat 0800 to 1800, no Sunday, bank holiday or night working Non-noisy activities (e.g. fit-out within buildings) may be undertaken outside those hours Up to 10 days' 24-hour construction working per phase (three phases) for continuous activity (e.g. concrete pour)	The applicant's proposed construction working hours
Construction traffic noise	Maximum construction traffic on public highway links, detailed in Chapter 9: Traffic and Transport). Up to 248 and 10 off-site HGV and LGV movements per day during the peak construction periods, respectively.	Maximum HGV movements during the peak construction period
Operation phase		
Operational plant noise	Plant operational during day, evening and night	Maximum potential noise impact
Operational plant noise	Plant layout as shown in Figure 2.2	An illustration of a representative plant design within the envelope of the Planning Parameters Plan (see Chapter 2)
Operational plant noise	Reasonable maximum internal sound level within electrolysis process buildings corresponding to control of noise at work regulations	Reasonable maximum potential noise impact
Operational plant noise	Reasonable minimum attenuation of H_2 compressor noise building or enclosure fabric	Assumed the minimum level of required mitigation

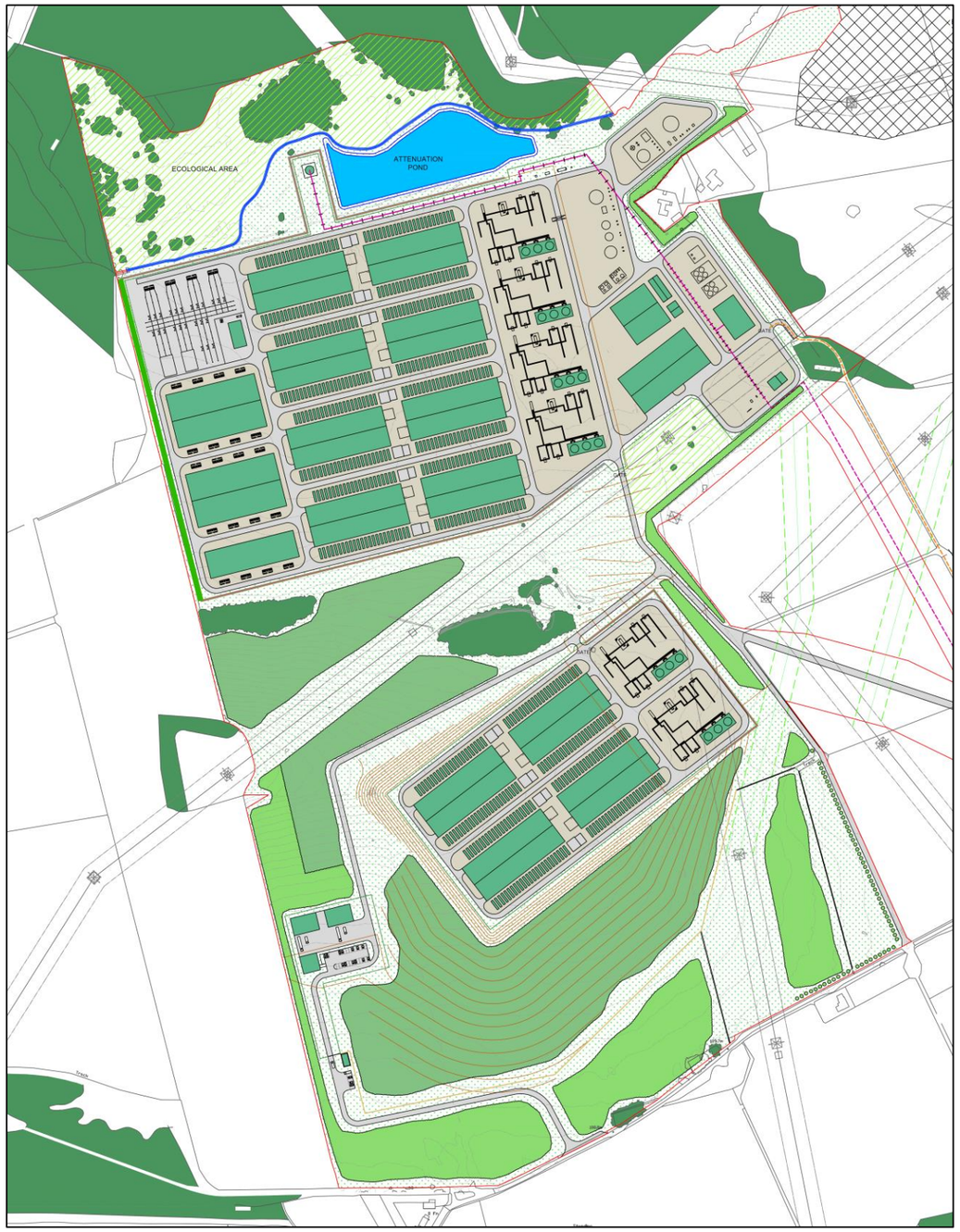

Figure 2.2: An illustrative potential operational plant site layout

2.8 Impacts scoped out of the assessment

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

Table 2.10: Impacts scoped out of the assessment

Potential impact	Justification
Construction phase	
Vibration	NVSRs not located in close proximity to construction activity and unlikely for percussive/impact piling to be required. Large distance between main site construction areas and the nearest vibration sensitive receptors (~400 m), significant impacts from vibration are unlikely to occur at these receptors.
Operation phase	
Vibration	No, or only negligible, vibration sources included. Large distance between main site construction areas and the nearest vibration sensitive receptors (~400 m), significant impacts from vibration are unlikely to occur at these receptors.
Road traffic	Road traffic movements below threshold for assessment, with implementation of limited on-site parking and a sustainable travel plan incorporating coach shuttles, as set out in Chapter 9.

2.9 Mitigation measures adopted as part of Kintore Hydrogen Plant

2.9.1 A number of measures have been incorporated into the Kintore Hydrogen Plant construction approach and plant design to reduce the potential for impacts on NSRs. Example measures that may be employed to reduce noise are listed in Table 2.11.

2.9.2 The selection of the final measures will be confirmed during the detailed design phase and will be consistent with Best Practicable Means (BPM) during construction and Best Available Techniques (BAT) which will be controlled via the PPC Permit for operation.

Table 2.11: Designed-in mitigation measures

Measures adopted as part of Kintore Hydrogen Plant	Justification
Construction phase	
Best Practicable Means (BPM), for example the use of quieter alternative methods, plant and/or equipment, where reasonably practicable; the use of site hoardings, enclosures, acoustic barriers, portable screens and/or screening nosier items of plant, where reasonably practicable; and	To minimise noise and vibration, where reasonably practicable.

Measures adopted as part of Kintore Hydrogen Plant	Justification
maintaining and operating all vehicles, plant and equipment in an appropriate manner, to ensure that extraneous sound from mechanical vibration, creaking and squeaking is kept to a minimum.	
Normal construction working hours will be Monday to Saturday 08:00-18:00 unless otherwise agreed with the relevant planning authority. No Sunday, bank holiday or night working is proposed except where certain activities cannot be interrupted and require 24-hour working.	To minimise noise and vibration impact during quieter periods.
Operational phase	
A proposed Grampian planning condition to prevent commissioning and operation of the proposed development until the two nearest residential properties at Dewsford have been vacated.	To avoid unacceptable adverse noise impacts to these residences.
Site layout optimisation to achieve the overall Rating Level specified in this assessment	To minimise operational noise as far as reasonably practicable
H_2 compressors housed in buildings / enclosures to achieve the overall Rating Level specified in this assessment	To minimise operational noise as far as reasonably practicable
Low noise coolers / radiators to achieve the overall Rating Level specified in this assessment	To minimise operational noise as far as reasonably practicable
Acoustic lagging around all external pipework to achieve the overall rating level specified in this assessment	To minimise operational noise as far as reasonably practicable

3 Baseline environment

3.1 Current baseline

3.1.1 The baseline survey locations and measured baseline data are presented in Appendix 10.1: Baseline Sound Monitoring Report. A summary of the adopted sound levels for the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods at each survey location are presented in Table 3.1.

Table 3.1: Adopted measured baseline sound levels

Survey Location	Daytime		Night-time	
	dB $L_{Aeq,T}$	dB $L_{A90,T}$	dB $L_{Aeq,T}$	dB $L_{A90,T}$
LT1	40	35	30	27
LT2	44	33	33	29
LT3	41	35	31	28
LT4	38	34	29	26
LT5	44	40	36	31
LT6	47	35	34	31

For long term measurements, the L_{Aeq} and L_{A90} are derived from the lower 25th percentile value for the relevant period.

3.1.2 Construction activity is not anticipated to occur outside of daytime working hours, save for any specific exceptions to be agreed in advance with Aberdeenshire Council (controlled in the Outline CEMP). Residual sound levels are below 60 dB L_{Aeq} during the day and are therefore subject to the criteria set within the lower cut-off values for the assessment of construction noise impacts (i.e. the most stringent limits).

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

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

3.1.5 The adopted representative survey locations for the nearest affected receptors during the operational phase of the proposed development are presented in Table 3.2. These receptors have been identified as the likely most affected receptors during the operational phase of the proposed development. All receptors are considered to be of medium sensitivity.

Table 3.2: Adopted representative survey locations for NVSRs

NVSR	Representative survey location
Dewsford Properties	LT1
Glenview	LT2
Green Acre	LT4
Leylodge House	LT3
Leylodge School House	LT3
North Leylodge	LT2
Tillybin	LT4
Womblehill	LT5
Dalwearie / Deystone Clydesdales	LT6

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

3.1.7 For the construction assessment, receptors for which the highest noise levels are predicted during each construction activity are presented. Receptors of high sensitivity are considered separately to determine whether a greater significance of effect would occur at these receptors. In order to present a robust assessment, the lower cut-off values as given in BS 5228:2009+A1:2014 have been taken as thresholds for the assessment of construction noise.

3.2 Future baseline

3.2.1 No significant change to the future baseline scenario, in the absence of Kintore Hydrogen Plant, is anticipated other than that which may be caused by cumulative developments (assessed in Section 5).

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

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

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

4 Assessment of Effects

4.1 Construction phase

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

Construction noise

Magnitude of impact

4.1.2 The noise modelling assumptions, predictions and results of the assessment are presented in Appendix 10.2: Construction Noise Assessment Methodology and Results. A summary of the assessment outcome is provided below.

4.1.3 Predictions have shown that predicted noise levels from the construction activity associated with the proposed development will be below the lower weekday / Saturday morning and Saturday afternoon cut-off values of 65 and 55 dB L_{Aeq} respectively, as given in Method 2 within Annex E of BS 5228-1:2009+A1:2014.

4.1.4 The highest predicted noise levels are predicted at the façade of Dewsford, immediate east of the site (also representative of other NVSRs in that vicinity) with levels of 54 dB $L_{Aeq,T}$ during initial site clearance stages. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible or minor magnitude of impact at these receptors for the weekday / Saturday morning and Saturday afternoon periods respectively. It should be noted that this is based on construction activity occurring in closest proximity to the NVSRs.

4.1.5 Noise levels at all other NVSRs would be lower, with the next highest predicted noise levels at the façade of Glenview, east of the site (also representative of other NVSRs in that vicinity) with levels of 38 dB $L_{Aeq,T}$. In accordance with the magnitude of impact criteria as detailed in Table 2.3, this is representative of a negligible magnitude of impact at these receptors.

4.1.6 Certain construction activities have the potential to overlap, resulting in a cumulative noise impact upon receptors. At this stage of the proposed development, a detailed schedule of construction activities is not realistically available. Predicted noise levels, as given in Appendix 10.2: Construction Noise Assessment Methodology and Results, are based on the activity occurring across the construction site. Therefore, based on the above, while combined effects from different construction activities may result in an increase in noise levels, it is not considered that this will result in an exceedance of the daytime cut-off value for a period greater than one month.

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

Sensitivity of the receptor

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

Significance of effect

4.1.9 It is predicted that a **negligible or minor** impact on the **medium** sensitivity receptors would result in a **negligible** or **minor adverse** effect, which is **not significant**.

Further mitigation or enhancement

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

Construction traffic

Magnitude of impact

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

4.1.12 The assessment methodology and results are presented in Appendix 10.2: Construction Noise Assessment Methodology and Results. A summary of the assessment outcome is provided below.

4.1.13 During the peak construction period, a noise change of <1 dB is predicted on 10 of the 11 road links assessed, and for only for one link >1 dB: up to 1.1 dB on the B977 to the north of Leylodge. In accordance with the magnitude of impact criteria in Table 2.4, this is representative of a minor impact. All other impacts associated with construction traffic are of negligible magnitude or below during all time periods.

Sensitivity of the receptor

4.1.14 The noise sensitive receptors identified within the construction assessment have a sensitivity considered to be medium. As discussed in paragraph 2.3.2, the nearest NVSRs identified for the assessment of construction noise impacts are considered

representative of the most affected receptors likely to be affected by the construction of the proposed development.

Significance of effect

4.1.15 Overall, it is predicted that a minor impact on the most affected medium sensitivity receptors would result in a minor adverse effect, which is not significant.

Further mitigation or enhancement

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

Future monitoring

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

4.2 Operational phase

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

Magnitude of impact

4.2.2 The noise modelling assumptions, predictions, context and results of the BS 4142 assessment and noise change assessment are presented in Appendix 10.3: Operational Noise Assessment Methodology and Results.

4.2.3 A summary of the outcome is provided below. Operational noise contours for the area around the main site are provided in Figure 4.1.

4.2.4 The results of the BS 4142 assessment have shown that, during the daytime period, a no change to negligible impact is predicted at all NVSRs.

4.2.5 During the night-time period, a moderate to major impact is predicted at the most affected NVSR (note paragraph 4.2.14), Leylodge House, with the Rating Level 11 dB above the background sound level.

4.2.6 The final determination of the significance of any effect is based on further consideration of the context of the sound, namely consideration of the absolute sound level and comparison with WHO guideline levels, and an assessment of resultant internal sound levels.

4.2.7 Predicted Rating Levels of 25 to 39 dB $L_{Ar,Tr}$ are considered to be low to very low (note that the 1997 revision of BS 4142 considered a Rating Level below 35 dB $L_{Ar,Tr}$ to be 'very low'). On this basis, it is considered that, regardless of the background sound level, the risk for adverse noise impact is low. In this regard BS 4142 states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

4.2.8 In terms of the absolute noise level assessment, sound from the proposed development will not contribute to, or give rise to, adverse impacts on NVSRs during the daytime or night-time period for the following reasons.

4.2.9 The level for the onset of sleep disturbance during the night-time contained in the WHO published Night Noise Guidelines for Europe is a free-field level of 42 dB L_{Aeq}. However, at all NVSRs, the resultant night-time ambient sound level would be less than 42 dB $L_{Aeq,T}$ and, as such, the resulting magnitude of impact would be minor to moderate, depending on the context. At the most affected NVSR, Leylodge House, the specific sound level is 39 dB $L_{Aeq,Tr}$ and the baseline residual sound level is 31 dB $L_{Aeq,T}$: consequently, the resultant ambient sound level would be 40 dB $L_{Aeq,T}$, i.e. 2 dB below the level for the onset of sleep disturbance during the night-time period.

4.2.10 Furthermore, with reference to Appendix 10.3, resultant internal octave band sound levels would not exceed the NR20 criteria at the most affected NVSR (Leylodge House).

4.2.11 On this basis, it is considered that the operation of the proposed development will not result in any significant impact based on WHO absolute noise criteria, as it is unlikely to result in any increased sleep disturbance.

4.2.12 Consequently, it is considered that night-time impacts would vary in magnitude from **no change to moderate** magnitude at the NVSRs.

Sensitivity of the receptor

4.2.13 All NVSRs identified within the operational assessment have a sensitivity considered to be medium. As discussed in paragraph 2.3.2, the nearest NSVRs identified for the assessment of operational noise impacts are considered representative of the most affected receptors likely to be affected by the operation of the proposed development.

4.2.14 Note that the two residential properties at Dewsford are not assessed as NVSRs for operational noise impacts because these properties must be unoccupied prior to commissioning and operation, as part of the adopted mitigation as set out in Table 2.11.

Significance of effect

4.2.15 At **medium** sensitivity NSRs the predicted daytime **negligible** impact would result in a **negligible adverse** effect. At **medium** sensitivity receptors the predicted night-time **moderate** impact would result in a **moderate adverse** effect.

4.2.16 A moderate adverse effects is considered to be a significant effect in the context of this assessment and may influence the decision-making process.

4.2.17 While a moderate adverse effect is predicted, given that the moderate adverse effect would be unlikely to affect sleep (due to the low sound level), it is considered that the significance is lower than a mechanistic application of the criteria would suggest, and that significant adverse effects on health or quality of life, or unacceptable noise issues, would be unlikely to result. On this basis, in terms of noise, the development would be compliant with Policy 23 of NPF4.

4.2.18 Furthermore, the design of the development will be undertaken from a good acoustic design perspective, including measures to minimise noise as far as reasonably practicable, taking into consideration other constraints, particularly health and safety concerns.

4.2.19 Consequently, it is considered that the low overall external and internal sound of the potential moderate adverse effect is such that significant adverse effect would be unlikely to result.

Further mitigation or enhancement

4.2.20 As a possibly significant adverse effect has been predicted, albeit unlikely given the low sound level, further mitigation measures should be investigated and employed if reasonably practicable.

4.2.21 However, the design of the development has already been undertaken in such a way that noise emissions would be as low as reasonably practicable, through the specification of low noise plant, optimisation of the site layout and installation of additional physical mitigation.

4.2.22 It is therefore recommended that the noise levels assessed from the Kintore Hydrogen Plant serve as limits for the most affected NVSRs.

Future monitoring

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

Figure 4.1: Operational night-time noise contour from electrolysis plant

4.3 Inter-related effects

4.3.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the construction or operation of the Kintore Hydrogen Plant on the same receptor.

Project lifetime effects

4.3.2 This section provides the assessment of the potential for effects that occur during more than one stage of the development's lifetime (such as phases of construction, operation or decommissioning) to interact such that they may create a more significant effect on a receptor than when assessed in isolation for each stage.

4.3.3 Due to the potential phased approach to constructing the proposed development and bringing initial capacity into operation, construction and operational impacts could overlap to both affect NVSRs. However, on the basis of the noise levels modelled (see Appendices 10.2 and 10.3) it is considered that the impacts assessed for full operation of all phases of the proposed development would be greater than a single phase plus ongoing construction work, so no greater adverse effect is predicted.

Receptor-led effects

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

4.3.5 The potential for disturbance from construction or operational noise to be caused to sensitive ecological receptors has been assessed in Chapter 8: Ecology and Biodiversity. The potential combined impacts of changes in noise, air quality and transport for sensitive human receptors has been assessed in Chapter 14: Population and Health. The traffic generated by the proposed development, reported in Chapter 9: Transport and Access, has been used in the noise assessment undertaken here. The potential for disturbance to the settings of heritage assets from the proposed development (signified by visibility or noise from it for example) has been assessed in Chapter 7: Archaeology and Cultural Heritage.

4.3.6 No additional receptor-related effects have been identified during the assessment.

5 Cumulative Effects Assessment

5.1.1 Following a desktop review of the cumulative developments identified (listed in full in Chapter 16: Summary of Cumulative Effects), only the following developments have been considered to potentially increase the risk for effects of greater significance, as these potentially include new noise generating plant/activity in a similar area to the proposed Kintore Hydrogen Plant.

- Scheme ID 1 APP/2022/2022: Scheme comprises formation of battery energy storage system (BESS) (49.9 megawatts), construction of substation, welfare facility, security fencing, CCTV, floodlighting, formation of access, attenuation basin and associated infrastructure. South Leylodge Farmhouse, Kintore, Inverurie, Grampian, AB51 0XY;
- Scheme ID 2 APP/2023/2310 (prev. ENQ/2023/0382): Scheme comprises construction of 49.9 megawatts battery storage facility, substation and associated infrastructure. Kintore Substation Kintore, Kintore, Inverurie, Grampian, AB51 0;
- Scheme ID 5 APP/2022/0651: Scheme comprises national for construction of enclosed 132kv gas insulated switchgear substation and associated infrastructure. Land South-east Kintore Grid E, Kintore, Inverurie, Grampian AB51 0XY; and
- Scheme ID 6 APP/2020/14375: Scheme comprises national for electricity substation comprising platform area, control building, associated plant and infrastructure, ancillary facilities, landscape works and road alterations and improvement works. Land To The West Of Kintore El, Kintore, Inverurie, Grampian AB51 0XZ

5.1.2 Other developments are located at significant distances away, or are not noise generating developments

5.1.3 To establish the risk for effects of greater significance to occur a review of submitted documentation for each of the developments above has been undertaken, as follows.

Scheme 1: APP/2022/2022

5.1.4 A noise impact assessment (NIA) has been completed and submitted as part of the planning application[2]. Table 6-8 of the report provides a summary of predicted Rating Levels for the development at the NVSRs considered in that assessment.

5.1.5 The most affected NVSR considered in the Scheme 1 NIA and this Kintore Hydrogen Plant assessment is the NVSR Glenview (#27 in the scheme 1 NIA), with predicted Rating Levels of 27 and 38 dB $L_{Ar,Tr}$ respectively.

5.1.6 The cumulative Rating Level would therefore be 38 dB $L_{Ar,Tr}$, i.e. no higher than for Kintore Hydrogen Plant only and would not increase the magnitude of impact or resultant effect.

Scheme 2: APP/2023/2310

5.1.7 A noise impact assessment (NIA) has been completed and submitted as part of the planning application[3]. Tables 6 and 8 of the report provide a summary of predicted free field and indoor sound levels for the development at the NVSRs considered in that assessment.

5.1.8 Table 10 provides a summary of predicted cumulative free field and indoor sound levels from this scheme and APP/2020/1437, APP/2020/1673, APP/2022/2022. Kintore Hydrogen Plant was not considered within the cumulative assessment undertaken by this scheme.

5.1.9 No NVSRs considered in the Scheme 2 NIA are also considered in this Kintore Hydrogen Plant assessment, with the nearest NVSR in the Scheme 2 NIA being 'NSR A Hillcrest', circa 300 m north-east of the nearest NVSR considered in this assessment, namely Glenview.

5.1.10 On the basis of the above, as the Scheme 2 Rating Level is significantly below the Kintore Hydrogen Plant Rating Level (by circa 20 dB), the cumulative Rating Level would be no higher than for Kintore Hydrogen Plant only and would not increase the magnitude of impact or resultant effect.

[2] APP_2022_2022-VOLUME_3_-_TA6_-_NOISE_IMPACT_ASSESSMENT-10178304

[3] APP_2023_2310-NOISE_IMPACT_ASSESSMENT-11011807

Scheme 5: APP/2022/0651

5.1.11 No noise assessment was undertaken for Scheme 5, on the basis that noise emissions from the development would not be significant.

Scheme 6: APP/2020/14375

5.1.12 A NIA has been completed and submitted as part of the planning application[4]. Table 8-1 of the report provides a summary of predicted Rating Levels for the development at the NVSRs considered in that assessment.

5.1.13 The most affected NVSR considered in the Scheme 6 NIA is circa 200 m north of the nearest NVSR considered in the Kintore Hydrogen Plant assessment, namely Glenview, with predicted Rating Levels of 26 and 38 dB $L_{Ar,Tr}$ respectively.

5.1.14 The cumulative Rating Level would therefore be 38 dB $L_{Ar,Tr}$, i.e. no higher than for Kintore Hydrogen Plant only and would not increase the magnitude of impact or resultant effect.

Schemes 1, 2 & 6 together

5.1.15 Rating Levels at the most affected NVSR for Kintore Hydrogen Plant and each of the cumulative schemes 1, 2 and 6 are 38, 27, <26 and 26 dB $L_{Ar,Tr}$ respectively.

5.1.16 Total cumulative Rating Levels would therefore be 38 dB $L_{Ar,Tr,}$ i.e. no higher than for Kintore Hydrogen Plant only and would not increase the magnitude of impact or resultant effect.

5.1.17 Consequently, cumulative developments would not result in any increase in significance of effect associated with the construction or operation of Kintore Hydrogen Plant.

[4] APP_2020_1437-KINTORE_SUBSTATION_EA_APPENDIX_3_2_NOISE_IMPACT_ASSESSMENT-9072459

6 Conclusion and Summary

6.1 Assessments undertaken

6.1.1 An assessment of the potential effects of noise from construction activity, construction traffic and the operation of the proposed development has been undertaken.

6.1.2 The baseline sound environment, based on long-term and attended sound monitoring, is detailed in Appendix 10.1: Baseline Sound Monitoring Report. The methodology and results are detailed in Appendix 10.2: Construction Noise Assessment Methodology and Results and Appendix 10.3: Operational Noise Assessment Methodology and Results.

6.1.3 The magnitude of impact and the significance of effects assessed are as follows.

6.2 Construction noise

6.2.1 Designed-in mitigation comprises control over construction working hours and a requirement to use Best Practicable Means, set out in the Outline Construction Environmental Management Plan.

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

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

6.3 Construction traffic

6.3.1 Designed-in mitigation comprises use of a shuttle bus arrangement for construction staff to minimise traffic generation.

6.3.2 Predictions have shown that noise change on the local highway network associated with the proposed development will result in a noise change of <1 dB on 10 of the 11 road links assessed, and for one link >1 dB and up to 1.4 dB (B977 to the north of Leylodge). In accordance with the magnitude of impact criteria in Table 2.4, this is representative of a minor impact. All other impacts associated with construction traffic are of negligible magnitude or below during all time periods.

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

6.3.4 All other receptors would experience a negligible impact, which results in a negligible adverse effect that is not significant.

6.4 Operational noise

6.4.1 Designed-in mitigation comprises a site layout and proposed sound source attenuation, through subsequent detailed design, to achieve a Rating Level as proposed to Aberdeenshire Council that would avoid unacceptable noise levels at sensitive receptors.

6.4.2 For the two nearest residential properties, where noise levels cannot be fully mitigated, a Grampian planning condition is proposed to require that the proposed development cannot enter commissioning or operation until the properties are vacant.

6.4.3 Predictions have shown that noise from the operation of the proposed development will result in a no change to moderate magnitude of impact at the most affected receptors, which are considered to be of medium sensitivity.

6.4.4 The no change to moderate impacts are considered to result in negligible to moderate adverse effects. Based on the noise environment context, it is determined that this will tend towards a minor adverse effect, which is not significant.

Table 6.1: Summary of potential environment effects, mitigation and monitoring

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Construction phase							
Noise from construction activity	Control of construction working hours and use of Best Practicable Means, managed via a CEMP	Negligible to minor	Medium	Negligible to minor adverse (not significant)	None	Negligible to minor adverse (not significant)	None
Construction traffic noise	Shuttle bus arrangement for construction staff to minimise traffic generation	Negligible to minor	Medium	Negligible to minor adverse (not significant)	None	Negligible to minor adverse (not significant)	None
Operation phase							
Operation of the proposed development	Site layout and sound source attenuation, through subsequent detailed design, to achieve acceptable Rating Level as proposed to Aberdeenshire Council. Grampian condition to avoid unacceptable adverse impacts at two nearest residential properties.	No change to moderate	Medium	Minor to moderate adverse (determined not to be significant)	None	Negligible to moderate adverse (determined not to be significant)	Noise monitoring following commissioning to ensure compliance with the levels reported in this EIAR

References

[1] Scottish Government. National Planning Framework 4. 2023

[2] Aberdeenshire Council. Aberdeenshire Local Development Plan 2023. 2023

[3] The Stationery Office Limited. Control of Pollution Act, Chapter 40, Part III. 1974.

[4] The Stationery Office Limited. Environmental Protection Act, Chapter 43, Part III. 1990

[5] British Standards Institute. British Standard 5228:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’ – Part 1: Noise.

[6] British Standards Institute. British Standard 5228:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’ – Part 2: Vibration.

[7] British Standards Institute. British Standard 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

[8] Highways England. Design Manual for Roads and Bridges, LA111 ‘Noise and Vibration’. 2020.

[9] Department of Transport. Calculation of Road Traffic Noise. HMSO. 1988.

[10] European Centre for Environment and Health. Night Noise Guidelines for Europe. World Health Organisation. 2009.

[11] International Standard (ISO) 9613-2:1996 ‘Acoustics: Attenuation of sound during propagation outdoors. Part 2: General method of calculation.