awnconsulting
A Trinity Consultants Company

The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.

T: + 353 1 847 4220
F: + 353 1 847 4257
E: info@awnconsulting.com
W: www.awnconsulting.com

ATTACHMENT-7-1-3-2 NOISE IMPACT ASSESSMENT FOR EPA LICENCE REVIEW APPLICATION

Technical Report Prepared For

Amazon Data Services Ireland Limited

Prepared By

Mike Simms BE MEngSc MIOA

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Dublin Office
The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17, Ireland.
T: + 353 1 847 4220
F: + 353 1 847 4257

AWN Consulting Limited
Registered in Ireland No. 319812

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EXECUTIVE SUMMARY

Amazon Data Services Ireland Limited ('ADSIL') operate a Installation with three data storage buildings on a site in the IDA Business & Technology Park, Clonshaugh, Dublin 17. AWN Consulting has been commissioned to prepare a noise impact assessment for the operation of the Installation to be compiled and submitted as part of this licence review application to the existing Industrial Emissions (IE) licence to consider two additional buildings (i.e. U and V).

This technical report has been prepared to provide details in relation to the noise impact assessment for the licence review application. The assessment is based on the most up-to-date design details available for the Installation and has been prepared with due consideration of the guidance contained within the Environmental Protection Agency (EPA) document *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 2016*.

Section 6 of the EPA's NG4 Guidance outlines the following assessment stages for the noise impact assessment for licence applications.

- Stage 1 – Baseline Noise Survey / Monitoring Locations;
- Stage 2 – Derivation of Noise Criteria;
- Stage 3 – Assessment of Noise Impact; and,
- Stage 4 – Reporting / Licence Application Form.

This report has been prepared with consideration of the four assessment stages outlined above.

An environmental noise survey was conducted to quantify the existing noise environment before the installations were in place in the vicinity of nearest Noise Sensitive Receivers (NSL's) to the site. The survey was conducted in accordance with the EPA's NG4 Guidance.

Appropriate operational noise criteria have been derived for the site following review of noise survey data and receiving environment, in accordance with the relevant NG4 Guidance. The applicable noise criteria identified are in line with the typical limit values for noise from licensed sites.

To assess the impact of noise from mechanical plant associated with the various buildings at nearby NSL's, a detailed computer-based noise model has been prepared using a proprietary noise modelling software package. Noise prediction calculations have carried out in accordance with ISO 9613-2:2024 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*. The predicted noise levels at all NSL's for new mechanical plant and the levels of existing plant noise from the Installation are within the day, evening and night-time noise criteria for site operations.

While not required within the EPA NG4 assessment, an exhaustive cumulative noise assessment is presented in Section 6.0.

CONTENTS

1.0 INTRODUCTION

Amazon Data Services Ireland Limited ('ADSIL') operate three data storage facilities on a site in the IDA Business & Technology Park, Clonshaugh, Dublin 17. AWN Consulting has been commissioned to prepare a noise impact assessment for the operation of the Installation to be compiled and submitted as part of the licence review application to the existing Industrial Emissions (IE) licence to consider two additional buildings (i.e. U and V). This assessment is based on the predicted noise emissions from the installation and the most up-to-date design details available for the Installation and has been prepared with due consideration to the guidance contained within the Environmental Protection Agency (EPA) document *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) 2016.* This report has been prepared in accordance with the four noise impact assessment stages outlined in Section 6 of NG4, which are as follows:

- Stage 1 – Baseline Noise Survey / Monitoring Locations;
- Stage 2 – Derivation of Noise Criteria;
- Stage 3 – Assessment of Noise Impact; and,
- Stage 4 – Reporting / Licence Application Form.

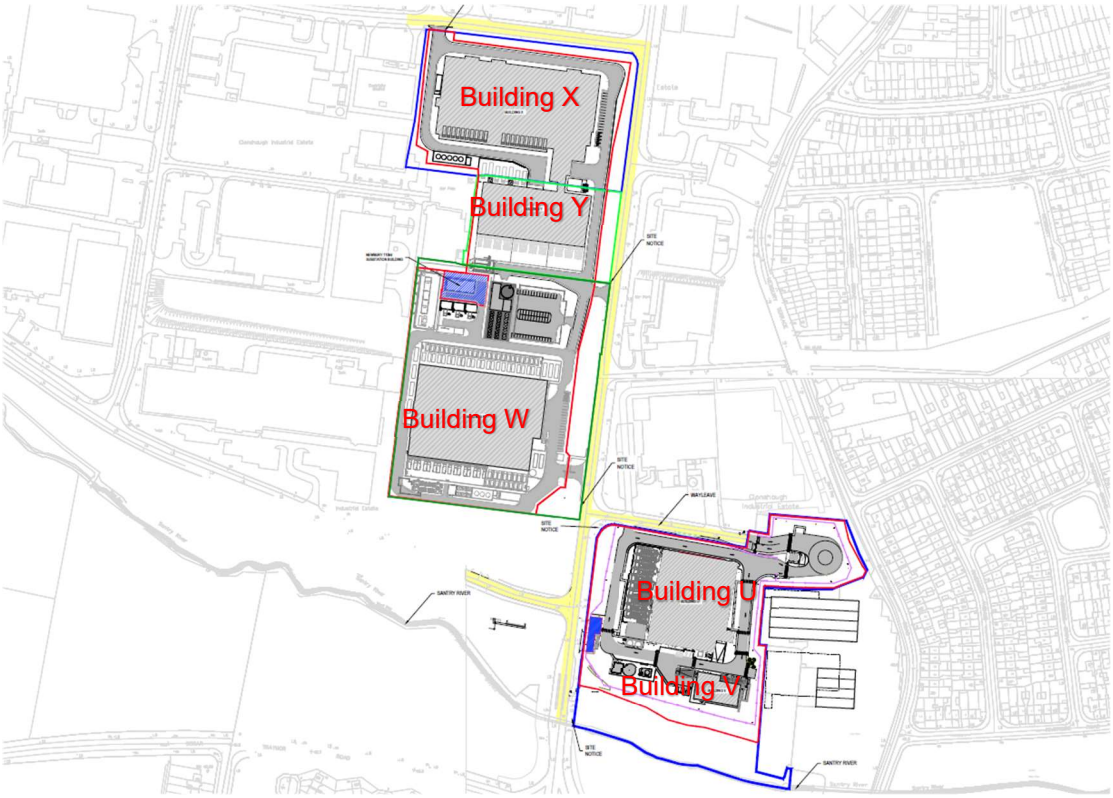

Figure 1 Site Location & Context

Figure 1 presents the proposed site location in the context of the surrounding environment. The nearest residential noise sensitive locations are to the east of the development along the Clonshaugh Road at a distance of approximately 28m from the site boundary. There are also residential dwellings to the west of the site within the Larch Hill development at a distance of approximately 300m from the site boundary, and within the Cromcastle Estate to the south of the site at a distance of approximately 135m from the site boundary. In addition, there are a number of commercial and industrial operations located on lands to the north, east, south and west of the site.

2.0 FUNDAMENTALS OF ACOUSTICS

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPL's measured using 'A-weighting' are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 2.

The established prediction and measurement techniques for the dB(A) parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text[1]. Appendix A to this report presents a glossary of the acoustic terminology referred to in this document.

[1] For example, *Woods Practical Guide to Noise Control* by Ian Sharland.

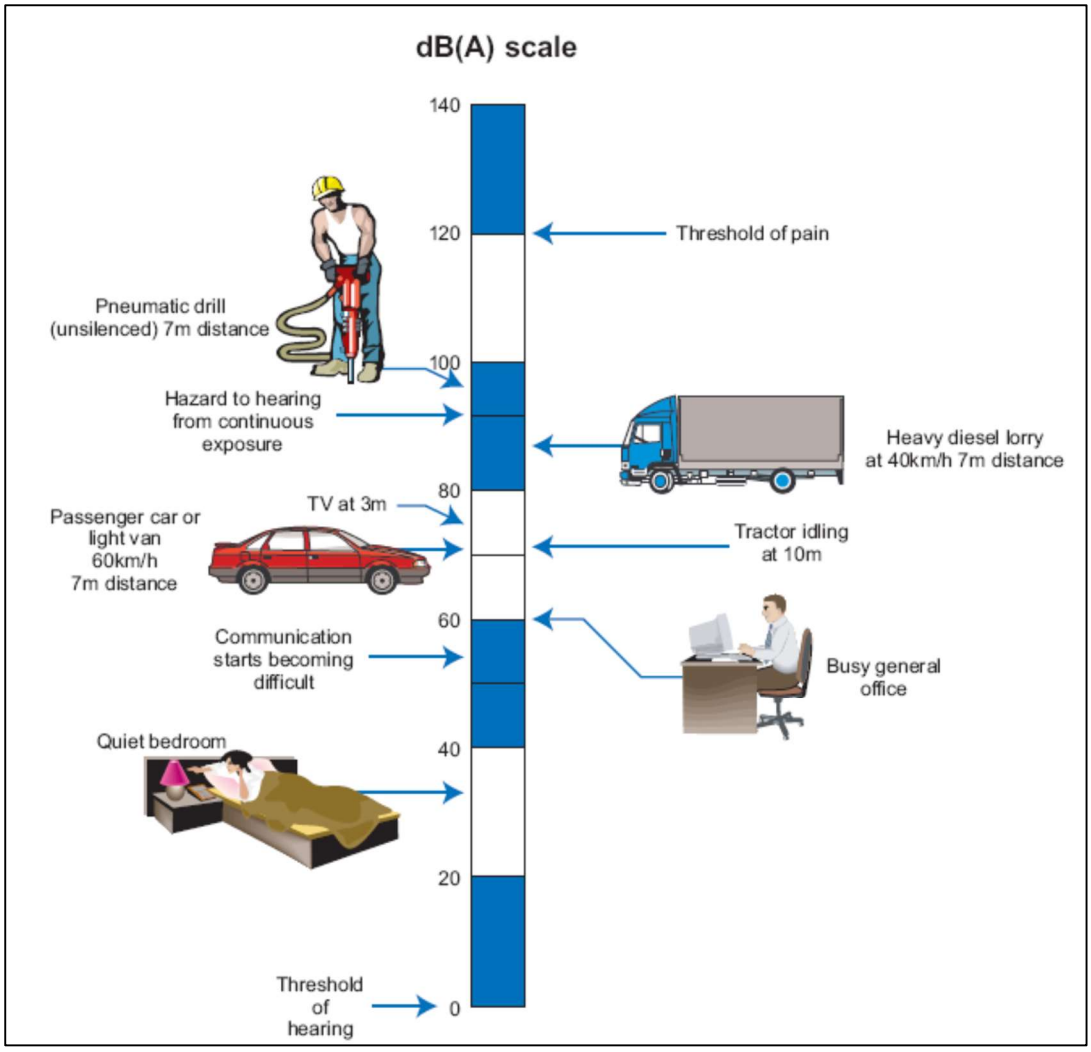

Figure 2 Level of Typical Sounds on the dB(A) Scale – (TII – Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes)

3.0 RECEIVING ENVIRONMENT

This section deals with 'Stage 1' of the noise impact assessment as outlined in the EPA's NG4 Guidance. Note this section has been based on baseline noise surveys completed for the planning applications for the original buildings on the site (i.e. prior to the construction of any of the projects considered here) and is considered representative of the environment at this point in time. It is appropriate to consider the baseline noise environment prior to development so that any noise impact is assessed relative to that pre-existing baseline noise environment.

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2007: *Acoustics – Description, measurement and assessment of environmental noise*[2]. Specific details are set out below.

3.1 Choice of Measurement Locations

Noise measurements were conducted at seven positions in the vicinity of the site. The location of these measurements is shown on Figure 3.

Table 1 Measurement Locations & Descriptions

Location	Description	Photo
A (15 May 2019)	Located within the Turnapin housing estate to the west of the development. This location is considered representative of the nearest residential dwellings to the west of the site. These properties are c. 475m from the western site boundary.	
B (15 May 2019)	Located in the vicinity of the Clayton Hotel Dublin Airport located on the northern side of the R139 to the north of the development. This property has some 8 storeys. These properties are c.135m from the northern site boundary.	
C (15 May 2019)	Located on a grass verge in front of residential units located off the roundabout on the R139. These properties are c. 250m from the northern site boundary.	
D (17-22 May 2019)	Located on a point midway along the eastern boundary of the development site. This location is considered to be representative of background noise levels at the noise sensitive location located c. 65m to the east of the site.	N/A
E (Dec. 2018)	Is located in the vicinity of the nearest residential dwellings to the east along the Clonshaugh Road.	

[2] Note this is the relevant version of the standard at the time of the survey being reported here.

Location	Description	Photo
F (Dec. 2018)	Is located in the vicinity of the nearest residential dwellings to the south that back onto the Oscar Traynor Road.	
G (Dec. 2018)	Is located in the vicinity of the nearest commercial units to the east.	
H (Dec. 2018)	Located at the boundary of the IDA Business Park that adjoins the Larch Hill development to the west of the site. These properties are some 440m from the southern site boundary of the development. This location is considered to be indicative of the noise environment experienced at residences within the Larch Hill estate.	

3.2 Survey Periods

Noise measurements were conducted during a daytime period and a typical night-time period that represents the time of night that provides a measure of existing background noise levels during a period where people are attempting to go to sleep or are sleeping. Due to the fact that the units in question here will operate on a 24-hour basis, their potential impact during night time periods is the critical issue. The surveys were conducted during the following periods:

- Daytime – 11:00 to 22:00hrs on 15 May 2019.
- Night-time – 23:00hrs on 15 May to 01:55hrs on 16 May 2019.
- Unattended – 13:10hrs on 17 May to 11:40hrs on 22 May 2019.
- Daytime – 14:20 to 17:40hrs on 17 December 2018.
- Night-time – 23:00hrs on 15 May to 01:50hrs on 17 – 18 December 2018.

In year 2024 ADSIL prepared this IED Licence application review in order to include Buildings U and V within the existing licence. At that time, Buildings W, X and Y were already in operation; also other sites outside ADSIL's control had come into operation. Therefore, it was not possible to re-create pre-existing noise environment before any of these sites were operational, and, in this instance, reference is made the noise surveys carried out previously.

In general, as ambient noise levels increase gradually over time due to the operation of new developments along with a corresponding increase in traffic flows, use of baseline noise levels from a period before the site was operational is appropriate and leads to a conservative environmental noise assessment, as the ambient noise levels tend to be slightly lower.

3.3 Personnel & Instrumentation

Donogh Casey (AWN) conducted the noise level measurements in 2019. AWN and CLV Consulting carried out the noise level measurements in 2018.

The noise measurements were performed using a Brüel & Kjær Type 2260 Sound Level Analyzer. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. The unattended noise monitoring was completed used a RION NL-52 sound level meter.

3.4 Procedure

Measurements were conducted at the boundary locations noted above. Sample periods for the noise measurements were typically 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis if required. Survey personnel noted the primary noise sources contributing to noise build-up.

Figure 3 Noise Survey Locations

3.5 Measurement Parameters

The survey results are presented in terms of the following parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Another parameter that will be commented upon in this report is the L_{ArT}.

$L_{Ar\,T}$ The L_{Aeq} during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound.

It should be noted for this assessment it has been assumed that detailed design will be carried out in order that there will be not tonal or impulsive noise emissions for the development. Therefore, in this instance L_{Aeq} is equal to $L_{Ar\,T}$.

3.6 Survey Results

3.6.1 Location A

The survey results for Location A are given in Table 2 below.

Table 2 Summary of Results for Location A

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	11:16 – 11:31	67	68	64
	12:43 – 12:58	67	69	63
	14:39 – 14:54	64	65	62
Evening	21:00 – 21:15	64	66	61
Night	23:40 – 00:05	65	61	55
	00:51 – 01:06	66	61	55

Daytime ambient and background noise levels at this location were dictated by road traffic noise from the M50 and M1. Other sources of noise included aircraft activity associated with Dublin Airport and some agricultural machinery. Ambient noise levels ranged from 64 to 67dB $L_{Aeq,15min}$ with background noise levels in the range of 61 to 64dB $L_{A90,15min}$.

During the night-time period road traffic noise was again the dominant noise source at this location with levels decreasing as the volume of traffic on the network deceased into the early hours of the morning. Noise levels were in the range of 65 to 66dB $L_{Aeq,15min}$ and the order of 55dB $L_{A90,15min}$.

3.6.2 Location B

The survey results for Location B are given in Table 3 below.

Table 3 Summary of Results for Location B

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	11:54 – 12:09	62	64	59
	13:42 – 13:57	63	65	59
	15:12 – 15:27	63	64	59
Evening	21:36 – 21:51	61	63	58
Night	00:09 – 00:24	57	57	52
	01:16 – 01:31	54	56	46

Daytime ambient and background noise levels at this location were dictated by road traffic noise from the R139, M50 and M1. Other sources of noise included aircraft activity associated with Dublin Airport and some agricultural machinery. Ambient noise levels ranged from 61 to 63dB $L_{Aeq,15min}$ with background noise levels in the range of 58 to 59dB $L_{A90,15min}$.

During the night-time period again road traffic noise was the dominant noise source at this location with levels decreasing as the volume of traffic on the network deceased into the early hours of the morning. Noise levels were in the range of 54 to 57dB $L_{Aeq,15min}$ and 46 to 52dB $L_{A90,15min}$.

3.6.3 Location C

The survey results for Location C are given in Table 4.

Table 4 Summary of Results for Location C

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	12:18 – 12:33	65	68	56
	14:11 – 14:26	66	69	56
	15:36 – 15:51	65	69	57
Evening	21:56 – 22:09	61	64	54
Night	00:28 – 00:42	59	60	48
	01:35 – 01:50	52	55	42

Daytime ambient and background noise levels at this location were dictated by road traffic noise from the R139, M50 and M1. Other sources of noise included aircraft activity associated with Dublin Airport and some agricultural machinery. Ambient noise levels ranged from 61 to 66dB $L_{Aeq,15min}$ with background noise levels in the range of 54 to 57dB $L_{A90,15min}$.

During the night-time period road traffic noise was again the dominant noise source at this location with levels decreasing as the volume of traffic on the network deceased into the early hours of the morning. Noise levels were in the range of 52 to 59dB $L_{Aeq,15min}$ and 42 to 48dB $L_{A90,15min}$

3.6.4 Location D

An unattended noise survey was carried out at Location D, yielding a time history over the period described in Section 3.2. The profile of the ambient (i.e. $L_{Aeq,15min}$) and background noise levels (i.e. $L_{A90,15min}$) measured during the survey undertaken at Location D is presented in Figure 4.

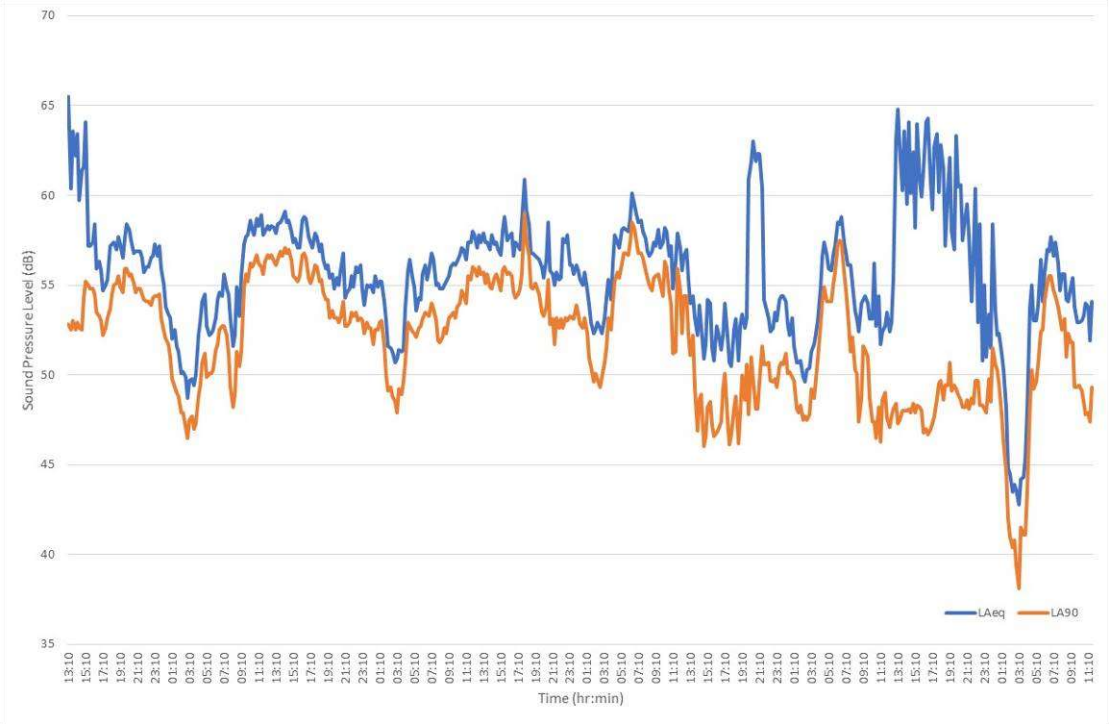

Figure 4 Noise Profile at Location D

The survey results for Location D are given in Table 5.

Table 5 Summary of Results for Location D

Location	Period	Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
			L_{Aeq} (Ambient)	L_{AF90} (Background)
D	Day	Average	57	53
	Evening	Average	57	52
	Night	Average	54	51

Daytime ambient and background noise levels at this location were dictated by road traffic noise from the R139, M50 and M1. Other sources of noise included aircraft activity associated with Dublin Airport and some commercial machinery. Ambient noise levels were the order of 57dB $L_{Aeq,12hr}$ with background noise levels the order of 53dB $L_{A90,12hr}$. Evening time ambient and background noise levels were of the order of 57dB $L_{Aeq,4hr}$ and 52dB $L_{A90,4hr}$.

During the night-time period again road traffic noise was the dominant noise source at this location with levels decreasing as the volume of traffic on the network deceased into the early hours of the morning. Noise levels were in the order of 54dB $L_{Aeq,8hr}$ and 51dB $L_{A90,8hr}$.

3.6.5 Location E

The survey results for Location E are given in Table 6 below.

Table 6 Summary of Results for Location E

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	14:20 – 14:35	64	67	57
	15:30 – 15:45	64	67	57
	16:35 – 16:50	65	68	56
Night	23:00 – 23:15	61	65	48
	00:05 – 00:20	58	60	43
	01:10 – 01:25	55	57	41

During daytime monitoring periods, the sources of noise noted in the area were local traffic along Clonshaugh Road as well as occasional vehicular movements at the adjacent commercial buildings and intermittent (but significant) aircraft movements. Daytime noise levels were in the range 64 to 65 dB L_{Aeq} and 56 to 57 dB L_{A90}.

The night-time noise measurements at this location were again dominated by local traffic along Clonshaugh Road, intermittent aircraft movements and wind generated noise. Noise levels were in the range 55 to 61 dB L_{Aeq} and 41 to 48 dB L_{A90}.

3.6.6 Location F

The survey results for Location F are given in Table 7.

Table 7 Summary of Results for Location F

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	14:45 – 15:00	64	66	58
	15:55 – 16:10	63	65	56
	17:00 – 17:15	64	67	57
Night	23:20 – 23:35	56	59	51
	00:25 – 00:40	53	57	48
	01:30 – 01:45	52	52	45

The daytime noise levels at this location local were influenced almost exclusively by traffic along the Oscar Traynor Road as well as intermittent (but significant) aircraft movements and some birdsong. Noise levels were in the range 63 to 64 dB L_{Aeq} and 56 to 58 dB L_{A90}.

The night-time noise measurements at this location were again dominated by traffic along the Oscar Traynor Road, intermittent aircraft movements and wind generated noise. Noise levels were in the range 52 to 56 dB L_{Aeq} and 45 to 51 dB L_{A90}.

3.6.7 Location G

The survey results for Location G are given in Table 8.

Table 8 Summary of Results for Location G

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Day	15:10 – 15:25	56	57	51
	16:15 – 16:30	57	58	51
	17:25 – 17:40	54	55	51
Night	23:45 – 00:00	52	53	52
	00:50 – 01:05	51	52	51
	01:50 – 02:05	51	52	51

The daytime noise levels at this location local were controlled primarily by road traffic on the nearby road networks, building services noise from the adjacent industrial park buildings and intermittent (but significant) aircraft movements. Noise levels were in the range 54 to 57 dB L_{Aeq} and of the order of 51 dB L_{A90}.

Road traffic noise from adjacent road networks, building services noise, intermittent aircraft movements and wind generated noise dominated the noise environment during night-time periods. Noise levels were in the range 51 to 52 dB L_{Aeq} and 51 to 52 dB L_{A90}.

3.6.8 Location H

The survey results for Location H are given in Table 9 below.

Table 9 Summary of Results for Location H

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{AF10}	L_{AF90}
Night	23:10 – 23:25	51	50	46
	00:31 – 00:46	49	51	46
	01:35 – 01:50	49	51	45

Night-time noise levels were influenced by distant road traffic movements along the Oscar Traynor Road, M1 and M50 motorways, occasional local vehicle movements and wind-generated noise on nearby foliage. Ambient noise levels were in the range of 49 to 51dB L_{Aeq}. Background noise levels were in the range 45 to 46dB L_{A90}.

3.7 Ecologically sensitive areas or areas of special interest

The lands in which the installation is located have no formal designations. The nearest ecologically sensitive area to the Installation (linear distance) is the Santry Demesne Proposed NHA (000178) which is 1.3 km west of the Installation. The nearest European sites to the Installation (linear distance) are the South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), c. 3.9 km to the south, the North Dublin Bay SAC (Site Code 000206), c. 4.4 km to the southeast and the North Bull Island SPA (Site Code 004006), c. 4.4 km to the southeast.

Appropriate Assessment (AA) Screening Reports have been prepared by Moore Group for both the existing Installation and the extended Installation and have been submitted as part of the licence review application for the site.

Based on the separation distance from the Installation to the nearest ecologically sensitive area and European site, the application installation is expected to be inaudible at these sites. Therefore, there is no noise impact at these designated sites.

4.0 REVIEW OF RELEVANT GUIDANCE

This section deals with 'Stage 2' of the noise impact assessment as outlined in the EPA's NG4 Guidance.

The discussion of appropriate IE Licence noise emission criteria for the overall Installation will be conducted in accordance with the NG4 document. This approach is summarised below in accordance with guidance detailed in Section 4 of the NG4 document.

4.1 Quiet Area Screening

The proposed development is not considered a quiet area in this instance as it fails to meet any of the criteria outlined in EPA's Guidance. The most stringent of these criteria are noted in bullet point and commented on below.

- At least 3km from urban area with a population >1,000 people;

The site is within the jurisdiction of Dublin City Council and is located less than 3km from a population significantly greater than 1,000.

- At least 3km away from any local industry;

Other industrial sites operate within 3km of the site.

- At least 5km away from any National Primary Route;

A section of the M50 and N81 national roads are located within 0.9 and 0.7km respectively.

4.2 Low Background Noise Area Screening

In order to establish whether the noise sensitive locations in the vicinity of the site would be considered 'low background noise' areas, the noise levels measured during the environmental noise survey need to satisfy all three of the following criteria:

- Arithmetic Average of L_{A90} During Daytime Period ≤40dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Evening Period ≤35dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Night-time Period ≤30dB L_{A90}.

The arithmetic average L_{A90} results at each location are compared against the criteria in Table 10. As can be seen, none of the locations would be considered 'Areas of Low Background Noise' as the measured noise levels do not satisfy the criteria.

Table 10 Comparison of Measurement Results with NG4 Low Background Noise Area Criteria

Location	Period	$L_{A90,T}$ (dB)	NG4 Screening (dB $L_{A90,T}$)	Satisfies All Criteria for Low Background Noise Area?
A	Daytime	62	≤40	No
	Evening	61	≤35	
	Night-time	55	≤30	
B	Daytime	59	≤40	No
	Evening	58	≤35	
	Night-time	46	≤30	

Location	Period	$L_{A90,T}$ (dB)	NG4 Screening (dB $L_{A90,T}$)	Satisfies All Criteria for Low Background Noise Area?
C	Daytime	56	≤40	No
	Evening	54	≤35	
	Night-time	42	≤30	
D	Daytime	53	≤40	No
	Evening	52	≤35	No
	Night-time	51	≤30	
E	Daytime	57	≤40	No
	Evening	52	≤35	
	Night-time	51	≤30	
F	Daytime	56	≤40	No
	Evening	--	≤35	
	Night-time	45	≤30	
G	Daytime	51	≤40	No
	Evening	--	≤35	
	Night-time	51	≤30	
H	Daytime	--	≤40	No
	Evening	--	≤35	
	Night-time	45	≤30	

4.3 Determining Appropriate Noise Criteria

Based on the EPA NG4 guidance, the following noise criteria are appropriate at the nearest NSL's to the Installation:

- Daytime (07:00 to 19:00hrs) 55dB $L_{Ar,30min}$
- Evening (19:00 to 23:00hrs) 50dB $L_{Ar,30min}$
- Night time (23:00 to 07:00hrs) 45dB $L_{Aeq,15min}$

During the night period, no tonal or impulsive noise from the Installation should be clearly audible or measurable at any NSL. The applicable noise criteria identified are in line with the typical limit values for noise from licensed sites. These limits are in line with those detailed in the existing licence (Register Number: P1186-01).

There are certain plant items within the Installation that are designed to be used in emergency situations, for example, when grid power supplies fail. It is common practice to allow a relaxation of noise limits associated with emergency plant operations. Section 4.4.1 of EPA NG4 contains the following comments in relation to emergency plant items:

> *"In some instances, licensed sites will have certain items of emergency equipment (e.g. standby generators) that will only operate in urgent situations (e.g. grid power failure). Depending upon the context, it may be deemed permissible for such items of equipment to give rise to exceedances in the noise criteria/limits during limited testing and emergency operation only. If such equipment is in regular use for any purposes other than intermittent testing, it is subject to the standard limit values for the site".*

Reference is made to the UK NHS document Health Technical Memorandum 08-01: Acoustics (HMSO, 2013) where the following is stated in respect of plant used only for emergency circumstances:

Emergency plant

2.30 An increase in internal and external noise levels of up to 10 dB(A) over the noise criteria is normally considered acceptable, provided regular testing only takes place during the daytime on a weekday.

For the NSLs in this assessment, the noise criterion for emergency operations is therefore 55 dB $L_{Aeq,T}$, being 10 dB higher than the night-time noise criterion of 45 dB $L_{Aeq,T}$. It is therefore considered that the proposed noise criterion of 55dB $L_{Aeq,(15mins)}$ is appropriate in emergency scenarios for daytime, evening and night-time periods. This approach is fully supported by the NG4 guidance.

In respect of generator testing It is confirmed that this will occur during weekday daytime periods only, therefore the standard daytime limit of 55 dB $L_{Ar,T}$ is applied to generator testing.

4.4 Compliance Noise Monitoring

See Attachment 7.5 of the Licence review application for further details on the noise monitoring locations. Given there may be potential access constraints at some noise sensitive locations and the presence of extraneous noise sources in the vicinity, it may be necessary to undertake compliance noise monitoring (if required) at the site boundary or at a suitable proxy location and assess to the nearest NSL's. Any such assessment should be undertaken in accordance with the guidance outlined in the EPA NG4 document and supported by a sufficiently detailed noise report outlining the calculation methods used to determine the noise emission levels at the NSL's.

5.0 ASSESSMENT

This section deals with 'Stage 3' of the noise impact assessment as outlined in the EPA's NG4 Guidance.

The noise levels expected at nearest NSL's, due to the operation of the Installation, must be considered and presented as part of the licence review application.

The following sections present details of the assessment and the findings. Further information in relation to the noise prediction model, inputs, calculation settings and assessment assumptions are provided in Appendices B and C to this report.

It should be noted that the noise impact assessment has been completed using information obtained from the design team for significant items of plant which in turn were procured from vendors.

5.1 Noise Sensitive Locations

Noise prediction calculations have been carried out at the representative nearest noise sensitive locations (NSL's) surrounding the site. Details of the NSL's used for the prediction calculations are presented in Table 11. Free-field noise emission levels have been predicted at a height above ground of 4 m in all cases.

Table 11 Coordinates of Noise Sensitive Receivers

Noise Sensitive Location	Distance to application boundary (m)	National Grid Reference (ITM)	
		North	East
R01	36	718,674	740,333
R02	28	718,707	740,261
R03	136	718,733	740,124
R04	176	718,559	739,929
R05	135	718,392	740,023
R06	156	718,315	740,044
R07	243	718,197	740,073
R08	339	717,951	740,175
R09	307	717,958	740,250
R10	379	717,878	740,322
R11	449	717,815	740,409
R12	570	717,700	740,464
R13	669	717,604	740,495
R14	713	717,569	740,567
R15	779	717,656	741,184
R16	847	717,639	741,274
R17	919	717,632	741,373
R18	352	718,629	741,031
R19	289	718,726	740,857
R20	267	718,739	740,764
R21	202	718,680	740,684
R22	173	718,646	740,649
R23	145	718,607	740,563
R24	121	718,645	740,422

5.2 Noise Source Data

Details of the noise source data assumed in the noise model are presented in Appendices D, E, F and G of this document.

Figure 5 Noise Assessment Locations

5.3 Calculation Methodology

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed buildings. This section discusses the methodology behind the noise modelling process.

5.3.1 DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors, 2024*.

DGMR iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

5.3.2 Brief Description of ISO9613-2:2024

ISO9613-2:2024 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, L_{AT}(DW), for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately 1ms^{-1} and 5ms^{-1}, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear calm nights. The basic formula for calculating $L_{AT}(DW)$ from any point source at any receiver location is given by:

$$L_{fT}(DW) = L_W + D_c - A \qquad \textbf{Eqn. A}$$

Where:

$L_{fT}(DW)$ is an octave band centre frequency component of $L_{AT}(DW)$ in dB relative to $2x10^{-5}$Pa;
L_W is the octave band sound power of the point source;
D_c is the directivity correction for the point source;
A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 12 below:

Table 12 Estimated Accuracy for Broadband Noise of $L_{AT}(DW)$

Height, h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

* *h is the mean height of the source and receiver. † d is the mean distance between the source and receiver. N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.*

5.3.3 Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings forwarded by the project architects.

Local Area The location of noise sensitive locations has been obtained from a combination of site drawings provided by the project architects and others obtained from Ordinance Survey Ireland (OSI).

Heights The heights of buildings on site have been obtained from site drawings forwarded by the project architects. Off-site buildings have been assumed to be 8m high for houses and 16m for apartments with the exception of industrial buildings where a default height of 15m has been assumed.

5.4 Predicted Noise Levels

This section presents the predicted noise levels at the nearest noise sensitive locations. The combined impact of all modelled noise sources on the site has been assessed for three distinct operational scenarios:

Scenario A would be considered to be the most representative of the day to day operation. In Scenario A, no generators are running, and the site is supplied with electricity from the grid.

Scenario B is representative of emergency situation; a loss, reduction or instability of grid power supply, critical maintenance to power systems, a request from the utility supplier (or third party acting on its behalf) to reduce grid electricity load. It should be noted that such an event is an extremely rare occurrence. In Scenario B, all of the onsite emergency back-up generators at buildings W, X, Y, U and V are assumed to run at 100% load, as a worst-case.

Scenario C is representative of generator testing scenario. Considering that only one generator within the application installation will be tested at any one time, the following approach was taken: various trial models were run, activating different single generators to compare which unit had the potential to be the most impactful at noise-sensitive locations. In this instance the eastern-most generator Building W was selected as the predicted noise levels were slightly higher than other alternatives, as it has line of sight to NSL R24. The load of the generator under test is assumed to be 100%. It is re-iterated that generator testing will take place during daytime periods only.

Figures 6, 7 and 8 present the predicted noise contour plot for mechanical services and process plant associated with the development for Scenarios A, B and C receptively.

The predicted noise levels from mechanical plant at Buildings W, X, Y, U and V are tabulated in Table 13 for each NSL.

Table 13 Predicted Operational Noise Levels at NSL's for Mechanical Plant Items at Building X, Y, W, U and V

Location	Plant Predicted Level (dB)		
	Scenario A	Scenario B	Scenario C
R01	41	47	41
R02	40	47	40
R03	38	46	38
R04	37	45	37
R05	41	50	41
R06	40	49	41
R07	39	49	40
R08	38	48	38
R09	38	49	39
R10	38	50	38
R11	37	49	37
R12	36	48	36
R13	35	47	35
R14	35	46	35

Location	Plant Predicted Level (dB)		
	Scenario A	Scenario B	Scenario C
R15	32	36	32
R16	32	36	32
R17	31	35	31
R18	35	39	35
R19	41	45	41
R20	39	43	39
R21	42	47	42
R22	40	45	41
R23	43	53	43
R24	41	50	41

Table 14 presents the predicted plant noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario A.

Table 14 Predicted Operational Noise Levels vs Criteria – Scenario A

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	41	55	Yes	50	Yes	45	Yes
R02	40		Yes		Yes		Yes
R03	38		Yes		Yes		Yes
R04	37		Yes		Yes		Yes
R05	41		Yes		Yes		Yes
R06	40		Yes		Yes		Yes
R07	39		Yes		Yes		Yes
R08	38		Yes		Yes		Yes
R09	38		Yes		Yes		Yes
R10	38		Yes		Yes		Yes
R11	37		Yes		Yes		Yes
R12	36		Yes		Yes		Yes
R13	35		Yes		Yes		Yes
R14	35		Yes		Yes		Yes
R15	32		Yes		Yes		Yes
R16	32		Yes		Yes		Yes
R17	31		Yes		Yes		Yes
R18	35		Yes		Yes		Yes
R19	41		Yes		Yes		Yes
R20	39		Yes		Yes		Yes
R21	42		Yes		Yes		Yes
R22	40		Yes		Yes		Yes
R23	43		Yes		Yes		Yes
R24	41		Yes		Yes		Yes

Table 15 presents the predicted plant noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario B.

Table 15 Predicted Operational Noise Levels vs Criteria – Scenario B

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	47	55	Yes	55	Yes	55	Yes
R02	47		Yes		Yes		Yes
R03	46		Yes		Yes		Yes
R04	45		Yes		Yes		Yes
R05	50		Yes		Yes		Yes
R06	49		Yes		Yes		Yes
R07	49		Yes		Yes		Yes
R08	48		Yes		Yes		Yes
R09	49		Yes		Yes		Yes
R10	50		Yes		Yes		Yes
R11	49		Yes		Yes		Yes
R12	48		Yes		Yes		Yes
R13	47		Yes		Yes		Yes
R14	46		Yes		Yes		Yes
R15	36		Yes		Yes		Yes
R16	36		Yes		Yes		Yes
R17	35		Yes		Yes		Yes
R18	39		Yes		Yes		Yes
R19	45		Yes		Yes		Yes
R20	43		Yes		Yes		Yes
R21	47		Yes		Yes		Yes
R22	45		Yes		Yes		Yes
R23	53		Yes		Yes		Yes
R24	50		Yes		Yes		Yes

The temporary exceedances of the standard noise criteria under Scenario B (the worst-case, i.e. all generators running at 100% load) during emergency, are expected to be a rare occurrence and limited in duration. Running of the generators during emergencies will be managed through a Noise Management Plan (NMP) as required by Condition 6.11.2 of the existing licence. The current NMP will be revised and updated post grant of the Licence Review. The standard noise conditions and limit values based on the day, evening, night criteria will continue to apply.

Table 16 presents the predicted plant noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario C, based on testing the generator the eastern-most generator Building W.

Given that the predicted noise levels are well within criteria for daytime generator testing of 55 dB $L_{Aeq,15mins}$, it follows that testing of generators individually at any location within the application installation will also result in compliant site noise levels at NSLs.

Table 16 Predicted Operational Noise Levels vs Criteria – Scenario C

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	41	55	Yes	--	--	--	--
R02	40		Yes		--		--
R03	38		Yes		--		--
R04	37		Yes		--		--
R05	41		Yes		--		--
R06	41		Yes		--		--
R07	40		Yes		--		--
R08	38		Yes		--		--
R09	39		Yes		--		--
R10	38		Yes		--		--
R11	37		Yes		--		--
R12	36		Yes		--		--
R13	35		Yes		--		--
R14	35		Yes		--		--
R15	32		Yes		--		--
R16	32		Yes		--		--
R17	31		Yes		--		--
R18	35		Yes		--		--
R19	41		Yes		--		--
R20	39		Yes		--		--
R21	42		Yes		--		--
R22	41		Yes		--		--
R23	43		Yes		--		--
R24	41		Yes		--		--

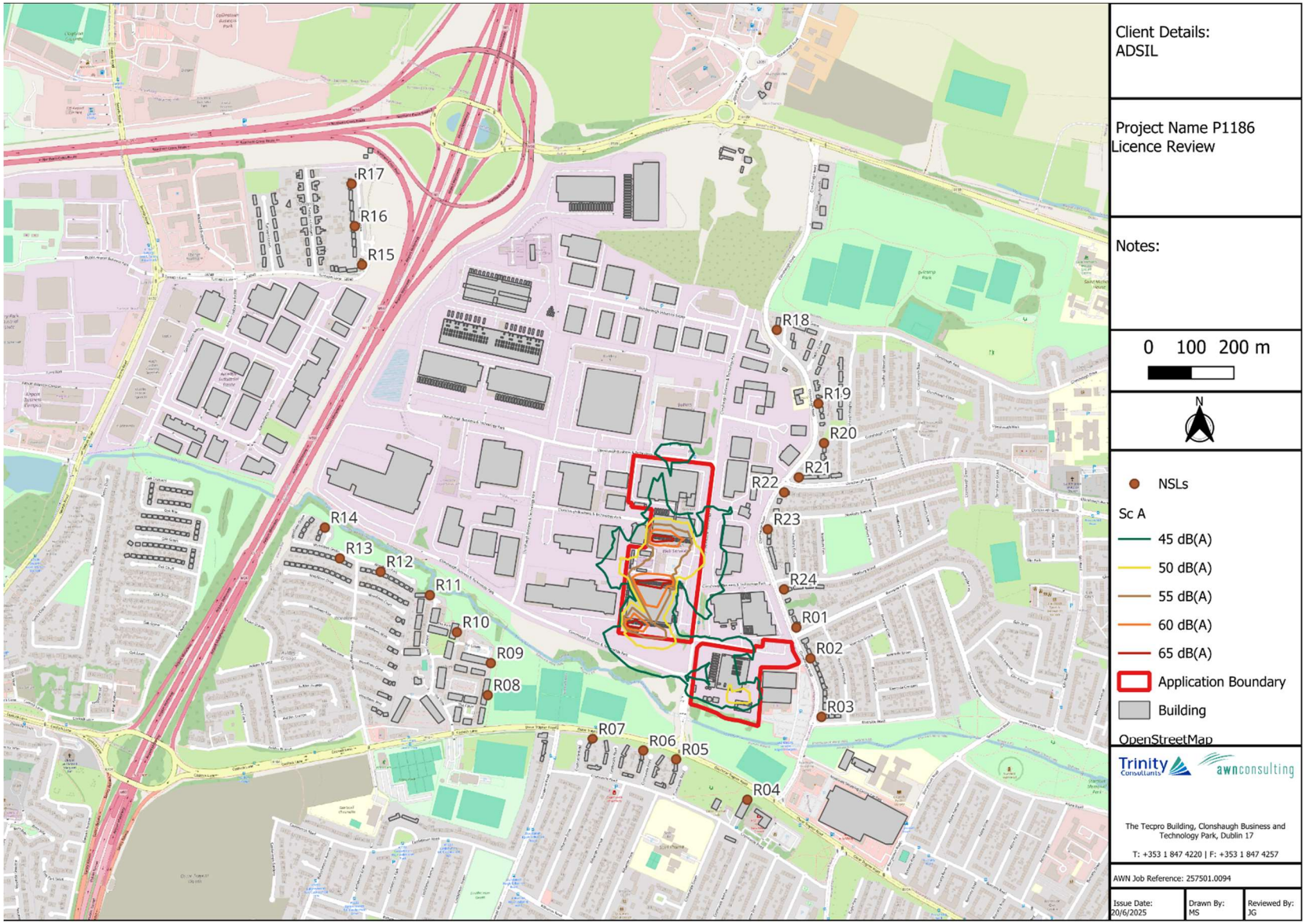

Figure 6 Predicted Operational Noise Contours – Scenario A

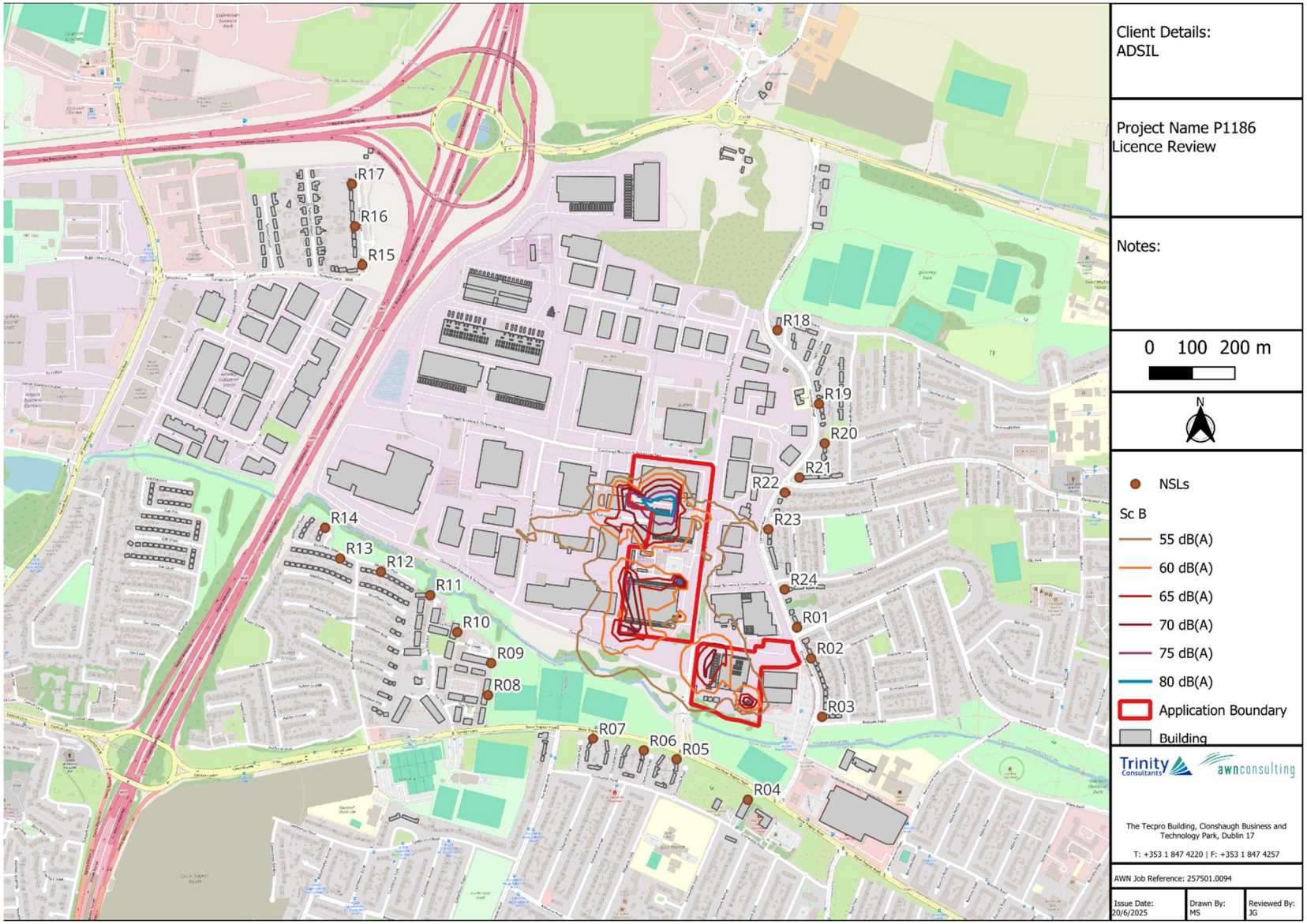

Figure 7 Predicted Operational Noise Contours – Scenario B

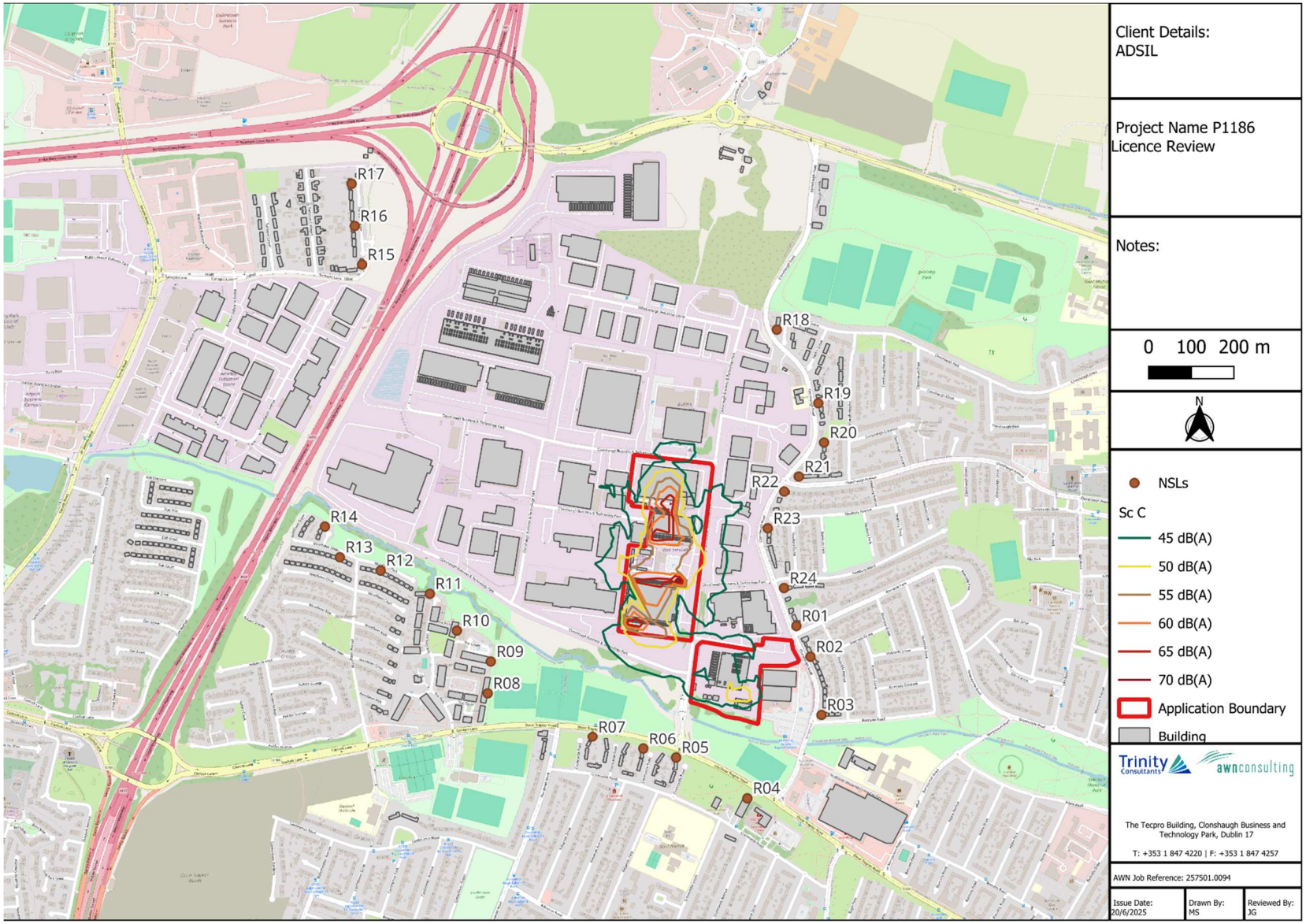

Figure 8 Predicted Operational Noise Contours – Scenario C

6.0 CUMULATIVE ASSESSMENT

The cumulative noise levels are considered to be the noise levels attributable to the application installation, in combination with noise from off-site sources.

In relation to the scope of noise sources to be included in an NG4 assessment, the following paragraphs are noted from the NG4 guidance (*emphasis added)*.

> *When an Agency licence includes conditions relating to noise emissions, this would normally entail specified numerical noise limits which are not to be exceeded. These limits may apply to individual sources of noise on the site itself, at the boundary of the site or at the nearest NSL. The setting of noise limits at any or all of these locations may be required, and the assignment of such limits will be decided during the licensing process for the facility.*
>
> *All reasonably practicable measures should be adopted at licensed facilities to minimise the noise impact of the activity, and BAT should be used in the selection and implementation of appropriate noise mitigation measures and controls. While BAT must be applied on a case by case basis,* ***the noise attributable solely to on-site activities, expressed as a free field value at any NSL, should not generally exceed the values given below****.*
>
> - *Daytime (07:00 to 19:00hrs)* *55dB $L_{Ar,30min}$*
> - *Evening (19:00 to 23:00hrs)* *50dB $L_{Ar,30min}$*
> - *Night time (23:00 to 07:00hrs)* *45dB $L_{Aeq,15min}$*

Thus, the guidance does not require that the cumulative noise levels meet these criteria; however, in this instance, in order to address the points raised in the Request for Further Information, an assessment of cumulative noise is included here.

6.1 Review of Potential Cumulative Development

A review was undertaken to determine the potential for cumulative noise impacts arising from the operation of the proposed application installation in combination with other existing or permitted developments in the vicinity.

It is often not possible to undertake a cumulative noise model where detailed noise emission data for other developments is not publicly available. In the absence of quantified noise emission data or modelling outputs, it is not feasible to robustly incorporate this facility into a cumulative noise model. However, in general, developments are expected to be designed and operated in accordance with Dublin City Council's standard noise guidance and criteria. Alternatively, where a site is regulated under an IE licence, it is expected to comply with the noise limits set out in the EPA licence.

Table 17 shows how each development is treated in the cumulative assessment presented in this report.

Table 17 Review and Treatment of Cumulative sites

Development	Location	Potential for Cumulative Impact
ADSIL EPA Reg. Ref.: P1171-01 The applicant operates an EPA Licenced data centre campus (EPA Reg. Ref.: P1171-01).	Northern end of Clonshaugh Business and Technology Park.	As the applicant has knowledge and sufficient information to model. This is included in the cumulative noise impact assessment. **The potential cumulative effect of this development in conjunction with the Application Installation considered using a cumulative noise model as described in section 6.2.**
Forest Laboratories Ireland Limited EPA Reg. Ref.: P0306-04	Located to the west of Building W	A review of the IE Licence documentation associated with the facility confirms that no detailed noise impact assessment was included as part of the application or supporting materials. As the site is regulated under an IE licence, it is expected to operate in compliance with EPA licence noise limits. The results of the 2023 noise survey indicate that noise measurements and assessment at the nearest NSLs indicate a minimal and in most cases negligible noise impact from the facility. No tonal or impulsive noise attributable to the facility was detected at any noise sensitive location. **The potential cumulative effect of this development in conjunction with the Application Installation considered though the methodology in Section 6.3.**
Global Switch Property (Dublin) Limited EPA Reg. Ref.: P0109	Located to the north of Building X	A review of the IE Licence documentation associated with the facility confirms that no detailed noise impact assessment was included as part of the application or supporting materials. As the site is regulated under an IE licence, it is expected to operate in compliance with EPA licence noise limits. There are no noise surveys available of the site activities. **The potential cumulative effect of this development in conjunction with the Application Installation considered though the methodology in Section 6.3.**
Planning Ref: 3865/20 Lidl Ireland GmbH Lidl discount supermarket with ancillary off-licence sales, located immediately south of "The Range". The development includes surface car parking, external plant areas, and delivery access via existing entrances on Clonshaugh Road.	Property adjacent and generally south of "The Range" store, Clonshaugh Road, Coolock, Dublin 17, D17 TY30	A review of the planning documentation associated with the facility confirms that no detailed operational noise impact assessment was included as part of the application or supporting materials. However the development will be expected to be designed and operated to comply with typical Dublin City Council noise guidance and criteria. **Taking into account the following:** • **The much smaller scale of noise sources compared to the other sites listed here;** • **the building's use as a neighbourhood supermarket, and** • **the contribution of road traffic noise at nearby noise survey location G during night-time periods (See Section 6.4)** **This development is scoped out of the cumulative noise assessment.**

Development	Location	Potential for Cumulative Impact
Dataplex	Northern end of Clonshaugh Business and Technology Park.	A review of the planning documentation associated with the facility confirms that no detailed operational noise impact assessment was included as part of the application or supporting materials. **The potential cumulative effect of this development in conjunction with the Application Installation considered though the methodology in Section 6.3.**
Digital Realty DUB11 - telecommunications service provider	Located to the north of Building U	A review of the planning documentation associated with the facility confirms that no detailed operational noise impact assessment was included as part of the application or supporting materials. **The potential cumulative effect of this development in conjunction with the Application Installation considered though the methodology in Section 6.3.**
All other existing Clonshaugh Business and Technology Park	Clonshaugh Business and Technology Park	Operating form dated prior to background baseline noise surveys (2018/2019) levels which date from 2018/2019 See section 6.3. **The potential cumulative effect of this development in conjunction with the Application Installation considered though the methodology in Section 6.3.**

6.2 Cumulative Noise Impact Assessment Model

The noise modelling and assessment presented in Section 5 includes Buildings W, X Y, U and V, the 'application installation'. This section presents the noise modelling and assessment of the application installation along with EPA Reg. Ref.: P1171-01.

Figures 9, 10 and 11 present the predicted noise contour plot for cumulative noise Scenarios A, B and C receptively.

Table 18 presents the predicted cumulative plant noise emission levels at the nearest NSLs for the three Scenarios, A, B and C.

Table 18 Predicted Cumulative Operational Noise Levels at NSLs

Location	Plant Predicted Level (dB)		
	Scenario A	Scenario B	Scenario C
R01	41	49	42
R02	40	49	41
R03	39	48	39
R04	38	47	39
R05	41	52	42
R06	40	49	41
R07	40	51	41
R08	38	49	39
R09	39	51	39
R10	39	51	39
R11	40	53	41
R12	40	54	44

Location	Plant Predicted Level (dB)		
	Scenario A	Scenario B	Scenario C
R13	40	52	42
R14	39	51	41
R15	43	55	48
R16	42	55	47
R17	42	54	46
R18	38	47	39
R19	42	48	43
R20	40	49	41
R21	42	49	43
R22	41	49	42
R23	43	54	44
R24	42	51	42

Table 19 presents the predicted cumulative plant noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario A.

Table 19 Predicted Operational Noise Levels vs Criteria – Scenario A

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	41	55	Yes	50	Yes	45	Yes
R02	40		Yes		Yes		Yes
R03	39		Yes		Yes		Yes
R04	38		Yes		Yes		Yes
R05	41		Yes		Yes		Yes
R06	40		Yes		Yes		Yes
R07	40		Yes		Yes		Yes
R08	38		Yes		Yes		Yes
R09	39		Yes		Yes		Yes
R10	39		Yes		Yes		Yes
R11	40		Yes		Yes		Yes
R12	40		Yes		Yes		Yes
R13	40		Yes		Yes		Yes
R14	39		Yes		Yes		Yes
R15	43		Yes		Yes		Yes
R16	42		Yes		Yes		Yes
R17	42		Yes		Yes		Yes
R18	38		Yes		Yes		Yes
R19	42		Yes		Yes		Yes
R20	40		Yes		Yes		Yes
R21	42		Yes		Yes		Yes
R22	41		Yes		Yes		Yes
R23	43		Yes		Yes		Yes

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R24	42		Yes		Yes		Yes

Table 20 presents the predicted plant cumulative noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario B.

Table 20 Predicted Operational Noise Levels vs Criteria – Scenario B

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	49	55	Yes	55	Yes	55	Yes
R02	49		Yes		Yes		Yes
R03	48		Yes		Yes		Yes
R04	47		Yes		Yes		Yes
R05	52		Yes		Yes		Yes
R06	49		Yes		Yes		Yes
R07	51		Yes		Yes		Yes
R08	49		Yes		Yes		Yes
R09	51		Yes		Yes		Yes
R10	51		Yes		Yes		Yes
R11	53		Yes		Yes		Yes
R12	54		Yes		Yes		Yes
R13	52		Yes		Yes		Yes
R14	51		Yes		Yes		Yes
R15	55		Yes		Yes		Yes
R16	55		Yes		Yes		Yes
R17	54		Yes		Yes		Yes
R18	47		Yes		Yes		Yes
R19	48		Yes		Yes		Yes
R20	49		Yes		Yes		Yes
R21	49		Yes		Yes		Yes
R22	49		Yes		Yes		Yes
R23	54		Yes		Yes		Yes
R24	51		Yes		Yes		Yes

Table 21 presents the predicted plant noise emission levels at the nearest NSL's and compares the results against the relevant criteria that have been derived for the site for Scenario C.

In respect of the cumulative noise calculations for Scenario C – Generator testing, the generators activated are as follows:

- The eastern-most generator at Building W as per the discussion in Section 5.4;
- The western-most generators at Buildings A, B, C, D E and F (EPA Reg. Ref.: P1171-01) and
- The southern-most generator at Building F.

The testing schedule for the facilities within EPA Reg. Ref.: P1171-01 has not been finalised; however the above is considered a representative schedule. It is noted that generator testing will occur during daytime periods only and that predicted noise levels are well below the daytime criterion of 55 dB $L_{Ar,T}$, thus the testing of any single generator among EPA Reg. Ref.: P1171-01 will result in site noise levels within the daytime criterion of 55 dB $L_{Ar,T}$.

Table 21 Predicted Operational Noise Levels vs Criteria – Scenario C

Receptor	Predicted $L_{Aeq,T}$	Day (07:00 – 19:00hrs)		Evening (19:00 – 23:00hrs)		Night (23:00 – 07:00hrs)	
		Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Ar,T}$	Complies?	Criterion dB $L_{Aeq,T}$	Complies?
R01	42	55	Yes	--	--	--	--
R02	41		Yes		--		--
R03	39		Yes		--		--
R04	39		Yes		--		--
R05	42		Yes		--		--
R06	41		Yes		--		--
R07	41		Yes		--		--
R08	39		Yes		--		--
R09	39		Yes		--		--
R10	39		Yes		--		--
R11	41		Yes		--		--
R12	44		Yes		--		--
R13	42		Yes		--		--
R14	41		Yes		--		--
R15	48		Yes		--		--
R16	47		Yes		--		--
R17	46		Yes		--		--
R18	39		Yes		--		--
R19	43		Yes		--		--
R20	41		Yes		--		--
R21	43		Yes		--		--
R22	42		Yes		--		--
R23	44		Yes		--		--
R24	42		Yes		--		--

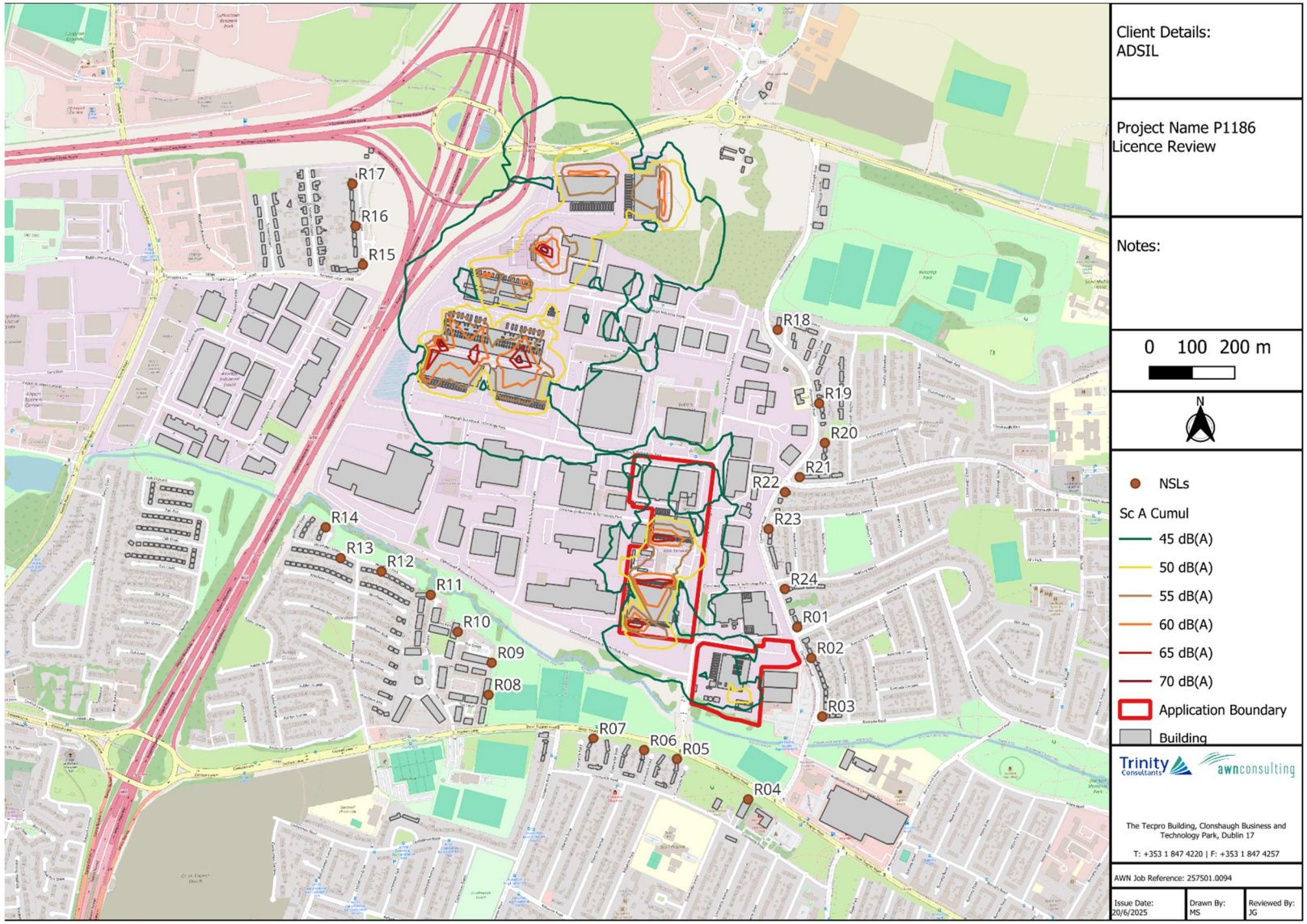

Figure 9 Cumulative Operational Noise Prediction Contours – Scenario A

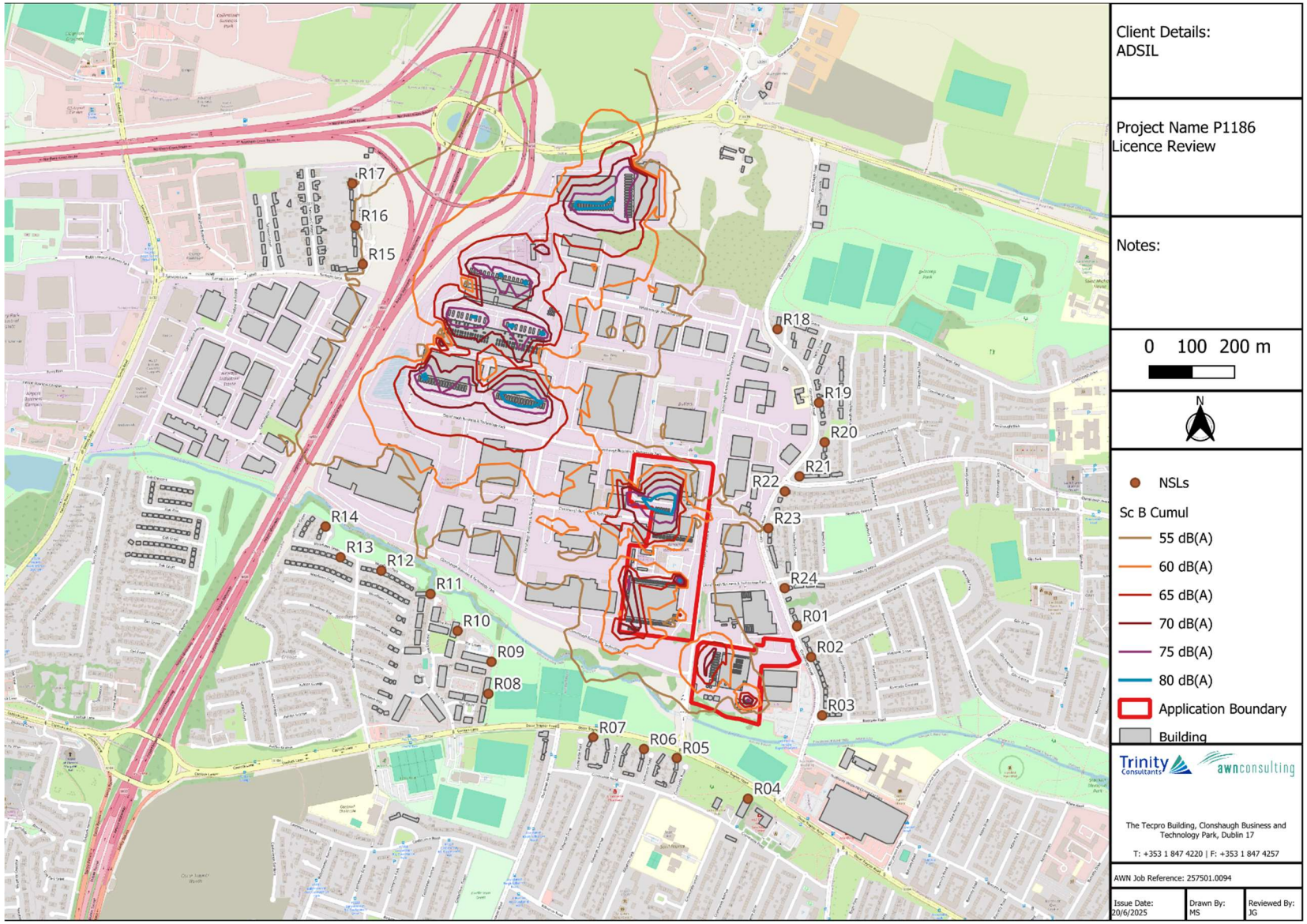

Figure 10 Cumulative Operational Noise Prediction Contours – Scenario B

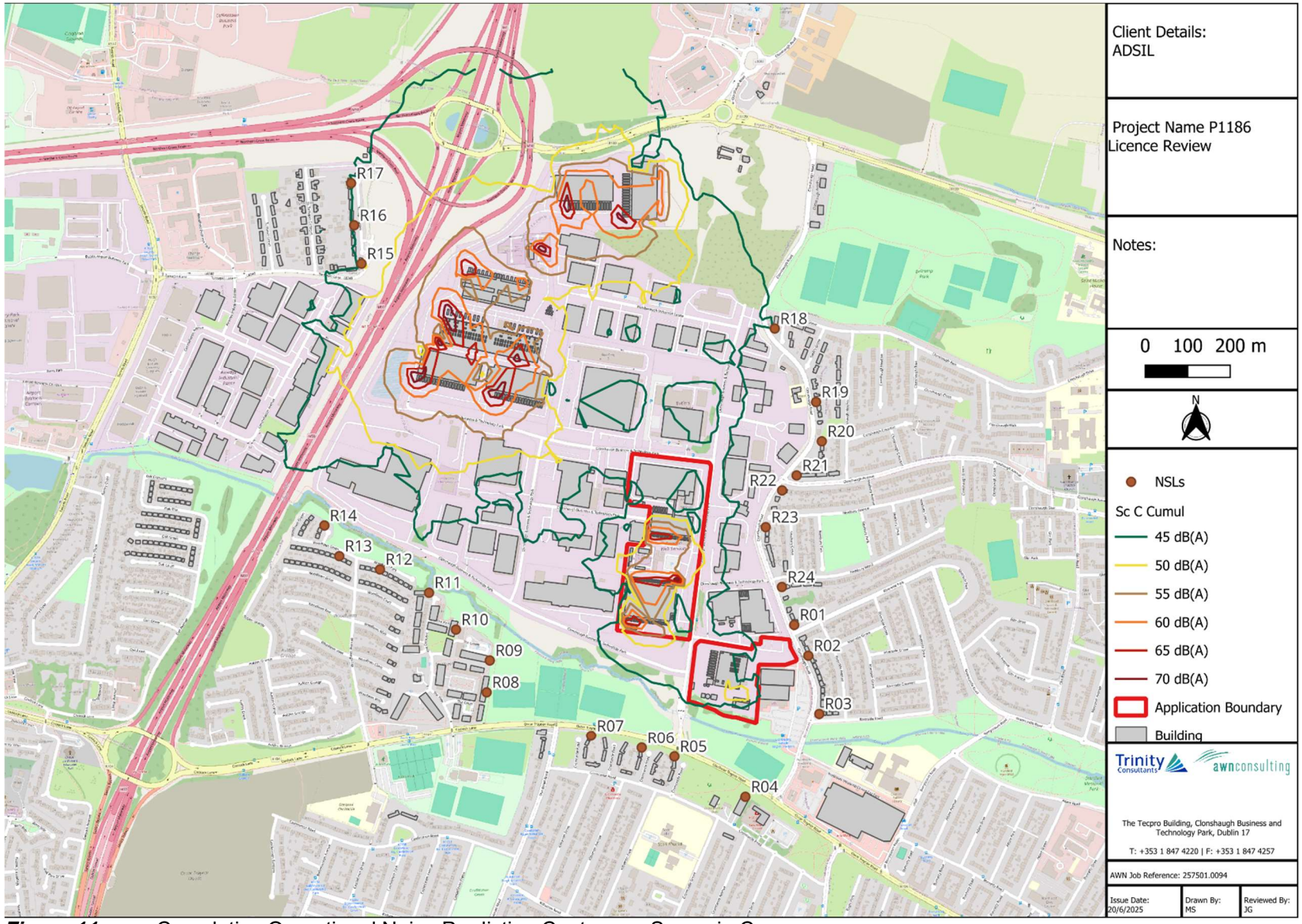

Figure 11 Cumulative Operational Noise Prediction Contours – Scenario C

6.3 Cumulative Noise Impact Assessment addition to background levels

In this section, the cumulative noise levels presented in Section 6.2 are added to the background noise levels in order to assess the changes in noise level at noise-sensitive locations.

As the noise impact of existing development is included within the measured baseline noise levels (it is assumed that all sites listed in Table 17, with the exception of ADSIL site IEL P1171-01) were operating during baseline noise surveys), the assessment of changes in background noise levels presented in this section considers the impact of the cumulative predicted noise levels against the existing noise environment.

The change in noise level is evaluated by comparing the cumulative predicted noise levels in Section 6.2 against the baseline measurements alone. This approach allows for a clear understanding of how the proposed development may alter the existing noise environment at NSLs.

To assess the overall cumulative impact of the Installation, the predicted noise emissions associated with the cumulative modelled activities (Section 6.2) have been added to the measured baseline levels to determine the overall cumulative noise levels at noise-sensitive locations (NSLs). It is re-iterated that the predicted noise levels include the application installation and EPA Reg. Ref.: P1171-01. This is a conservative worst-case assessment.

The 'Guidelines for Environmental Noise Impact Assessment' produced by the Institute of Environmental Management and Assessment (IEMA) (2014) are referenced in order to categorise the potential effect of changes in the ambient noise levels during the operational phases of the proposed development. The methodology considers the addition of the predicted site noise levels to the measured background noise levels and comment on the potential cumulative impact through discussion of the change in noise levels.

The scale adopted in this assessment is shown in Table 22 below is based on an example scale within the IEMA guidelines. The corresponding significance of effect from in the EPA's EIA Report Guidelines (2022) is also presented.

Table 22 Noise Effect Scale

Difference between Calculated Noise Level and criteria or baseline	Subjective Response	Impact Guidelines for Noise Impact Assessment Significance (Institute of Acoustics)	Effect Guidelines on the Information to be contained in EIARs (EPA)
0	No change	None	Imperceptible
0.1 – 2.9	Barely perceptible	Minor	Not Significant
3.0 – 4.9	Noticeable	Moderate	Slight, Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial	Significant
10.0 or more	More than a doubling or halving of loudness	Major	Profound

Tables 23 and 24 below update the cumulative assessment in the previous RFI response to include all NSLs, R01 to R24, for normal day-to-day operations. It is re-iterated that the predicted noise levels include the application installation and EPA Reg. Ref.: P1171-01. This is a conservative worst-case assessment.

Table 23 Review of Predicted Changes in Existing Noise Levels – Day

Ref	Daytime (07:00 – 23:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Cumulative Noise Level (dB(A))	Change in Noise Level (dB(A))	EPA Glossary of Impacts
R01	41	56	56.1	+0.1	Not Significant
R02	40	56	56.1	+0.1	Not Significant
R03	39	56	56.1	+0.1	Not Significant
R04	38	45	45.8	+0.8	Not Significant
R05	41	45	46.5	+1.5	Not Significant
R06	40	45	46.2	+1.2	Not Significant
R07	40	45	46.2	+1.2	Not Significant
R08	38	45	45.8	+0.8	Not Significant
R09	39	45	46.0	+1.0	Not Significant
R10	39	45	46.0	+1.0	Not Significant
R11	40	45	46.2	+1.2	Not Significant
R12	40	45	46.2	+1.2	Not Significant
R13	40	45	46.2	+1.2	Not Significant
R14	39	45	46.0	+1.0	Not Significant
R15	43	55	55.3	+0.3	Not Significant
R16	42	55	55.2	+0.2	Not Significant
R17	42	55	55.2	+0.2	Not Significant
R18	38	56	56.1	+0.1	Not Significant
R19	42	56	56.2	+0.2	Not Significant
R20	40	56	56.1	+0.1	Not Significant
R21	42	56	56.2	+0.2	Not Significant
R22	41	56	56.1	+0.1	Not Significant
R23	43	56	56.2	+0.2	Not Significant
R24	42	56	56.2	+0.2	Not Significant

Table 24 Review of Predicted Changes in Existing Noise Levels – Night

Ref	Daytime (07:00 – 23:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Combined Cumulative Noise Level (dB(A))	Change in Noise Level (dB(A))	EPA Glossary of Impacts
R01	41	41	44.0	+3.0	See Note A: Not Significant
R02	40	41	43.5	+2.5	Not Significant
R03	39	41	43.1	+2.1	Not Significant
R04	38	45	45.8	+0.8	Not Significant
R05	41	45	46.5	+1.5	Not Significant
R06	40	45	46.2	+1.2	Not Significant
R07	40	45	46.2	+1.2	Not Significant
R08	38	45	45.8	+0.8	Not Significant
R09	39	45	46.0	+1.0	Not Significant
R10	39	45	46.0	+1.0	Not Significant
R11	40	45	46.2	+1.2	Not Significant
R12	40	45	46.2	+1.2	Not Significant

Ref	Daytime (07:00 – 23:00 hrs)				
	Predicted dB $L_{Aeq,T}$	Background Level dB $L_{A90,T}$	Combined Cumulative Noise Level (dB(A))	Change in Noise Level (dB(A))	EPA Glossary of Impacts
R13	40	45	46.2	+1.2	Not Significant
R14	39	45	46.0	+1.0	Not Significant
R15	43	55	55.3	+0.3	Not Significant
R16	42	55	55.2	+0.2	Not Significant
R17	42	55	55.2	+0.2	Not Significant
R18	38	41	42.8	+1.8	Not Significant
R19	42	41	44.5	+3.5	See Note A: Not Significant
R20	40	41	43.5	+2.5	Not Significant
R21	42	41	44.5	+3.5	See Note A: Not Significant
R22	41	41	44.0	+3.0	See Note A: Not Significant
R23	43	41	45.1	+4.1	See Note B: Not Significant
R24	42	41	44.5	+3.5	See Note A: Not Significant

For daytime periods, a change rated as 'not significant' is noted at all locations.

Note A: In the case of R01, R19, R21, R22 and R24, the combined cumulative noise level remains within the criterion of 45 dB $L_{Aeq,T}$, therefore the effect considered 'not significant'.

Note B: In the case of R23, the combined cumulative noise is less than 1.0 dB greater than the criterion, therefore the noise effect is not considered significant.

It is reiterated that the predicted site-specific cumulative noise levels as presented in Section 6.2 comply with the EPA NG4 adopted in this report.

6.4 Operational Noise Surveys

Finally, it is noted that a recent annual noise survey has been completed for EPA Licences P1186-02 and P1171-01, both in Clonshaugh Business and Technology Park. The associated reports were provided to the EPA in response to the previous RFI request, as follows:

- Noise surveys during November and December 2023, presented in AWN report 237501.0343NR12 dated 30 January 2024;
- Noise surveys during November 2024, presented in AWN report 237501.0505NR01 dated 5 December 2024.

Measured noise levels are inherently cumulative in that they contain noise contributions from all operating sources at the time of the measurement. Noise survey Location G (See Figure 3 above) is the closest noise survey location to the site under consideration here. The noise survey results are re-produced in the table below, focussing on night-time periods which are critical to the assessment:

Table 25 Measured noise levels at Location G

Date	Period	Start Time	Measured noise level, dB $L_{A90,15min}$	Comments
15 Nov 2023	Night	23:41	42	The noise environment during this period was made up of occasional road traffic along the Clonshaugh Road and mechanical noise from the Clonshaugh business park. This was not associated with the site under review here and believed to be from units closer to the measurement position. A reverse alarm was also noted within the business park during this measurement period.
15 Nov 2023	Night	00:49	41	The noise environment during this period was made up of occasional road traffic along the Clonshaugh Road and mechanical noise from the Clonshaugh business park. This was not associated with the site under review here and believed to be from units closer to the measurement position.
13 Nov 2024	Night	23:00	49	The noise environment during the nighttime period was dominated by distant road traffic noise. Other noise sources included aircraft, wind rustle and HGVs within the Clonshaugh business park. No audible noise from the site was noted.
14 Nov 2024	Night	00:05	48	

In 2023, the total i.e. cumulative noise levels were 41-42 dB L_{A90}, which is within the IED limits. In the 2024 survey, although the measured total noise levels were in excess of the IED criteria, there was no audible site noise in this context.

In both cases the surveys confirm that site specific noise levels (i.e. noise attributable to activities within the IEL boundary) fall within the specified emission limit values for noise as set out in the licences.

7.0 CONCLUSION

A detailed noise survey has been completed at seven noise sensitive locations surrounding the site to establish the existing noise environment. This work has demonstrated that the existing noise environment is dictated by road traffic noise and noise associated with aircraft movements and some existing industry plant noise.

In accordance with the relevant NG4 Guidance, appropriate operational noise criteria have been derived for the site which are based on consideration of the existing licence noise conditions and the existing noise environment at the nearest NSL's.

A noise impact assessment has been completed using information obtained from the design team for significant items of new mechanical plant. A detailed computer-based noise model has been prepared using proprietary noise modelling software in accordance with the calculation method outlined in ISO 9613-2:2024.

The predicted noise levels at all NSL's are below the day, evening and night-time noise criteria that are applicable to the site operations.

Running of the generators during emergencies will be managed through a Noise Management Plan (NMP) as required by Condition 6.11.2 of the existing licence. The current NMP will be revised and updated to incorporate the extended Installation post grant of the Licence Review. The standard noise conditions and limit values based on the day, evening, night criteria will continue to apply.

While not required within the EPA NG4 assessment, in order to respond to Requests 23 and 24 from the EPA, an exhaustive cumulative noise assessment is presented in Section 6.0.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

ambient noise The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

background noise The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

broadband Sounds that contain energy distributed across a wide range of frequencies.

dB Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).

dB L_{pA} An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Hertz (Hz) The unit of sound frequency in cycles per second.

impulsive noise A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.

$L_{Aeq,T}$ This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.

L_{AFmax} is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).

$L_{Ar,T}$ The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.

L_{AF90} Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.

L_{AT}(DW) equivalent continuous downwind sound pressure level.

L_{fT}(DW) equivalent continuous downwind octave-band sound pressure level.

low frequency noise LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.

noise Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.

noise sensitive location NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

octave band A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

rating level See $L_{Ar,T}$.

sound power level The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) where:

$$Lw = 10\,Log\,\frac{P}{P_0}\ \text{dB}$$

Where: p is the rms value of sound power in pascals; and

P_0 is 1 pW.

sound pressure level The sound pressure level at a point is defined as:

$$Lp = 20\,Log\,\frac{P}{P_0}\ \text{dB}$$

specific noise level A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: ‘the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq,\,T}$)’.

tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.
$^1/_3$ octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each.

APPENDIX B – NOISE MODELLING DETAILS

Noise Model

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed building. This section discusses the methodology behind the noise modelling process.

DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors, 2024*.

DGMR iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Brief Description of ISO9613-2: 2024

ISO9613-2:2024 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT}(DW)$, for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately $1ms^{-1}$ and $5ms^{-1}$, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT}(DW)$ from any point source at any receiver location is given by:

$$L_{fT}(DW) = LW + Dc - A \qquad \textbf{Eqn. A}$$

Where:

$L_{fT}(DW)$ is an octave band centre frequency component of $L_{AT}(DW)$ in dB relative to $2x10^{-5}Pa$;
L_W is the octave band sound power of the point source;
D_c is the directivity correction for the point source;
A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table B.1 below:

Table B.1 Estimated Accuracy for Broadband Noise of L_{AT}(DW)

Height, h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

* h is the mean height of the source and receiver. † d is the mean distance between the source and receiver.
N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings forwarded by the scheme architects.

Local Area The location of noise sensitive locations has been obtained from a combination of site drawings provided by the scheme architects and others obtained from Ordinance Survey Ireland (OSI).

Heights The heights of buildings on site have been obtained from site drawings forwarded by the scheme architects. Off-site buildings have been assumed to be 8m high for houses and 16m for apartments with the exception of industrial buildings where a default height of 15m has been assumed.

Contours Site ground contours/heights have been obtained from site drawings forwarded by the scheme architects where available.

Figure B1 presents a 3D render of the developed site noise model for the current proposals.

Modelling Calculation Parameters[3]

Prediction calculations for plant noise have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

Ground attenuation factors of 1.0 have been assumed. No metrological corrections were assumed for the calculations. The atmospheric attenuation outlined in Table B.2 has been assumed for all calculations.

Table B.2 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (ºC)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

3 See Appendix C for further discussion of calculation parameters.

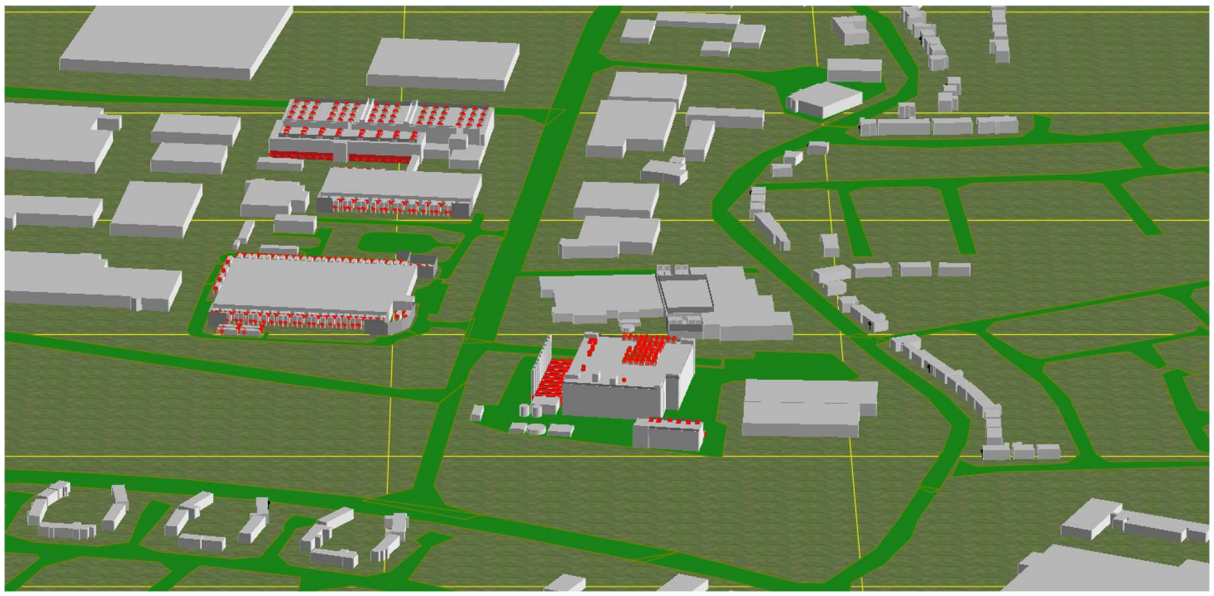

Figure B1 Images of Developed Noise Model – View of Site

APPENDIX C - NOISE MODELLING PARAMETERS

Prediction calculations for noise emissions have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*. The following are the main aspects that have been considered in terms of the noise predictions presented in this instance.

Directivity Factor: The directivity factor (D) allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case the sound power level is measures in a down wind direction, corresponding to the worst-case propagation conditions and needs no further adjustment.

Ground Effect: Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects is inherently complex and depend on source height receiver height propagation height between the source and receiver and the ground conditions. The ground conditions are described according to a variable defined as G, which varies between 0.0 for hard ground (including paving, ice concrete) and 1.0 for soft ground (includes ground covered by grass trees or other vegetation) Our predictions have been carried out using various source height specific to each plant item, a receiver heights of 1.6m for single storey properties and 4m for double. An assumed ground factor of G = 1.0 has been applied off site. Noise contours presented in the assessment have been predicted to a height of 4m in all instances. For construction noise predictions have been made at a level of 1.6m as these activities will not occur at night.

Geometrical Divergence This term relates to the spherical spreading in the free-field from a point sound source resulting in attenuation depending on distance according to the following equation:

$$A_{geo} = 20 \times \log (\text{distance from source in meters}) + 11$$

Atmospheric Absorption Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with increasing attenuation towards higher frequencies. In these predictions a temperature of 10°C and a relative humidity of 70% have been used, which give relativity low levels of atmosphere attenuation and corresponding worst case noise predictions.

Temp (°C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

Table C1 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Barrier Attenuation The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise.

APPENDIX D – BUILDING W – NOISE SOURCE DATA (MEASURED)

Predictor Ref	Danann AHU Type	Duty / Pressure	Octave Bands (Hz) Sound Power Levels dB (A-weighted) per band									L_{wA}
			31.5	63	125	250	500	1000	2000	4000	8000	
1 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.0	62.7	69.7	79.4	77.2	75.9	73.6	68.3	62.0	83.4
1 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3
1 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.5	64.8	76.7	83.7	82.7	81.2	79.1	72.8	65.6	88.5
2 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.4	63.2	69.4	80.4	78.1	76.3	73.9	68.7	59.3	84.2
2 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
2 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3
3 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
3 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
3 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
4 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
4 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
4 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
5 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.2	62.8	69.8	79.6	77.9	76.4	73.7	68.6	64.7	83.8
5 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9
5 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
6 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.3	61.9	67.9	74.8	75.1	73.4	70.1	65.1	55.6	80.3
6 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
6 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9
7 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.5	63.3	69.1	78.0	77.6	75.9	73.0	67.9	57.4	82.9
7 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
7 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
8 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.4	62.5	69.4	79.4	78.0	77.0	73.8	68.6	59.2	83.9
8 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.7	61.2	69.1	73.4	76.0	73.4	71.5	66.7	58.9	80.6
8 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
9 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.0	62.7	69.7	79.4	77.2	75.9	73.6	68.3	62.0	83.4
9 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3
9 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.5	64.8	76.7	83.7	82.7	81.2	79.1	72.8	65.6	88.5
10 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.4	63.2	69.4	80.4	78.1	76.3	73.9	68.7	59.3	84.2
10 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
10 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3

Predictor Ref	Danann AHU Type	Duty / Pressure	Octave Bands (Hz) Sound Power Levels dB (A-weighted) per band									L_{wA}
			31.5	63	125	250	500	1000	2000	4000	8000	
11 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
11 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
11 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
12 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
12 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
12 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
13 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.2	62.8	69.8	79.6	77.9	76.4	73.7	68.6	64.7	83.8
13 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9
13 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
14 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.3	61.9	67.9	74.8	75.1	73.4	70.1	65.1	55.6	80.3
14 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
14 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9
15 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.5	63.3	69.1	78.0	77.6	75.9	73.0	67.9	57.4	82.9
15 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
15 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
16 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.4	62.5	69.4	79.4	78.0	77.0	73.8	68.6	59.2	83.9
16 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.7	61.2	69.1	73.4	76.0	73.4	71.5	66.7	58.9	80.6
16 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
17 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.0	62.7	69.7	79.4	77.2	75.9	73.6	68.3	62.0	83.4
17 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3
17 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.5	64.8	76.7	83.7	82.7	81.2	79.1	72.8	65.6	88.5
18 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.4	63.2	69.4	80.4	78.1	76.3	73.9	68.7	59.3	84.2
18 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
18 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.8	64.0	73.8	80.0	79.4	78.1	76.4	71.0	62.9	85.3
19 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
19 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
19 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	58.7	67.1	74.7	79.4	79.1	76.5	75.2	70.2	61.6	84.7
20 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.8	62.9	70.1	80.1	78.6	77.1	74.6	69.4	62.2	84.4
20 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
20 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	56.1	64.7	72.2	76.7	76.7	75.7	74.1	69.5	61.9	82.7
21 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.2	62.8	69.8	79.6	77.9	76.4	73.7	68.6	64.7	83.8
21 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9

Predictor Ref	Danann AHU Type	Duty / Pressure	Octave Bands (Hz) Sound Power Levels dB (A-weighted) per band									L_{wA}
			31.5	63	125	250	500	1000	2000	4000	8000	
21 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	53.9	61.3	74.2	76.4	74.9	74.2	72.0	67.9	64.4	81.9
22 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.3	61.9	67.9	74.8	75.1	73.4	70.1	65.1	55.6	80.3
22 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
22 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.4	62.8	72.0	75.1	75.6	72.9	70.6	66.3	61.3	80.9
23 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	55.5	63.3	69.1	78.0	77.6	75.9	73.0	67.9	57.4	82.9
23 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
23 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	54.2	62.5	74.7	80.2	75.9	74.6	72.8	68.1	59.5	83.7
24 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	54.4	62.5	69.4	79.4	78.0	77.0	73.8	68.6	59.2	83.9
24 S Exh 2	DA55.45.	25.37m^3/s at 600pa Return	53.7	61.2	69.1	73.4	76.0	73.4	71.5	66.7	58.9	80.6
24 S Exh 1	DA55.45.	25.37m^3/s at 600pa Return	55.7	63.0	73.2	78.9	78.1	75.2	74.0	68.8	59.9	83.7
25 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	44.9	56.8	65.5	71.8	74.0	73.1	68.8	64.0	51.5	78.7
25 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	50.8	60.3	76.2	76.9	83.2	84.8	80.9	77.7	68.1	89.0
25 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	46.9	56.2	72.8	75.0	79.7	81.2	77.2	73.6	61.6	85.5
26 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	44.9	56.8	65.5	71.8	74.0	73.1	68.8	64.0	51.5	78.7
26 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	44.8	54.3	70.2	70.9	77.2	78.8	74.9	71.7	62.1	83.0
26 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	46.9	56.2	72.8	75.0	79.7	81.2	77.2	73.6	61.6	85.5
27 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	44.8	56.3	66.2	71.3	74.3	73.5	69.1	64.4	54.1	79.0
27 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	45.4	55.4	73.3	74.5	79.2	81.1	77.2	73.5	63.4	85.3
27 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	44.8	54.3	70.2	70.9	77.2	78.8	74.9	71.7	62.1	83.0
28 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	45.5	56.4	66.6	71.9	74.3	73.5	68.7	64.2	53.0	79.0
28 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	49.0	59.7	75.7	74.2	81.2	83.2	78.5	74.3	63.5	87.1
28 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	45.4	55.4	73.3	74.5	79.2	81.1	77.2	73.5	63.4	85.3
29 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	45.5	56.4	66.6	71.9	74.3	73.5	68.7	64.2	53.0	79.0
29 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	47.0	55.8	71.6	73.5	77.9	80.0	75.5	71.3	59.9	84.0
29 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	49.0	59.7	75.7	74.2	81.2	83.2	78.5	74.3	63.5	87.1
30 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	45.8	57.1	67.0	72.4	74.7	74.1	69.6	65.2	54.8	79.6
30 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	44.4	54.5	70.4	71.2	77.2	78.9	74.8	71.4	60.0	83.0
30 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	47.0	55.8	71.6	73.5	77.9	80.0	75.5	71.3	59.9	84.0
31 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	45.6	57.2	66.3	71.5	74.2	73.6	68.8	65.2	52.2	79.0
31 S Exh 2	DA45.55.	26.0m^3/s at 700pa Return	47.7	56.6	72.4	75.9	80.6	81.6	77.1	73.8	60.3	86.0
31 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	44.4	54.5	70.4	71.2	77.2	78.9	74.8	71.4	60.0	83.0
32 S Int	DA45.55.	26.7m^3/s at 800pa Supply.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5

Predictor Ref	Danann AHU Type	Duty / Pressure	Octave Bands (Hz) Sound Power Levels dB (A-weighted) per band									L_{wA}
			31.5	63	125	250	500	1000	2000	4000	8000	
32 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	49.3	57.6	72.7	77.8	82.3	83.6	78.5	75.4	64.0	87.7
32 S Exh 1	DA45.55.	26.0m^3/s at 700pa Return	47.7	56.6	72.4	75.9	80.6	81.6	77.1	73.8	60.3	86.0
33 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	45.5	58.9	66.9	72.9	75.0	74.2	69.2	65.3	56.8	79.8
33 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	49.9	58.3	73.2	76.6	81.4	82.0	77.2	74.6	64.5	86.5
33 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	49.3	57.6	72.7	77.8	82.3	83.6	78.5	75.4	64.0	87.7
34 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	46.8	58.7	67.7	73.1	75.6	74.1	69.0	64.5	52.3	80.0
34 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	51.5	61.8	77.0	77.7	84.1	85.1	80.3	77.8	68.1	89.4
34 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	49.9	58.3	73.2	76.6	81.4	82.0	77.2	74.6	64.5	86.5
35 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	47.8	58.8	67.3	73.1	75.4	74.3	69.9	64.8	52.0	80.0
35 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	49.2	58.6	75.3	78.6	82.8	83.0	78.5	75.3	63.4	87.8
35 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	51.5	61.8	77.0	77.7	84.1	85.1	80.3	77.8	68.1	89.4
36 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	47.8	58.8	67.3	73.1	75.4	74.3	69.9	64.8	52.0	80.0
36 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	48.6	57.4	72.6	74.5	80.0	80.4	76.0	73.5	63.7	85.1
36 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	49.2	58.6	75.3	78.6	82.8	83.0	78.5	75.3	63.4	87.8
37 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	46.9	57.9	68.6	73.7	75.5	74.7	70.3	66.1	59.8	80.5
37 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	48.1	57.8	74.6	76.4	80.9	81.6	77.2	75.1	65.0	86.4
37 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	48.6	57.4	72.6	74.5	80.0	80.4	76.0	73.5	63.7	85.1
38 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	48.8	59.1	70.0	74.2	76.4	75.6	71.2	66.7	55.4	81.3
38 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	50.1	60.5	77.3	76.9	81.7	82.2	77.7	75.5	62.3	87.1
38 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	48.1	57.8	74.6	76.4	80.9	81.6	77.2	75.1	65.0	86.4
39 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	48.8	59.1	70.0	74.2	76.4	75.6	71.2	66.7	55.4	81.3
39 S Exh 2	DA45.65.	25.6m^3/s at 500pa Return	46.4	56.4	72.2	74.1	77.9	77.6	73.5	72.3	60.5	83.1
39 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	50.1	60.5	77.3	76.9	81.7	82.2	77.7	75.5	62.3	87.1
40 S Int	DA45.65.	25.6m^3/s at 700pa Supply.	46.4	58.1	69.7	73.5	76.8	75.9	71.0	66.5	55.0	81.4
40 S Exh 2	DA55.45 / DA45.65.	25.3m^3/s at 600pa Return / 25.6m^3/s at 500pa Return	48.3	56.6	73.4	75.1	79.7	79.3	74.8	72.3	61.2	84.5
40 S Exh 1	DA45.65.	25.6m^3/s at 500pa Return	46.4	56.4	72.2	74.1	77.9	77.6	73.5	72.3	60.5	83.1
41 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	45.9	57.7	67.3	73.5	76.5	75.4	69.8	65.6	51.7	80.8
41 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	49.0	57.6	73.3	77.1	82.1	81.0	76.1	72.2	58.5	86.3
41 S Exh 1	DA55.45 / DA45.65.	25.3m^3/s at 600pa Return / 25.6m^3/s at 500pa Return	48.3	56.6	73.4	75.1	79.7	79.3	74.8	72.3	61.2	84.5
42 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	47.3	58.6	68.7	74.0	77.5	76.3	69.7	64.5	53.1	81.6
42 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	51.6	61.0	76.2	76.2	82.3	82.3	77.3	73.6	60.1	87.0

Predictor Ref	Danann AHU Type	Duty / Pressure	Octave Bands (Hz) Sound Power Levels dB (A-weighted) per band									L_{wA}
			31.5	63	125	250	500	1000	2000	4000	8000	
42 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	49.0	57.6	73.3	77.1	82.1	81.0	76.1	72.2	58.5	86.3
43 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	47.3	58.6	68.7	74.0	77.5	76.3	69.7	64.5	53.1	81.6
43 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	47.8	56.7	72.4	74.8	79.9	79.7	74.4	70.5	58.0	84.5
43 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	51.6	61.0	76.2	76.2	82.3	82.3	77.3	73.6	60.1	87.0
44 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	49.1	58.4	68.7	74.1	77.0	75.7	70.1	66.0	53.4	81.3
44 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	48.1	56.3	72.1	72.7	79.0	79.1	74.3	71.3	59.9	83.8
44 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	47.8	56.7	72.4	74.8	79.9	79.7	74.4	70.5	58.0	84.5
45 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	47.4	57.9	68.0	74.4	77.3	76.3	71.0	66.3	53.3	81.7
45 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	48.1	57.3	72.7	75.1	79.8	80.1	75.2	71.4	57.9	84.8
45 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	48.1	56.3	72.1	72.7	79.0	79.1	74.3	71.3	59.9	83.8
46 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	48.0	58.0	68.4	73.9	77.7	76.3	71.7	66.8	51.9	81.9
46 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	47.3	56.4	72.2	72.9	79.4	79.5	74.3	70.6	58.3	84.0
46 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	48.1	57.3	72.7	75.1	79.8	80.1	75.2	71.4	57.9	84.8
47 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	50.1	60.9	71.6	78.5	80.5	79.7	73.8	68.5	55.1	85.1
47 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	49.2	57.7	73.6	76.1	81.0	80.6	75.2	71.1	58.5	85.5
47 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	47.3	56.4	72.2	72.9	79.4	79.5	74.3	70.6	58.3	84.0
48 S Int	DA55.45.	26.7m^3/s at 725pa Supply.	47.3	58.6	69.8	76.2	79.0	78.6	73.6	68.1	53.4	83.7
48 S Exh 2	DA55.45.	25.3m^3/s at 600pa Return	47.6	57.1	68.8	75.1	80.3	79.8	74.5	69.9	57.9	84.5
48 S Exh 1	DA55.45.	25.3m^3/s at 600pa Return	49.2	57.7	73.6	76.1	81.0	80.6	75.2	71.1	58.5	85.5

Table D1 Sound Power Levels Associated with Phase 1 Plant (Measured on Site)

APPENDIX E – NOISE SOURCE DATA – BUILDING X & Y

Noise emissions associated with the existing Building W AHU plant are detailed in Appendix D. Noise source data for additional plant associated with Building X consist of some 21 additional AHU installations and for Building Y some 86 roof mounted fans and other supporting items of plant.

Table D1 presents the noise data associated with these plant items.

Source	No. Units	L_{wA} - Octave Band Centre Frequency								dB (A)
		63	125	250	500	1k	2k	4k	8k	
AHU Air Intake	21	62	74	78	87	86	82	74	64	91
AHU Air Exhaust	21	69	77	85	91	90	86	82	69	95
Roof Fans	84	60	64	72	75	74	71	62	59	80
Roof Fans ($16m^3/s$)	22	60	64	72	75	74	71	62	59	80
Roof Fans ($33m^3/s$)	6	60	64	72	75	74	71	62	59	80
Dry Coolers	20	60	64	72	75	74	71	62	59	80
Trane Chillers	6	60	64	72	75	74	71	62	59	80

Table D1 L_{wA} levels Utilised in Noise Model

In terms of emergency generators, the following source noise data has been assumed for the proposed units based on measurements obtained on site for generator units associated with Building W.

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Sides	67	77	81	86	84	60	73	58	90
Intake	79	92	94	95	90	85	80	66	99
Exhaust	65	74	82	87	85	82	77	65	91

Table D2 L_{wA} levels Utilised in Noise Model – Generators – Building W & X

In relation to Building Y the emergency generators are located within the building. It is understood that exhausts and intakes associated with these units have been designed such that 85 dB(A) at 1m is not exceeded from them. This has been assumed for the assessment presented here.

APPENDIX F – NOISE SOURCE DATA – BUILDING U & V

The noise modelling completed uses the following noise data in relation to various items of plant associated with the overall site development. Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant/building in order that the plant noise emission levels are achieved on site (including any system regenerated noise).

Building	Source	L_{wA} - Octave Band Centre Frequency								dB(A)
		63	125	250	500	1000	2000	4000	8000	
U	Exhaust Fans [A]	57	67	80	82	78	76	73	64	86
	Condensers	51	64	67	73	77	74	69	63	81
	AHU Supply [C]	32	53	43	50	47	46	45	41	57
	AHU Breakout [C]	49	61	64	67	66	68	53	32	71
	AHU Exhaust [C]	47	64	64	79	83	79	78	67	86
	AHU Breakout [C]	37	52	54	62	62	64	53	24	68
	Generator Inlet [D]	80	78	76	70	65	66	59	78	85
	Generator Outlet [D]	79	74	65	67	68	69	63	64	81
	Generator Wall [D]	76	83	86	80	75	68	54	57	89
	Generator Roof [D]	75	82	85	79	74	67	53	56	88
V	Condensers	51	64	67	73	77	74	69	63	81
	AHU Supply [E]	32	53	43	50	47	46	45	41	57
	AHU Breakout [E]	39	54	58	64	65	68	55	31	71
	AHU Exhaust [E]	57	71	70	82	84	79	76	68	86
	AHU Breakout [E]	37	52	54	62	62	64	53	24	68
	Generator Inlet [F]	104	98	87	76	59	61	58	82	86
	Generator Outlet [F]	99	97	85	72	67	67	65	83	86
	Generator Wall [F]	102	102	93	82	71	66	56	61	89
	Generator Roof [F]	102	102	93	82	71	66	56	61	89

Table F1 L_{wA} levels Utilised in Noise Model

Note A Based on data supplied in Dannan Air submittal – "DH Extract Unit - Baseline OPT"
Note B Based on data supplied for Stultz KSV045A22p unit.
Note C Based on data supplied for AHU from Mark Climate Technology LMS299414-01-3
Note D Based on supplied Cummings data for a 75 dB(A) at 1m generator set – "DUB90-CMM-ZZ-TS-E-POWR-0007 REVISION P03". Corrected to obtained sound power levels based on dimensions of units detailed on Cundall drawings.
Note E Based on data supplied for AHU from Mark Climate Technology LMS299414-01-3
Note F Based on supplied Cummings data for a 75 dB(A) at 1m generator set – "DUB90 – Main Gens and Ski Lodge _ Noise Information". Corrected to obtained sound power levels based on dimensions of units detailed on Cundall drawings.

APPENDIX G – NOISE SOURCE DATA – EPA REG. REF.: P1171-01

The data presented here relates to the cumulative assessment and does not form part of the application installation.

The noise modelling competed indicates the following limits in relation to various items of plant associated with the overall site development. Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant/building in order that the plant noise emission levels are achieved on site (including any system regenerated noise).

Source	No. of	L_{wA} - Octave Band Centre Frequency								dB (A)
		63	125	250	500	1k	2k	4k	8k	
Roof Fan Note A	96	57	72	81	80	75	69	65	60	84.5
Data Hall CRAH (Roof)	84	55.5	64.6	71.1	75.5	75.7	71.9	65.7	59.6	80.3
Electrical Room Extract Fan Note B	10	61.5	67.7	71.8	73.8	69.3	74.5	75.3	73.2	81.4
Generator Exhaust	18	67.2	77.1	80.8	86.4	83.6	79.6	73.0	58.0	89.8
Generator Intake	18	79.4	91.6	94.2	95.0	90.0	84.9	79.9	66.0	99.4
Generator Stack	18	70.0	79.4	87.2	92.2	90.2	87.3	82.3	70.2	96.0
Pumps Note C	12	38.0	48..0	55.0	65.0	64.0	65.0	61.0	52.0	70.0

Table G1 L_{WA} levels Utilised in Noise Model – Building A

Note A Includes directivity effect of unit exhausting in the vertical plane.

Note B Incudes provision of in line attenuation offering the following minimum sound reduction:

Element	Sound Insertion Loss dB – Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Louvre	6.0	9.0	16.0	19.0	24.0	17.0	13.0	10.0

Note C Acoustic enclosures will be provided for external pumps in order that the stated noise levels in Table 10 are achieved.

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Roof Fan Note D	57	72	81	80	75	69	65	60	84.5
Data Hall CRAH (Roof)	55.5	64.6	71.1	75.5	75.7	71.9	65.7	59.6	80.3
Electrical Room Extract Fan Note E	61.5	67.7	71.8	73.8	69.3	74.5	75.3	73.2	81.4
AHU Louvres Note F	54	63	74	73	66	67	71	66	79
Generator Exhaust Note G	54	63	74	73	66	67	71	66	79
Generator Intake Note G	88	90	82	83	83	80	78	76	94
Generator Rear Note G	88	90	82	83	83	80	78	76	94
Generator Stack Note H	84	77	77	73	69	74	71	71	86
Generator Sides & Roof Note G	82	93	92	94	94	93	88	75	101
Pumps Note I	38	48	55	65	64	65	61	52	70
Transformers (x 4)	64	66	96	88	76	69	71	71	97

Table G2 L_{WA} levels Utilised in Noise Model – Building B, C and D

Note D Includes directivity effect of unit exhausting in the vertical plane.

Note E Incudes provision of in line attenuation offering the following minimum sound reduction:

Element	Sound Insertion Loss dB – Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Louvre	6.0	9.0	16.0	19.0	24.0	17.0	13.0	10.0

Note F It is assumed the relevant L_w associated with the AHU intake fan(s) is 84dB(A) as detailed in supplied data sheets. Provision of in line attenuation offering the following minimum sound reduction has been assumed:

Element	Sound Insertion Loss dB – Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Splitter	6	8	13	15	18	12	9	8
Filter	0	2	2	2	4	7	7	12

Note G Assuming generator housing dimensions of 17m (L) x 4m (W) x 4m (H). Data based on CAT data supplied in relation to previous sites.

Note H Additional attenuation due to 25m stack and additional bends assumed.

Note I Acoustic enclosures will be provided for external pumps in order that the stated noise levels in Table D2 are achieved.

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Roof Fan	61	68	75	77	75	74	77	73	84
Roof Condensers	57	77	67	74	77	74	68	65	82
AHU Louvres	54	69	73	70	63	62	61	61	79
Generator Exhaust Note A	54	63	74	73	66	67	71	66	79
Generator Intake Note A	88	90	82	83	83	80	78	76	94
Generator Rear Note A	88	90	82	83	83	80	78	76	94
Generator Stack Note B	84	77	77	73	69	74	71	71	86
Generator Sides & Roof Note A	82	93	92	94	94	93	88	75	101
Pumps Note C	38	48	55	65	64	65	61	52	70
Transformers (x 4) Note D	49	51	81	73	61	54	56	56	82

Table G3 L_{WA} levels Utilised in Noise Model – Buildings E and F

Note A Assuming generator housing dimensions of 17m (L) x 4m (W) x 4m (H). Data based on CAT data supplied in relation to previous sites.