

NOISE & VIBRATION

12.1 INTRODUCTION

Company

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Chapter Purpose

This chapter of the ES assesses the likely significant effects of the proposed development on the environment in terms of noise. The chapter and its supporting appendices describe the planning policy context, the assessment methodology; the baseline conditions at and in the vicinity of the application site; the likely significant effects; mitigation measures required to prevent, reduce or offset any significant adverse effects; the likely residual effects after these measures have been employed; and the cumulative effects. In summary, the objectives of the chapter are to:

- Present an assessment of the potential noise impacts associated with the proposed development; and
- Ensure that impacts on human health and the wider environment are assessed and mitigated appropriately.

Figures

- Figure 12.1 Baseline Noise Survey Locations;

Appendices

- Appendix 12.1 Baseline Noise Monitoring
- Appendix 12.2 Demolition and Construction Noise Assessment
- Appendix 12.3 Road Traffic Noise Assessment Calculations
 - Appendix 12.3.1 Predicted Baseline 2018
 - Appendix 12.3.2 2030 Without Development
 - Appendix 12.3.3 2030 With Development
- Appendix 12.4 Trace Mineral Explosives Summary

12.2 METHODOLOGY

Guidance

- Planning Practice Guidance, 2019 [1]
- British Standard 5228: 2009 + A1:2014 - Code of Practice for Noise and Vibration Control on Construction and Open Sites [2]
- British Standard 4142: 2014 - Methods for Rating and Assessing Industrial and Commercial Sound [3]

- British Standard 8233: 2014 – Guidance on Sound Insulation and Noise Reduction for Buildings [4]
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites [2]
- World Health Organisation Guidelines for Community Noise, 1999 (WHO) [5]
- Calculation of Road Traffic Noise, 1988 [6]
- Institute of Environmental Management and Assessment - Guidance Note 1 Guidelines for the Environmental Assessment of Road Traffic, 1993 [7]
- Professional Practice Guidance on Planning and Noise – New Residential Development, 2017 [8]
- Institute of Environmental Management and Assessment Guidelines for Environmental Noise Impact Assessment, 2014 [9]

Legislation and Policy

- Control of Pollution Act 1974 [10]
- Environmental Protection Act, 1990 [11]
- National Planning Policy Framework, 2019 [12]
- Noise Policy Statement for England, 2010 [13]
- Sevenoaks District Council adopted Core Strategy, 2011 [14]
- Sevenoaks District Council Allocations and Development Management Plan (ADMP), 2015 [15]
- Sevenoaks Local Plan Proposed Submission Version 2018 [16]

Consultees

Correspondence with Mr Colin Alden, Environmental Health Officer, Sevenoaks District Council, SDC, was established in November 2018 with respect to the proposed acoustic survey, methodologies and assessment. Agreement was made in principle with the SDC that the previous 2015 extant planning permission acoustic report survey methodology and scope is appropriate for the new proposed development. Hydrock confirmed that the background noise monitoring locations chosen for the most recent survey would be similar to the locations accepted in the 2015 planning application acoustic report. This allows for some direct comparison of data and provides consistency wherever practicable for assessment purposes.

Scoping

The below table provides a list of all the comments made in the Scoping Opinion in regard to the assessment of noise and vibration, with responses provided on how each comment has been addressed within this chapter.

Table 0.1

Scoping Opinion Comments

SCOPING OPINION COMMENTS	HOW THIS HAS BEEN ASSESSED/ADDRESSED IN ENVIRONMENTAL STATEMENT
The development will require acoustic assessment to include evaluations to BS 8233:2014, BS 4142:2014 and for the construction activities BS 5228:2009 + A1:2014.	BS 5228:2009 assessment for construction noise completed for existing and proposed noise sensitive receptors using details regarding typical demolition and construction plant and machinery. Businesses/offices/commercial/light industrial land uses and operations including building services noise assessed referencing BS 4142:2014 and BS 8233:2014. Outline design criteria provided in line with BS 4142:2014. Road traffic noise and construction traffic noise assessed at noise sensitive receptors using CadnaA noise modelling software referencing BS 8233:2014 external and internal noise levels.
The assessment should evaluate the potential impact of transport and commercial noise sources with an emphasis on the protection of dwellings from noise and minimising the noise exposure to amenity space.	Operations from adjacent land occupiers and trace material detonations assessed at all noise sensitive receptors. Detailed assessments provide representative and worst-case scenarios.

The following was stated in the Scoping Report in regard to vibration:

“A previous scoping exercise undertaken by Waterman for the application site identified that sources of vibration in the area are considered to be low and, as such, environmental vibration impacts on existing and potential receptors are not anticipated to be significant. Vibration and a vibration impact assessment was scoped out of the previous EIA assessment. Given that no new significant sources of vibration are anticipated or located on or adjacent to the application site, it is considered that vibration can be scoped out of this current EIA.”

SDC did not comment on vibration in the Scoping Opinion. An assessment of vibration effects has therefore been scoped out of this chapter.

Consideration of Climate Change

Climate change is not considered likely to have a material effect on the assessment of noise and vibration reported in this chapter and as such, has not been considered further. Wider consideration of climate change in the context of the proposed development is addressed at Appendix 2.4, Vol III of this ES.

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Consideration of Human Health

The noise exposure guidelines recommended by WHO and BS 8233:2014, upon which the assessment criteria in this Chapter have been based, have been developed from research into the impacts of noise and vibration on human health. Therefore, this noise assessment directly addresses human health. Wider consideration of human health in the context of the proposed development is addressed at Appendix 2.5, Vol III of this ES.

Consideration of Risk of Major Accidents and/or Disasters

It is considered that major accidents and/or disasters identified as relevant to the proposed development are not applicable to this technical area and have not been considered within the assessment. Wider consideration of the risk of major accidents and disasters in the context of the proposed development is addressed at Appendix 2.6, Vol III of this ES.

Alternatives

See Chapter 4 of the ES. Alternative scenarios considered are limited to the 'Do Something'

Assessment of Baseline Conditions & Receptor Sensitivity

Baseline noise conditions at the site have been characterised during a noise survey. The survey consisted of a mixture of attended and unattended, long-term and short-term measurements.

Baseline noise survey data has been reviewed alongside the previous ES chapter. Survey data has been used to model the site using acoustic software CadnaA, noise levels predictions at receptor locations have been derived from the models.

The previous ES Noise and Vibration Chapter (referred to as 'the previous ES'), submitted within the 2015 outline planning permission (OPP), has been referenced to ensure consistency with Hydrock's noise survey, assessment and reporting methods for the production of this ES Chapter. This follows consultation advice gained from SDC.

The spatial extent of the assessment area covers the site and also the surrounding regions where existing noise sensitive receptors (identified in the previous ES and replicated in this ES) have been identified for assessment.

The temporal extent of the assessment has been modelled from existing to future baseline conditions.

The nearest noise sensitive receptors include the same receptors as provided in the previous ES.

Error! Not a valid bookmark self-reference.2 sets out the scale of sensitivity that has been applied to receptors identified and considered within this assessment.

Table 0.2

Scale of noise receptor sensitivity used in the assessment

SENSITIVITY	DESCRIPTION
Very High	Residential, recreational spaces, educational spaces in daytime, conference
High	Educational premises
Medium	Businesses/offices daytime, retail, restaurants
Low	shops
Negligible	B2, light/general industrial uses,

Assessment of Magnitude

Construction Phase

The assessment was undertaken based on the description of development contained in Chapter 3 of this ES. **Error! Not a valid bookmark self-reference.** indicates the scale of construction impact magnitude that has been used in undertaking the assessment.

Table 0.3

Scale of magnitude for construction noise impacts used in the assessment

MAGNITUDE	DESCRIPTION
Very large	Construction noise level greater than or equal to BS 5228 Noise Category C, >75dB $L_{Aeq,T}$
Large	Construction noise level greater than 70 dB $L_{Aeq,T}$ but lower than 75 dB $L_{Aeq,T}$, equivalent to BS 5228 Noise Category B
Medium	Construction noise level greater than 65 dB $L_{Aeq,T}$ but lower than 70 dB $L_{Aeq,T}$, equivalent to BS 5228 Noise Category A
Small	Construction noise level lower than 65 dB $L_{Aeq,T}$, equivalent to BS 5228 Noise Category A

Table 12.4 indicates the scale of construction impact magnitude that has been used in undertaking the assessment.

Table 0.4

Scale of magnitude for construction traffic noise impact

MAGNITUDE	CHANGE OR DIFFERENCE IN NOISE LEVEL, DBA
Large	>5
Medium	3.0 – 4.9
Small	1.0 – 2.9
Negligible	-0.9 – 0.9

Operational Phase

The assessment was undertaken based on the description of development contained in Chapter 3 of this ES. **Error! Not a valid bookmark self-reference.** indicates the scale of construction impact magnitude that has been used in undertaking the assessment.

Table 0.35 indicates the scale of impact magnitude that has been used in undertaking the assessment of noise impacts from Trace Material Detonation Activity by current occupants (DSTL and QinetiQ).

Table 0.5

Scale of magnitude for Trace Mineral Detonation Activity noise impacts used in the assessment

MAGNITUDE	DESCRIPTION
Large	Level at which there is an increased possibility of serious disturbance and annoyance and should be considered unacceptable, > 65dB L_{Afmox} inside, >80dB L_{Afmox} outside, > 5 events per day.
Medium	Level at which there is an increased possibility of disturbance and annoyance. The impact gives rise to some concern but is likely to be tolerable depending on scale and event numbers, 58-64 L_{Afmox} inside, 73-79dB L_{Afmox} outside, > 5 events per day.
Small	Level is undesirable but of limited concern, 51-57dB L_{Afmox} inside, 66-72dB L_{Afmox} , 3-5 events per day.
Negligible	Level to avoid disturbance and annoyance at which the impact is not of concern, > 50dB L_{Afmox} inside, < 65dB L_{Afmox} outside, 1-2 events per day.

Table 12.6 indicates the impact magnitude that has been used in undertaking the building services plant noise assessment as based on BS 4142:2014 guidance.

Table 0.6

Scale of magnitude for building services noise impact

MAGNITUDE	DESCRIPTION
Large	A difference of +10 dB (over background noise level, $L_{A90,T}$) or more
Medium	A difference of +5 dB (over background noise level, $L_{A90,T}$)
Small	Rating level does not exceed the background sound level ($L_{A90,T}$)
Negligible	Rating level is less than 0dBA above background noise level ($L_{A90,T}$)

Table 12.7 indicates the impact magnitude that has been used in undertaking the commercial, business and industrial land uses assessment and also the difference in noise level from road traffic noise as a result of the proposed development traffic generation.

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Table 0.7

Scale of magnitude for commercial, business and industrial noise impacts, and also the scale of magnitude for road traffic noise

MAGNITUDE	CHANGE OR DIFFERENCE IN NOISE LEVEL, DB(A)
Large	≥10, The impact gives rise to serious concern and it should be considered unacceptable.
Medium	5.0 to 9.9, The impact gives rise to some concern but is likely to be tolerable depending on scale and duration.
Small	3.0 to 4.9, The likely impact is undesirable but of limited concern.
Negligible	≤ 0 to 2.9, The likely impact is not of concern.

Assessment of Significance

The assessment of significance within this chapter is based on the matrix presented in Table 0.8.

Table 0.8

Significance Matrix

MAGNITUDE OF IMPACT	SENSITIVITY OF RECEPTOR				
	Very High	High	Medium	Low	Negligible
Large	Major Significance	[3]	Moderate Significance	Minor Significance	[2]
Medium	[3]	Moderate Significant	Minor Significance	[2]	Negligible Significance
Small	Moderate Significance	Minor Significance	[2]	Negligible Significance	Negligible Significance
Negligible	[1]	[2]	Negligible Significance	Negligible Significance	Negligible Significance

[1] The choice between 'Moderate Significance', 'Minor Significance' and 'Negligible Significance' will depend on the specifics of the impact and will be down to professional judgement and reasoning.

[2] The choice between 'Minor Significance' and 'Negligible Significance' will depend on the specifics of the impact and will be down to professional judgement and reasoning.

[3] The choice between 'Major Significance' and 'Moderate Significance' will depend on the specifics of the impact and will be down to professional judgement and reasoning.

n.b. 'Negligible Significance' includes 'Neutral' and 'No Impact' assessments.

Relevant Associated Development

Associated development that has been assessed within the chapter includes transport and road improvements works.

Assumptions/Limitations

- In undertaking the noise assessment of the application site and wider surrounding area, there are a number of limitations and constraints affecting the outputs from this work. These include:
- Limitation in the level, robustness and certainty in source noise data regarding Defence Science and Technology Laboratory (DSTL) Trace Explosions. However, this has been completed in close consultation with the current occupants (DSTL and QinetiQ) to gain representative data as far as practicable.
- Limitations in interpreting the previous ES Chapter in providing comparative source noise data to assess demolition and construction noise.
- Limitations in assessing construction and demolition noise impact significance. Reasonable assumptions have been applied to ascertain noise levels e.g., use of BS 5228 for noise data for plant and machinery, land use site plan to inform relative distances between the site and the nearest residential receptors, reasonable assumption made for plant and machinery 'on' time during working day. Reasonable assumption on construction and demolition noise has been based on professional experience of assessing such activities from similar development sites.

Table 12.9 provides the list of plant and vehicles which has been adopted for this assessment, based on typical construction/demolition practices, from which noise levels at each noise sensitive receptor have been predicted. Noise level predictions at each noise sensitive receptor are based on reasonable worst-case assumptions regarding typical demolition and construction works/operations e.g., plant/machinery location, duration of source noises (plant/machinery on times).

Table 12.9

Assessment of Construction Noise

PHASE	PHASE OF CONSTRUCTION	PLANT DESCRIPTION	BS 5228 REFERENCE	SOUND PRESSURE LEVEL AT 10 METRES
Construction	Demolition Works	Tracked Excavator	C.2.17	76
		Breaker Mounted on Excavator	C.1.9	90
		Tipper Lorry	C.8.20	79
		Circular Bench Saw	C.4.71	85
		Tracked Crusher	C.1.14	82
		Skip Wagon	C.8.21	78
Construction	Construction Works	Tracked Mobile Crane	C.3.28	67

PHASE	PHASE OF CONSTRUCTION	PLANT DESCRIPTION	BS 5228 REFERENCE	SOUND PRESSURE LEVEL AT 10 METRES
Construction	Demolition Works	Concrete Mixer Truck	C.4.20	80
		Hand-held Gas Cutter	C.3.35	65
		Cement Mixer Truck (Discharging)	C.4.18	75

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12.3 BASELINE CONDITIONS

Noise Survey

An environmental noise survey has been carried out in order to characterise the existing noise environment at the site and in the vicinity of existing sensitive receptors. Full information on survey methodology and results can be found in Appendix 12.1 Baseline Noise Monitoring.

Table 12.10 presents the baseline noise survey results.

Table 0.10

Baseline Noise Monitoring Survey Data

MONITORING LOCATIONS	PERIOD	DURATION	L _{AEQ,T}	L _{A90,T}	L _{AFMAX}
LT1	Day	16hr	56dB	52 dB	66 dB
	Night	8hr	48dB	46 dB	59 dB
LT2	Day	16hr	49 dB	45 dB	63 dB
	Night	8hr	44 dB	41 dB	57 dB
LT3	Day	16hr	52 dB	49 dB	66 dB
	Night	8hr	47 dB	44 dB	57 dB
ST1	Day	30min	42 dB	36 dB	56 dB
ST2	Day	50min	47 dB	39 dB	65 dB
ST3	Day	30min	43 dB	34 dB	63 dB
ST4	Day	40min	50 dB	43 dB	70 dB
ST5	Day	40min	46 dB	37 dB	61 dB
ST6	Day	20min	75 dB	71 dB	81 dB

Table 12.11 presents the key noise sensitive receptors considered within the assessment. It should be noted that the noise sensitive receptors are the same as those assessed in the noise report and ES Chapter as provided in the previous outline application.

Table 0.11

Noise Sensitive Receptors

KEY RECEPTORS	DESCRIPTION	SENSITIVITY	FURTHER INFORMATION
NSR A Armstrong Close	2 Storey Existing Residential Houses Located to the North of the application site at approximately 20 meters distance.	Very High	Figure 12.1.
NSR B Star House, Star Hill Road	2 Storey Existing Residential Houses Located to the South of the application site at approximately 220 meters distance	Very High	Figure 12.1
NSR C Rose Cottage Farm, Birchwood Lane	2 Storey Existing Residential Houses Located to the West of the application site at approximately 95 meters distance	Very High	Figure 12.1
NSR D The Cottage, Otford Lane	2 Storey Existing Residential Houses Located to the North of the application site at approximately 310 meters distance	Very High	Figure 12.1
NSR E Proposed Residential Development	Residential, up to three storeys (Up to 13.5m to top of ridgeline) proposed at the application site	Very High	Figure 12.1

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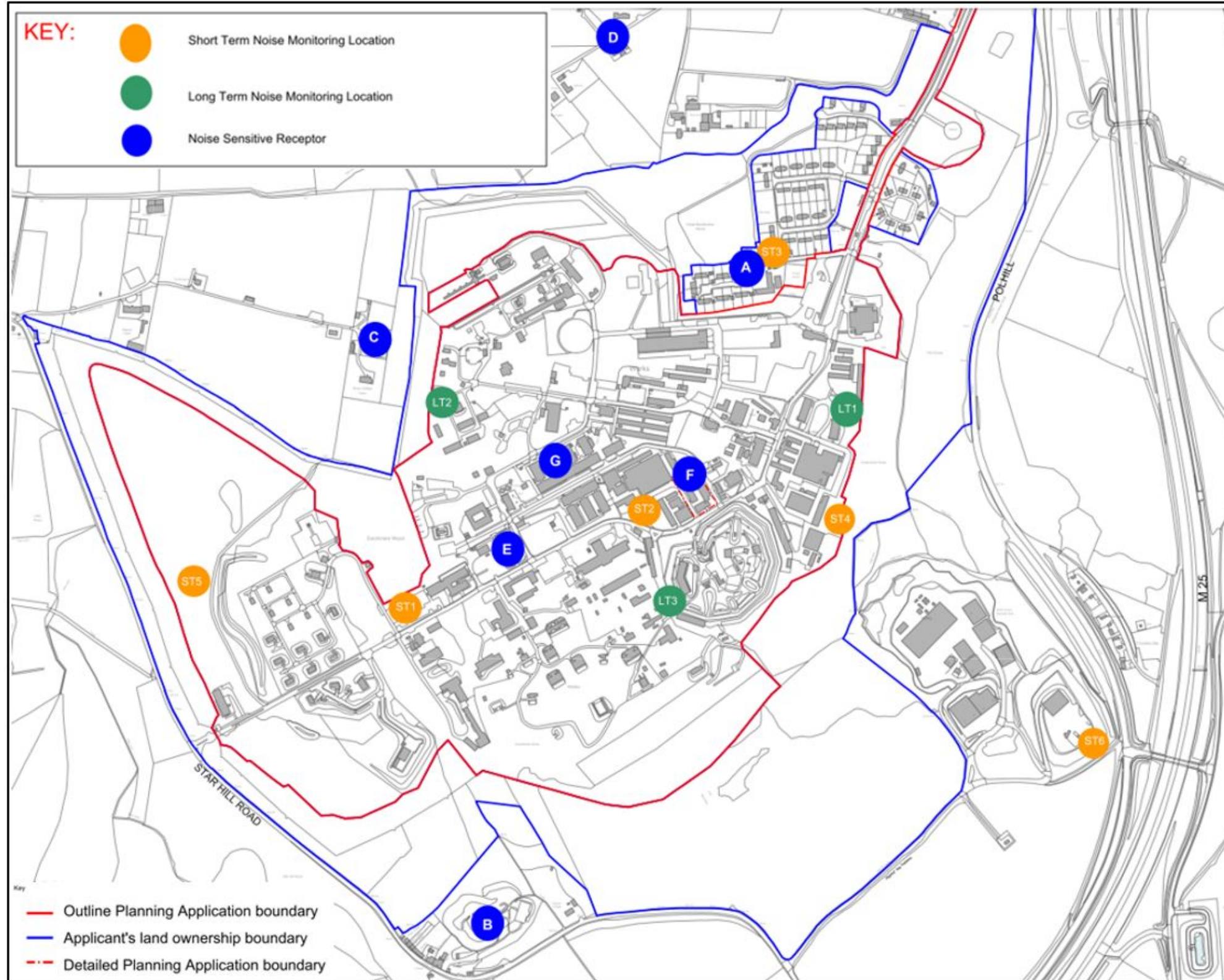
KEY RECEPTORS	DESCRIPTION	SENSITIVITY	FURTHER INFORMATION
NSR F Proposed Mixed-Use Development	Mixed Use: Up to 3 storeys (Up to 16m to top of ridgeline) proposed at the application site	Very High	Figure 12.1
NSR G Proposed Residential Development	Residential, up to three storeys (Up to 13.5m to top of ridgeline) proposed at the application site	Very High	Figure 12.1
NSR H Proposed School	New school proposed east of Crow Drive, approximately 20metres from application's eastern site boundary	Very High	Figure 12.1

Figure 12.1 presents a plan showing the noise sensitive receptor locations and baseline noise monitoring locations

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Figure 02.1

Noise Sensitive Receptor Locations and Baseline Noise Survey Monitoring Locations



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Trace Mineral Explosive Noise

The baseline noise environment includes noise from trace mineral explosions, associated with the operations of DSTL and QinetiQ within the site boundary. DSTL are in the process of relocating their operations and are scheduled to fully vacate the site by 2021. QinetiQ are expected to continue operations in to the foreseeable future, however various elements of their operation will be relocated within the site boundary. The relocation will effectively increase the distance between existing residential receptors and noise sources associated with the operations.

12.4 POTENTIAL SIGNIFICANT IMPACTS

PHASE	DESCRIPTION	ADVERSE/BENEFICIAL
Construction	The potential impacts of construction traffic (including HGV movements), non-mobile machinery and other construction plant on noise levels at existing and proposed sensitive receptors.	Adverse
Operation	Presence of additional road traffic vehicles generated by the development once operation within future year (2031) with full occupation flow scenario affecting internal and external ambient noise levels at existing residential receptors and new residential receptors at the site brought about by the proposals.	Adverse
Construction & Operation	Presence of existing noise sources from current occupants in adjoining land, DSTL and QinetiQ, and maximum impact noise associated with onsite testing of Trace Mineral Explosives. Noise predictions from the operation of these activities has the potential to significantly affect all residential receptors, both existing and introduced, however those located closest to the activities (B, E, F, G) would be considered worst case assessment.	Adverse
Operation	Introduction of potential noise sources into development; atypical commercial land uses/operations (Land Use Class A/B/D employment buildings/areas, hotel uses), building services noise (kitchen extract fans, air conditioning plant etc.). It is expected that typical building services mechanical plant as part of the development proposal would affect the nearest proposed residential elements of the development only, i.e., existing residential noise sensitive receptors off site are of considerable distance from likely commercial/business plant source.	Adverse

12.5 ASSESSMENT PRE-MITIGATION (INCLUDING DESIGN INTERVENTION)

This section presents the pre-mitigation assessment. None of the proposed operational uses (NSR E-H) will be operational during the proposed demolition works and, as such, these receptors have not been considered within the demolition works noise assessment. However, some of the operational uses could be operational while construction works are ongoing. To ensure that a robust worst-case scenario is assessed, it has been assumed that all operational uses would be operational while construction works are ongoing and therefore NSR E-H have been considered as sensitive receptors to these impacts.

PHASE	RECEPTOR(S) AFFECTED	IMPACT	MAGNITUDE PRE-MITIGATION	SIGNIFICANCE PRE-MITIGATION	MITIGATION PROPOSED?	FURTHER INFORMATION
Construction	NSR A	Demolition Works Noise level during demolition works: up to 73dB(A), constitutes a large magnitude of effect.	Large	Major Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR B	Demolition Works Noise level during demolition works: up to 51dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR C	Demolition Works Noise level during demolition works: up to 59dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR D	Demolition Works Noise level during demolition works: up to 52dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR A	Construction Works Noise level during construction works: up to 67dB(A), constitutes a medium magnitude of effect.	Medium	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.

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PHASE	RECEPTOR(S) AFFECTED	IMPACT	MAGNITUDE PRE-MITIGATION	SIGNIFICANCE PRE-MITIGATION	MITIGATION PROPOSED?	FURTHER INFORMATION
Construction	NSR B	Construction Works Noise level during construction works: up to 45dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR C	Construction Works Noise level during construction works: up to 54dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR D	Construction Works Noise level during construction works: up to 47dB(A), constitutes a medium magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR E	Construction Works Noise level during construction works: up to 56dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR F	Construction Works Noise level during construction works: up to 49dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR G	Construction Works Noise level during construction works: up to 56dB(A), constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR H	Construction Works Noise level during construction works: up to 67dB(A), constitutes a large magnitude of effect.	Medium	Moderate Adverse	YES	Table 12.12. Appendix 12.2. Chapter 5.
Construction	NSR A - H	Demolition and Construction Traffic Noise Noise levels during demolition and construction from construction traffic; predicted ≤ 1.5 dB(A) increase, which constitutes a small magnitude of effect.	Small	Moderate Adverse	YES	Table 12.12. Chapter 5.
Construction & Operation	NSR E & F	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally at the nearest proposed noise sensitive receptors (NSRs E & F, adjacent to Crow Drive) within the Development (on Crow Drive), assuming partially open windows, are 66dB $L_{A_{fmax}}$ and 53 dB $L_{A_{fmax}}$ respectively.	Large	Moderate Adverse	YES	Figure 12.1 Table 12.5
Construction & Operation	NSR A	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 60 dB $L_{A_{fmax}}$ and 47 dB $L_{A_{fmax}}$ respectively. However, noise impacts are reduced compared to baseline, as a result of QinetiQ relocation and withdrawal of DSTL, therefore of negligible significance at existing receptors.	Small	Negligible	NO	Figure 12.1 Table 12.5
Construction & Operation	NSR B	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 61 dB $L_{A_{fmax}}$ and 48dB $L_{A_{fmax}}$ respectively. However, noise impacts are reduced compared to baseline, as a result of QinetiQ relocation and withdrawal of DSTL, therefore of negligible significance at existing receptors.	Negligible	Negligible	NO	Figure 12.1 Table 12.5
Construction & Operation	NSR C	Human exposure and negative health effects due to operations at QinetiQ on adjacent land	Negligible	Negligible	NO	Figure 12.1 Table 12.5

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PHASE	RECEPTOR(S) AFFECTED	IMPACT	MAGNITUDE PRE-MITIGATION	SIGNIFICANCE PRE-MITIGATION	MITIGATION PROPOSED?	FURTHER INFORMATION
		Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 58 dB $L_{A_{fmax}}$ and 45dB $L_{A_{fmax}}$ respectively. However, noise impacts are reduced compared to baseline, as a result of QinetiQ relocation and withdrawal of DSTL, therefore of negligible significance at existing receptors.				
Construction & Operation	NSR D	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 56 dB $L_{A_{fmax}}$ and 43dB $L_{A_{fmax}}$ respectively. However, noise impacts are reduced compared to baseline, as a result of QinetiQ relocation and withdrawal of DSTL, therefore of negligible significance at existing receptors.	Negligible	Negligible	NO	Figure 12.1 Table 12.5
Construction & Operation	NSR G	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 64 dB $L_{A_{fmax}}$ and 51 dB $L_{A_{fmax}}$ respectively.	Small	Moderate Adverse	YES	Figure 12.1 Table 12.5
Construction & Operation	NSR H	Human exposure and negative health effects due to operations at QinetiQ on adjacent land Maximum predicted noise levels from trace explosive detonations both externally and internally assuming partially open windows, are 64 dB $L_{A_{fmax}}$ and 51 dB $L_{A_{fmax}}$ respectively.	Small	Moderate Adverse	YES	Figure 12.1 Table 12.5
Operation	NSR A	Road Traffic Noise Increase of road traffic noise predicted to be 0.1 dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR B	Road Traffic Noise Increase of road traffic noise predicted to be 0.2dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR C	Road Traffic Noise Increase of road traffic noise predicted to be 0.1 dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR D	Road Traffic Noise Increase of road traffic noise predicted to be 0.1 dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR E	Road Traffic Noise Increase of road traffic noise predicted to be 0.9dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR F	Road Traffic Noise Increase of road traffic noise predicted to be 0.1 dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR G	Road Traffic Noise Increase of road traffic noise predicted to be 0.1 dB.	Negligible	Negligible	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSR H	Road Traffic Noise Increase of road traffic noise predicted to be 59.3dBA daytime during typical school operational hours.	Negligible	Minor Adverse	YES	Appendix 12.3.1, 12.3.2, 12.3.3
Operation	NSRs A - H	Commercial, Business and Industrial Uses Noise levels at NSRs A - G due to existing commercial, business and industrial land class uses are predicted to result in a negligible impact in accordance with BS4242:2014.	Negligible	Negligible	YES	Figure 12.1
Operation	NSRs A - H	Building Services/Plant Noise	Negligible	Negligible	NO	Figure 12.1

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PHASE	RECEPTOR(S) AFFECTED	IMPACT	MAGNITUDE PRE-MITIGATION	SIGNIFICANCE PRE-MITIGATION	MITIGATION PROPOSED?	FURTHER INFORMATION
		Plant noise emissions from the proposed development at every NSR (A – H) are predicted to be (as a maximum operational noise level) 0dBA above daytime and night time background noise levels at each NSR. This is based on acoustic calculations considering the baseline noise survey data and typical building services noise levels.				

12.6 MITIGATION & ENHANCEMENT MEASURES

PHASE	POSSIBLE EFFECT BEING MITIGATED	MITIGATION MEASURE	HOW SECURED / TRIGGER	MAGNITUDE POST-MITIGATION	ADVERSE / BENEFICIAL	FURTHER INFORMATION
Construction	Human Health (noise exposure) effect	<p>Prior to construction, a construction programme will be subject to a CEMP approval by Kent County Council/SDC. Demolition and construction contractors will be subject to controlling noise with Best Practicable Means as per Control of Pollution Act, 1974 and minimum mitigation measures as specified in BS 5228.</p> <p>Reduction of greatest ambient construction noise levels to 75 dB or 70 dB $L_{Aeq,10hr}$ (0800 hrs-1800 hrs) at NSRs by use of the mitigation measures contained in CEMP, Best Practicable Means of Control of Pollution Act 1974 and minimum mitigation measures for controlling construction noise from BS 5228:2009. This is of particular importance to existing residential receptors at NSR A (Armstrong Close) and proposed NSR H (school).</p> <p>Typical outline measures include:</p> <ul style="list-style-type: none"> All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order; Inherently quiet plant should be used where appropriate – all major compressors and generators will be ‘sound reduced’ with sealed acoustic covers Machines in intermittent use will be shut down in the intervening periods between use or turned down to a minimum; All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided; The use of all noisy plant will be limited to core construction time periods (08:00 – 18:00 hrs Monday to Friday, 08:00 – 13:00hrs Saturdays); Channels of communication will be established between the contractor / developer, local authority and residents; A site representative will be responsible for matters relating to noise; Localised noise barriers will be erected as necessary around plant items such as generators or high duty compressors; and Construction compounds will be organised so as to minimise noise impacts to neighbouring noise sensitive receptors, by locating noisy operations away from receptors and using on-site structures and materials to screen noise where practicable and necessary 	Planning condition for Construction Environmental Management Plan for demolition and construction works	NSR A: 5-10dBA reduction NSR B: 5-10dBA reduction NSR C: 5-10dBA reduction NSR D: 5-10dBA reduction NSR E: 5-10dBA reduction NSR F: 5-10dBA reduction NSR G: 5-10dBA reduction	Adverse	Chapter 5
Operation	Human Health (noise exposure) effect	<p>Road Traffic management measures on Crow Drive, e.g., information provided by Peter Brett Associates (PBA) detail highway proposals for speed attenuation curves and bends, traffic islands and traffic control junctions which will reduce vehicle speeds and have a proportionate decrease in noise levels over the previously consented scheme where these measures were not previously considered.</p> <p>All residential premises within approximately 20metres of, and with a direct line of sight on to Crow Drive, will require glazing ratings ranging from 30 dB R_w (standard thermal double glazing) to 35 dB R_w at the noisiest locations. The closest noise sensitive locations will require acoustic trickle ventilators to allow for adequate ventilation, while maintaining appropriate internal levels, in accordance with current guidance.</p> <p>For residential premises and noise sensitive receptors to the North East of the site and East of Crow Drive, including the school, glazing ratings requirements range from 30 dB R_w (standard thermal double) to 35 dB R_w at the noisiest locations, with facades requiring acoustic trickle ventilators to allow for adequate ventilation where windows cannot be opened without exceeding the internal ambient noise level.</p> <p>For noise sensitive receptors located North West and West of the site where noise levels are relatively lower compared to the South East and East of the Site, and where they are approximately 20 metres or more from Crow Drive, external noise levels are predicted to be at or below 55 dB L_{Aeq} (07:00 – 23:00hrs) thereby showing compliance with external noise level criteria taken from BS 8233:2014 and WHO.</p>	Secured through outline planning application design proposals/plans.	NSR A: < 5 dBA reduction NSR B: < 5 dBA reduction NSR C: < 5 dBA reduction NSR D: < 5 dBA reduction NSR E: < 5 dBA reduction NSR F: < 5 dBA reduction NSR G: < 5 dBA reduction	Adverse	Chapter 10

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PHASE	POSSIBLE EFFECT BEING MITIGATED	MITIGATION MEASURE	HOW SECURED / TRIGGER	MAGNITUDE POST-MITIGATION	ADVERSE / BENEFICIAL	FURTHER INFORMATION
		It should be noted that glazing ratings are based on elevations and plans submitted as part of the outline application. Glazing ratings are provided as indicative recommendations and are to be used only as guidance to demonstrate the expected performance required to meet the internal noise levels as recommended by BS 8233 and WHO guidelines.				
Construction & Operation	Human Health (noise exposure) effect	QinetiQ and adjacent land occupiers to review operations and apply mitigation on their site wherever practicable (e.g., review of open range firing to become semi-open range firing to reduce noise impact at noise sensitive receptors).	Ongoing operations at adjacent land occupiers to be agreed	NSR A: 5-10 dBA reduction NSR B: 5-10 dBA reduction NSR C: 5-10 dBA reduction NSR D: 5-10 dBA reduction NSR E: 5-10 dBA reduction NSR F: 5-10 dBA reduction NSR G: 5-10 dBA reduction	Adverse	
Operation	Human Health (noise exposure) effect	Attenuation and control of noise through building design and acoustic engineering (e.g., typical commercial attenuators for commercial ducting and extracts), building services design requires that the rating level does not exceed the typical minimum $L_{A90,15min}$ background sound level at any time. At NSR A, the adopted plant noise rating level upper limits are 34 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 29 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR B, the adopted plant noise rating level upper limits are 37 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 32 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR C, the adopted plant noise rating level upper limits are 40 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 36 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR D, the adopted plant noise rating level upper limits are 34dB $L_{A,Tr}$ (daytime 07.00-23.00) and 29 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR E, the adopted plant noise rating level upper limits are 39 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 34 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR F, the adopted plant noise rating level upper limits are 36 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 31 dB $L_{A,Tr}$ (night-time 23.00-07.00). At NSR G, the adopted plant noise rating level upper limits are 36 dB $L_{A,Tr}$ (daytime 07.00-23.00) and 31 dB $L_{A,Tr}$ (night-time 23.00-07.00). It should be noted that the background levels and rating level limits are considered to be low and BS 4142:2014 provides guidance with regard to assessment of plant at low noise levels and the noise being considered in context (relative to the existing/residual noise climate). The criteria are designed to ensure there is negligible impact on noise sensitive receptors.	Planning condition for the control and operation of mechanical plant and building services noise to operate at or below the background noise levels as given in Table 12.9.	NSR A: 0 - 5 dBA reduction NSR B: 0 - 5 dBA reduction NSR C: 0 - 5 dBA reduction NSR D: 0 - 5 dBA reduction NSR E: 0 - 5 dBA reduction NSR F: 0 - 5 dBA reduction NSR G: 0 - 5 dBA reduction	Adverse	

12.7 ASSESSMENT POST-MITIGATION

PHASE	RECEPTOR	RESIDUAL IMPACT	RESIDUAL EFFECT					
			SIGNIFICANCE	ADV/BEN	ST/MT/LT	D/IND	P/T	R/IRR
Construction	NSR A	Demolition Works Noise level during demolition works: up to 68dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR
Construction	NSR B	Demolition Works Noise level during demolition works: up to 46dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR
Construction	NSR C	Demolition Works Noise level during demolition works: up to 54dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR
Construction	NSR D	Demolition Works Noise level during demolition works: up to 47dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR
Construction	NSR A	Construction Works Noise level during construction works: up to 62dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR
Construction	NSR B	Construction Works	Negligible /Moderate	ADV	ST	D	T	IRR

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PHASE	RECEPTOR	RESIDUAL IMPACT	RESIDUAL EFFECT						
			SIGNIFICANCE	ADV/BEN	ST/MT/LT	D/IND	P/T	R/IRR	
		Noise level during construction works: up to 40dB(A). Reduced residual impact.	Adverse						
Construction	NSR C	Construction Works Noise level during construction works: up to 49dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR D	Construction Works Noise level during construction works: up to 42dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR E	Construction Works Noise level during construction works: up to 51dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR F	Construction Works Noise level during construction works: up to 41dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR G	Construction Works Noise level during construction works: up to 51dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR H	Construction Works Noise level during construction works: up to 62dB(A). Reduced residual impact.	Negligible /Moderate Adverse	ADV	ST	D	T	IRR	
Construction	NSR A - H	Demolition and Construction Traffic Noise Noise levels from construction traffic increase ambient noise levels > 1.5dBA over existing ambient noise levels	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR E & F	Human exposure and negative health effects due to operations at QinetiQ 61dB L _{Afmax} externally and 48 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR A	Human exposure and negative health effects due to operations at QinetiQ 55 dB L _{Afmax} externally and 38 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR B	Human exposure and negative health effects due to operations at QinetiQ 55 dB L _{Afmax} externally and 43 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR C	Human exposure and negative health effects due to operations at QinetiQ 53 dB L _{Afmax} externally and 40 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR D	Human exposure and negative health effects due to operations at QinetiQ 51 dB L _{Afmax} externally and 38 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR G	Human exposure and negative health effects due to operations at QinetiQ 59 dB L _{Afmax} externally and 46 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Construction & Operation	NSR H	Human exposure and negative health effects due to operations at QinetiQ 59 dB L _{Afmax} externally and 46 dB L _{Afmax} internally	Negligible Significance	ADV	ST	D	T	IRR	
Operation	NSR A	Road Traffic Noise External road traffic noise predicted to be 46.6dBA daytime, 41.1dBA night time.	Negligible Significance	ADV	ST	D	T	IRR	
Operation	NSR B	Road Traffic Noise External road traffic noise predicted to be 51.4dBA daytime, 45.8dBA night time.	Negligible Significance	ADV	ST	D	T	IRR	
Operation	NSR C	Road Traffic Noise External road traffic noise predicted to be 41.8dBA daytime, 35.9dBA night time.	Negligible Significance	ADV	ST	D	T	IRR	
Operation	NSR D	Road Traffic Noise	Negligible Significance	ADV	ST	D	T	IRR	

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PHASE	RECEPTOR	RESIDUAL IMPACT	RESIDUAL EFFECT					
			SIGNIFICANCE	ADV/BEN	ST/MT/LT	D/IND	P/T	R/IRR
Operation	NSR E	External road traffic noise predicted to be 42.9dBA daytime, 37.2dBA night time. Road Traffic Noise	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSR F	External road traffic noise predicted to be 59.4dBA daytime, 54dBA night time. Road Traffic Noise	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSR G	External road traffic noise predicted to be 46.4dBA daytime, 40.9dBA night time. Road Traffic Noise	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSR H	External road traffic noise predicted to be 41.3dBA daytime, 35.8BA night time. Road Traffic Noise	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSR A - H	External road traffic noise predicted to be 59.3dBA daytime Commercial, Business and Industrial Uses	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSRs A - H	Increase in ambient noise levels at NSRs A - G due to commercial, business and industrial land class uses are predicted to be within BS 8233:2014 noise levels at external and internal areas, being less than 50dBA L _{eq} at external locations daytime, and less than 45dBA L _{eq} night time Building Services/Plant Noise	Negligible Significance	ADV	ST	D	T	IRR
Operation	NSRs A - H	Plant noise emissions from the proposed development at every NSR (A – H) are predicted to be (as a maximum operational noise level) 5dBA below daytime and night time background noise levels at each NSR.	Negligible Significance	ADV	ST	D	T	IRR

Key: ADV/BEN = Adverse/Beneficial; ST/MT/LT = Short-term/Medium-term/Long-term; D/IND = Direct/Indirect; P/T = Permanent/Temporary; R/IRR = Reversible/Irreversible

The above table indicates that noise impacts during the demolition and construction phases of the proposed development have the potential to cause Moderate Adverse impacts at existing sensitive receptors in the short term. This is likely to occur when activity takes place at the closest site boundary to existing receptors, and would be reduced as the location of demolition and construction moves around the site. At greater distances associated impacts are likely to be negligible.

Noise impacts at existing and proposed sensitive receptors will be negligible during the operational phase of the development, providing appropriate mitigation measures are implemented, as detailed in Table 12.15. This demonstrates the development meets the objectives of Policy EN2 – Amenity Protection and Policy EN7 – Noise Pollution of Sevenoaks Allocations and Development Management Plan (ADMP), together with overarching policy and current acoustic assessment guidance.

12.8 WORKS CITED

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