



CONDITION 24:
OPERATIONAL PLANT
ASSESSMENT

Leisure Development at
New Road, Deighton



HARWORTH ESTATES
INVESTMENTS LIMITED

R22.11481/1/COND24/IK
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REPORT DETAILS

Client	Harworth Estates Investments Limited
Report Title	Condition 24: Operational Plant Assessment
Site Address	Former North Selby Mine, Off New Road, Deighton
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QUALITY ASSURANCE

Issue No.	Issue Date	Comments	Author	Technical Review
1	27/07/22	n/a		
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1.0 INTRODUCTION

- 1.1 Vibrock Limited has been commissioned by Harworth Estates Investments Limited to provide acoustic consultancy services to assist with the discharge a noise related planning condition of the planning permission (reference: 19/00078/OUTM) for the proposed leisure development at New Road, Deighton.
- 1.2 Condition 24 of the permission requests that a noise assessment be submitted and approved which details all machinery, plant and equipment to be installed at the site and details of any mitigation measures to ensure the agreed noise criteria can be met at the nearest noise sensitive receptors.
- 1.3 The assessment draws upon the baseline noise measurement results and the fixed plant design criteria presented in the Environmental Statement Chapter 9.0 produced by White Young Green (WYG) as supporting documentation for the planning application.
- 1.4 The assessment has been prepared in accordance with applicable standards and guidance, and following consultation with the Public Protection Team at York City Council. Where appropriate, consideration has been given to noise mitigation measures to demonstrate how a suitable level of protection could be afforded to future and existing residents in the vicinity of the fixed plant.
- 1.5 A glossary of acoustic terminology is presented in Appendix A.

2.0 BACKGROUND INFORMATION

2.1 Site Location and Setting

2.1.1 The proposed leisure development is situated around 1.75km northeast of the residential area of Escrick, approximately 1.8km east of the village of Deighton, 2.9km southeast of Crockey Hill Caravan Site, and 2.8km west of the residential area of Wheldrake.

2.1.2 The development is located within the City of York Council area. There are several Noise Action Plan Important Areas (IA) associated with the A79, which is a strategic trunk road situated to the west of the development site. The nearest IA is Noise Important Area ID: 6579 which is approximately 2.1 km to the south-east.

2.2 Development Proposals

2.2.1 The proposals include for the redevelopment of the former North Selby Mine site to a leisure development comprising of a range of touring caravan and static caravans with associated facilities. Facilities will include an on-site restaurant, leisure centre, snack bar, welfare facilities, and buildings housing entertainment and games facilities.

2.2.2 The leisure centre and restaurant buildings will be situated towards the north of the site with other buildings situated towards the east of the caravan pitches.

2.2.3 A sub-station will be situated towards the south of the central area of the site.

2.2.4 Figure 1 illustrates the general arrangement with the approximate aspects of each building where fixed plant is proposed (circled).

2.3 Planning Condition 24

2.3.1 In August 2020 York City Council granted approval subject to a number of planning conditions, of which Condition 24 pertains to noise and is as follows:

“24 Details of all machinery, plant and equipment to be installed in or located on the site, which is audible outside of the site, shall be submitted to the local planning authority for approval. These details shall include average sound levels (LAeq), octave band noise levels and any proposed noise mitigation measures. The machinery, plant or equipment and any approved noise mitigation measures shall be fully implemented and operational before the proposed use first opens and shall be appropriately maintained thereafter.

Note: The combined rating level of any building service noise associated with plant or equipment at the site should not exceed the representative LA90 1 hour during the hours of 07:00 to 23:00 or representative LA90 15 minutes during the hours of 23:00 to 07:00 at 1 metre from the nearest noise sensitive facades when assessed in accordance with BS4142: 2014, inclusive of any acoustic feature corrections associated with tonal, impulsive, distinctive or intermittent characteristics.

Reason: To protect the amenity of nearby properties and the environmental qualities of the area.”

3.0 CONSULTATION, GUIDANCE AND STANDARDS

3.1 Consultation with York City Council (YCC)

3.1.1 Prior to carrying out the peer review and re-assessment, consultation was undertaken with Mike Southcombe, Public Protection Manager at YCC to gain an understanding of the shortfalls in the previous noise impact assessment.

3.1.2 A consultation email was prepared and sent to Public Protection on 24 June 2022 and detailed the following approach to the assessment.

“The assessment will draw on the results of the baseline noise survey undertaken to inform the noise impact assessment prepared in support of the planning application. Noise emissions from fixed plant and machinery at the proposed development will be predicted, and then compared against the criteria stated in Condition 24. Where necessary, consideration will be given to mitigation measures in order that the adopted assessment / design criteria will not be exceeded.

At this time, the business does not have specific detail of the type, model/make of plant to be installed at the site. We do have details of where the external plant is intended to be installed (buildings and likely aspects). We would therefore like to agree a reasonable approach using plant noise spectra for typical plant items such as wall mounted extract fans, outdoor condensing units etc.

We will undertake a series of cumulative noise calculations and assess whether the derived background sound levels will be exceeded at the NSRs. The cumulative noise calculations will include acoustic character corrections to obtain the Rating Level in accordance with BS 4142:2014+A1:2019. The assessment will be undertaken for both day and night-time periods, however it is likely the design criteria will target the worst-case night-time period. Where predictions indicate significant adverse impacts, mitigation will be recommended to offset these.”

3.1.3 Mike Southcombe confirmed via return of email dated 24 June 2022 that he was satisfied with the approach to the assessment.

3.2 Guidance and Standards

British Standard (BS) 4142:2014 + A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

3.2.1 This British Standard was published in October 2014 and supersedes BS 4142:1997, which is withdrawn.

- 3.2.2 This edition describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described, use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes.
- 3.2.3 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. When making assessments and arriving at decisions it is essential to place the sound in context.
- 3.2.4 This standard is intended to be used for the purposes of:
- 1) investigating complaints;
 - 2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
 - 3) assessing sound at proposed new dwellings or premises used for residential purposes.
- 3.2.5 This standard is not intended to be applied for the following purposes:
- The determination of noise amounting to a nuisance;
 - The derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels;
 - The assessment of low-frequency noise;
 - The assessment of sound from the passage of vehicles on public roads and railway systems;
 - The assessment of sound from recreational activities, including all forms of motorsport; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; and public address systems for speech;
 - The assessment of sound from other sources falling within the scopes of other standards or guidance.
- 3.2.6 The sound level from a source when determined as a discrete entity, distinct and free of other influences contributing to the ambient sound is referred to as the 'specific sound level'. The specific sound level is evaluated, at an identified assessment location, over the appropriate reference time interval which is as follows:
- 1 hour during the daytime (07:00 –23:00); and
 - 15 minutes during the night-time (23:00 –07:00).
- 3.2.7 The specific noise may be subject to an acoustic feature correction if the noise level at the assessment location is subjectively considered to exhibit certain acoustic features that could increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.

3.2.8 This standard requires the assessor to consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention. Such features are considered by applying the following corrections to the specific sound level to obtain the rating level as follows:

Subjective Prominence	Tonality	Impulsivity	Other Characteristics
Just Perceptible	+2 dB	+3 dB	-
Clearly Perceptible	+4 dB	+6 dB	-
Highly Perceptible	+6 dB	+9 dB	-
Readily Distinctive Against Residual Environment	-	-	+3 dB
Intermittency			+3 dB

3.2.9 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be considered. If one feature is dominant, then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion. The rating level is equal to the specific sound level if there are no such features present or expected to be present.

3.2.10 In addition to the above, this edition of the standard also presents a number of objective methods for the characterisation of sound to be used when the subjective method is not sufficient.

3.2.11 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level, and consider the following.

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB or more is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3.2.12 Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) The absolute level of sound.
- 2) The character and level of the residual sound compared to the character and level of the specific sound.
- 3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
 - i) facade insulation treatment;
 - ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - iii) acoustic screening.

3.2.13 Response to sound can be subjective and is affected by many factors both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. This edition of the standard recognises the importance of the context in which a sound occurs.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

3.2.14 British Standard 8233:2014 provides guidance for sound insulation and noise reduction in buildings. Tables in the document advise on acoustic criteria and limits which are appropriate for various types of space that have different functions. The guidance applies to external noise as it affects the internal acoustic environment from steady sources without a specific character.

3.2.15 For dwellings, the main considerations are; for bedrooms, the acoustic effect on sleep and for other rooms the acoustic effect on resting, listening and communicating. Table 4 in the BS gives desirable ambient noise levels that should not be exceeded. For dwellings the daytime, 07:00 –23:00 hours, values are between 35 –40 dB $L_{Aeq,16h}$ depending on the specific use of the room. The guideline value for bedrooms at night-time, 23:00 –07:00 hours, is 30 dB $L_{Aeq,8h}$.

3.2.16 BS 8233 states that for external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. There is also a recognition that the above guideline values may not be achievable in all circumstances and that a balance between noise and other factors will require to be made.

3.2.17 For regular individual noise events with the potential to cause sleep disturbance it is stated that a guideline value may be set in terms of SEL or L_{AFmax} . No further guidance is provided with respect to an appropriate criterion which may be adopted for the assessment of such events. The assessment of night-time events has therefore drawn upon the guidance detailed within the WHO: Guidelines for Community Noise document as summarised in the corresponding section below.

World Health Organisation (WHO) Environmental Noise Guidelines for the European Region: 2018

3.2.18 This document replaces the WHO Guidelines for Community Noise (GCN), 1999. The revised study provides recommendations for protecting human health from exposure to environmental noise originating from various sources, taking account of further research that has taken place since the publication of the GCN and Night Noise Guidelines.

3.2.19 The noise sources considered include road traffic, rail and aircraft noise, wind turbine noise and noise from leisure activities.

3.2.20 The following examples are taken from the guidance as levels of average noise exposure:

Road traffic noise	53 dB L_{den}
	44 dB L_{night}

The ENG does not include target external noise levels for amenity spaces. However, an external noise level range of 50 - 55 dB $L_{Aeq,T}$ is recommended by BS 8233: 2014 which is in line with the superseded WHO GCN.

World Health Organisation (WHO): Guidelines for Community Noise

3.2.21 This is a wide-ranging document describing the effects of community noise, which is now superseded by the WHO Environmental Noise Guidelines (2018). However, it provides useful information about the effects of noise that may occur at certain levels of exposure and an appropriate criterion for the assessment of individual events.

3.2.22 Indoor guideline values are provided for bedrooms with the aim of protecting against sleep disturbance, a guideline value of 30 dB $L_{Aeq,8h}$ for continuous noise and 45 dB L_{AFmax} for single sound events is recommended. To enable casual conversation during the daytime an internal guideline noise level of 35 dB $L_{Aeq,16h}$ is also recommended.

3.2.23 With respect to night-time L_{AFmax} noise levels, the WHO states:

“For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10 - 15 times per night.”

4.0 RECEPTORS AND BACKGROUND SOUND LEVELS

4.1 Noise Sensitive Receptors

- 4.1.1 The assessment has considered the nearest noise sensitive receptors to the proposed development, and are representative of those adopted in the Noise and Vibration ES Chapter completed by WYG Limited.
- 4.1.2 A review of satellite and street scene imagery and the address point data on YCC's Planning Portal would indicate that there are no new NSRs in the vicinity of the site that would require consideration over and above those presented in previous assessments.
- 4.1.3 The nearest dwellings to the proposed fixed plant are Sheepwalk Farm and Sheepwalk Farm Cottages which correspond to a single representative location of R2.
- 4.1.4 The receptors adopted in the ES Chapter and in this assessment are detailed in the following table.

Receptor ID	Receptor Name	Distance to Nearest Redline Boundary, metres
R1	Spring House Farm	625
R2	Sheepwalk Farm Cottages	25
R3	Warren House Farm	210
R4	Chequer Hall Farm	450

4.2 Background Sound Levels

- 4.2.1 The Noise and Vibration ES Chapter presented the baseline noise levels measured at locations representative of the NSRs during day, evening and night-time periods.
- 4.2.2 Although the original noise survey was completed in November 2018, for the purposes of this assessment, the measured background sound levels are still considered to be relevant. With no new, significant noise generating developments in the vicinity of the scheme since the survey was completed it is very unlikely that the background sound levels will have changed in that time.
- 4.2.3 A summary of the results from the four short term measurement locations and the corresponding receptor descriptions are presented below.

Location	Period	Statistical Parameters (dB)			Comments
		L _{Aeq}	L _{A10}	L _{A90}	
ST1	Daytime	45.3	41.8	33.6	Spring House Farm
	Evening	39.0	40.5	36.0	
	Night-time	33.3	34.9	26.3	
ST2	Daytime	35.1	38.1	27.1	Sheepwalk Farm / Cottages
	Evening	50.6	56.0	29.7	
	Night-time	31.9	33.8	24.0	
ST3	Daytime	36.1	38.9	29.8	Warren House Farm
	Evening	33.2	34.6	28.9	
	Night-time	29.0	28.9	21.6	
ST4	Daytime	64.3	62.0	29.3	Chequer Hall
	Evening	58.4	42.8	30.5	
	Night-time	53.0	35.6	26.5	
LT1	Weekday Day	46.1	42.0	36	Representative of Sheepwalk Farm / Cottages
	Weekday Night	40.1	35.6	22	
	Weekend Day	39.1	37.2	30	
	Weekend Night	27.7	27.8	22	

- 4.2.4 For the assessment of fixed plant the ES Chapter applied a single background sound level of 30 dB L_{A90,T} as being representative of both day and night-time periods at all NSRs. From the results above it can be seen that the derived background sound level exceeds the measured level for the night-time periods at all locations and daytime periods at some locations.
- 4.2.5 The results of the long term monitoring undertaken by WYG in the vicinity of Sheepwalk Farm Cottages would indicate the weekday and weekend night-time background sound levels to be approximately 22 dB L_{A90,T}.
- 4.2.6 There is some merit in the approach taken by WYG in their assessment through adoption of a single background value. However, uncertainty is an important consideration in the context of the BS4142 methodology and adopting a higher background level than is 'typical' would introduce uncertainty at an early stage in the process.

- 4.2.7 As the full fixed plant complement is not known at this stage, it is good practice to design to a noise rating level that does not exceed the background sound level, and to ensure the amenity of the receptors are protected. For the purpose of this assessment it is advisable to adopt a more rigorous background sound level at each receptor.
- 4.2.8 The following table presents the background sound levels at each NSR based on both the short term attended measurements and the long term data at LT1.

Receptor ID	Receptor Name	Daytime (07:00 –23:00 hrs) $L_{A90,T}$ (dB)	Night-time (23:00 – 03:00 hrs) $L_{A90,T}$ (dB)
R1	Spring House Farm	34	26
R2	Sheepwalk Farm Cottages	30	22
R3	Warren House Farm	30	22
R4	Chequer Hall Farm	29	27

5.0 PREDICTIONS OF FIXED PLANT NOISE

5.1 Introduction

5.1.1 This section details the methodology used in the prediction of the specific noise level from the concurrent operation of all proposed fixed plant at the noise sensitive aspects of the nearest NSRs.

5.1.2 The predictions are based on example plant items and the manufacturer's sound power level octave band data for the likely operational states of the plant. Locations of the fixed plant are based on the general arrangement drawing presented as Figure 1.

5.1.3 The following sections describe the method of calculation of the specific sound level for the fixed plant items.

5.2 Acoustic Modelling

5.2.1 Cadna 'A' environmental noise prediction software, Version 2021, has been used to predict noise from the fixed plant. Predictions have been undertaken at the nearest noise sensitive receptors to the proposed development.

5.2.2 The following general configuration settings have been applied in the software:

The model was set up to apply the prediction methodology set out in ISO 9613-2: 1996: Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation (ISO 9613-2) for the calculation of industrial/commercial sound sources.

Google aerial photography for the site and surrounding area has been calibrated into the noise model based on OS six figure grid co-ordinates.

Ordnance Survey Terrain 5 (DTM) data has been obtained for the site and surrounding area, then incorporated to provide a topographic basis for the noise model.

Provided redline boundary plans for the site and surrounding area have been calibrated into the noise model based on Ordnance Survey six-figure grid co-ordinates.

Off-site buildings have been incorporated with heights informed by street scene imagery. Existing 1 and 2 storey buildings in the vicinity of the site were set to 5 and 7.0 metres in height, respectively.

The proposed buildings have been set to 3 metres and 5 metres in height to the eaves, i.e. 1 & 2 storeys at 2.5 metres floor height.

All buildings were set to be 'structured façade' with an associated level of acoustic reflection.

The default ground absorption was set to set to $G = 1.0$ (acoustically soft ground) to best reflect local ground cover as present and proposed.

The model was set to include second order acoustic reflections.

Receivers have been included at external areas of the NSRs considered to be habitable spaces i.e. patios and garden areas. The receiver heights were set to 1.5 metres above DTM.

- 5.2.3 Fixed plant serving the various buildings have been selected based on the intended use of the building. Fixed plant items including air extract and air conditioning units are likely to be utilised on all proposed buildings and have been assumed to consist of wall mounted and outdoor floor mounted units.
- 5.2.4 Buildings used for food preparation and food storage, are likely to require refrigeration units consisting of externally mounted condensers. In addition, the kitchen serving the restaurant will likely have an extract system consisting of an inline axial fan or similar, mounted within a galvanised steel duct. The duct is assumed to finish 1 metre above the proposed restaurant roof height. Factors that inform the theoretical sound pressure level reductions between the fan outlet and the duct exit are not known at this stage. Factors will include the length, shape and diameter of the duct, the number of bends/elbows, the presence of turning vanes and the adoption of any attenuators, for example.
- 5.2.5 It is unlikely the kitchen extract system will be in use during the night-time period (23:00 –07:00 hours), however, this has been assumed to operate continuously.
- 5.2.6 The specific parameters and settings applied to the 3D acoustic model to account for the fixed plant are as follows:

Vent Axia Lo-Carbon T-series extract/intake panel fans (12 inch) installed in all buildings as a through wall mounted fan.

The kitchen extract system serving the restaurant is based on a Elta SLC560-1EC axial fan with a nominal sound power level (L_w) of 81 dB(A). No reductions have been applied for the ducting or any silencers/attenuators that will be installed on completion. This is a worst case scenario whereby the fan is operating externally at a height of 1 metre above the roofline of the restaurant building.

Refrigeration requirements for the restaurant, snack building and leisure facilities have been assumed to be served by Danfoss Optyma SlimOP-MSBM024AJ condensing units or similar. These units are typically floor or wall mounted externally to buildings. The manufacturer's sound power level (L_w) of 64 dB(A) has been adopted.

The sub-station has been modelled as two separate transformers (no screening attenuation) with a nominal sound power level (L_w) of 79 dB(A) with dominant octave frequency bands at 63 Hz and 125 Hz. The levels are those measured at a comparably sized sub-station serving an industrial process.

With the exception of the axial fan serving the kitchen, all other plant has been input into the acoustic model with a height of 1.5 and 2.0 metres above DTM.

The manufacturer and library sound power level spectrum data for all plant is presented in Table 1.

Each source has been modelled to operate continuously and no 'on-time' corrections have been applied in the assessment. This is a worst case scenario; in reality not all plant will run concurrently and continuously within the 1-hour daytime and 15 minute night-time reference periods.

- 5.2.7 The 3D acoustic model does not include the environmental noise barrier recommended in the Noise and Vibration ES Chapter 9. The results of the fixed plant noise predictions are discussed in the following section.

6.0 ASSESSMENT

6.1 Overview

- 6.1.1 The following assessments have been undertaken at the nearest NSRs to the main noise generating sources at the proposed development, as described in Section 4.
- 6.1.2 The assessment considers the noise impact from the fixed plant presented in Section 5 and has been undertaken with reference to the methodology described in BS 4142:2014+ A1:2019. Where appropriate context has been used to qualify the initial assessment of impact with reference to applicable standards and guidance including, BS 8233:2014 and the WHO: Environmental Noise Guidelines.
- 6.1.3 Consideration has also been given to the noise mitigation measures which will be required to ensure a suitable level of protection against noise for existing residents.
- 6.1.4 It is generally accepted that a window left partially open provides 10 -15 dB attenuation from external noise sources with the WHO Guidelines for Community Noise suggesting 15 dB from a façade noise level or 13 dB from a free field level.

6.2 BS4142:2014+A1:2019 Assessment

- 6.2.1 The assessment methodology compares the typical background sound levels at the residential NSRs against the noise levels generated by the fixed plant (specific level) once they have been corrected for their operational 'on-time' and corrections for any acoustically distinguishing characteristics (rating level).
- 6.2.2 The rating levels for each assessment scenario are derived by adding an acoustic feature correction to the derived specific sound levels. This has been determined based on the predicted specific plant noise level at each NSR relative to the ambient sound level corresponding to the period of assessment. For the main restaurant kitchen extract, the condensers and the transformers the acoustic character correction likely to be just perceptible at the nearest assessed receptor of Sheepwalk Farm Cottages is 'tonality'. The remaining plant items are predicted to be inaudible at this receptor as are all plant items at the receptors at greater distance from the site.
- 6.2.3 On this basis a 2 dB acoustic character correction has been added to the predicted specific noise level at Sheepwalk Farm Cottages for just perceptible tonality.
- 6.2.4 Further corrections for characteristics such as intermittency or impulsivity are not required where one characteristic is subjectively prominent over the other. In this instance tonality is the acoustic characteristic that is most likely to be prominent at the nearest receptor and is therefore likely to attract the attention of the existing residents.

- 6.2.5 The BS4142 assessment process is generally more onerous during the night-time, due to a short reference time period (T) of 15 minutes and lower background sound levels when compared to daytime. To present a robust assessment, daytime and night-time assessments have been undertaken.
- 6.2.6 It is considered reasonable to conduct the BS4142 assessment at the location of external habitable spaces (for example gardens) but not in spaces that are not considered to be noise sensitive (for example bin store areas, driveways or parking areas). Figure 2 illustrates the assessment locations used for the BS4142:2014 assessment.
- 6.2.7 Table 2.1 presents the cumulative fixed plant octave band centre frequency specific sound levels at each of the NSRs. Tables 3.1 - 3.2 present the results of the BS4142 assessment for the daytime and night-time scenarios. The results are discussed below.

Assessment Results Discussion

- 6.2.8 The BS4142 assessment during the daytime periods has found that when operational, the fixed plant will likely result in a low impact at the nearest NSRs to the site, depending on the context.
- 6.2.9 During the night-time the fixed plant will likely result in a low impact at the nearest NSRs with the exception of Sheepwalk Farm Cottages where a low likelihood of adverse impact is predicted. The item of plant contributing to the predicted specific noise level is the kitchen extract system and the axial fan.
- 6.2.10 As stated in Section 5, no reductions have been applied for the kitchen extract ducting or any silencers/attenuators that will be installed on completion. Equally, it is unlikely that this plant item will be in regular use during the night-time period and the assessment represents a worst case scenario whereby the fan is operating externally at a height of 1 metre above the roofline of the restaurant building. However, there may be an occasional requirement for overnight or early morning cooking with the potential for the kitchen extract to operate throughout the night.

BS4142:2014 Context

- 6.2.11 BS 4142:2014 advises the initial estimated impact should be considered within the context of the site and the surrounding acoustic environment. Factors including the absolute level of the sound, its characteristics and the sensitivity of the receptor can contribute to the modification of the initial impact where appropriate.
- 6.2.12 The character of the noise from the proposed fixed plant is likely to be just noticeable during the night-time when the closest residents are outdoors in external amenity areas. This has been adequately addressed through the application of appropriate acoustic character corrections.

- 6.2.13 When considering noise generated by the development during the night-time, residents are likely to be indoors resting or sleeping with windows open. The BS 4142 assessment would indicate that the noise impact within a dwelling would be the same regardless of the façade construction of the nearest proposed noise sensitive receptors. As the absolute level of noise generated by the fixed plant, is predicted to be no greater than 21 dB at the nearest dwelling, the internal night-time criterion of 30 dB $L_{Aeq,T}$ is predicted to be met when accounting for open windows.
- 6.2.14 Considering the above points revision of the initial estimate of impact using context as described in BS4142 is not proposed.
- 6.2.15 Notwithstanding the outcome of the assessment, consideration to 'Good Acoustic Design' measures to ensure the selection, installation and operation of the fixed plant do not adversely impact the amenity of the NSRs are detailed in the following section.

7.0 GOOD ACOUSTIC DESIGN MEASURES

- 7.1.1 The worst case assessment has identified that the concurrent operation of all of the fixed plant and sub-station are likely to result in a low likelihood of adverse impact when assessed according to the methodology in BS4142:2014+A1:2019 at the nearest NSR during the night-time.
- 7.1.2 There is potential for the final selection of some fixed plant items to be noisier than those presented in this assessment. The plant item with the largest contribution to the overall specific noise level at the nearest NSR is the axial fan associated with the kitchen extract system.
- 7.1.3 The noise predictions have not included any attenuation of the fan noise level that would occur from the various components of the overall exhaust system. In reality significant reductions in noise level can be realised through the installation of inline attenuators and adoption of best practice in the system installation and ongoing maintenance.
- 7.1.4 It must be emphasised that the outcome of the assessment does not specifically warrant any mitigation over and above that embedded within the design of the extract system itself. The following advice is presented to assist with final plant selection, installation and ongoing maintenance.
- 7.2 Best Practice for the Design and Operation of a Kitchen Extract System
- 7.2.1 The DEFRA document, Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2005) presents best practice for the design and operation of commercial kitchen ventilation systems. The following points should be considered in the final design and ongoing maintenance of the systems to ensure noise control (this list is not exhaustive):

The in-line attenuator should be constructed to ensure that no grease impregnation occurs into the acoustic media.

Ensure that the attenuator and fan can be accessed for cleaning/maintenance purposes.

Access panels for cleaning should incorporate quick release catches, sealing gasket and thermal, acoustic and fire-rated insulation properties equal to that of the duct to which the panel is fitted.

Ensure that the ductwork has no flow restrictions other than that for which it is designed.

Use of flexible connections to isolate fan noise and transmission through the ducting.

Use of stiff walled ducting to reduce vibration and degree of noise breakout.

Use of lined ducts and elbows can further assist with noise reduction.

8.0 CONCLUSIONS

- 8.1 The report has been prepared for the purposes of assisting with the discharge of a noise related planning condition for the proposed Leisure Development at New Road Deighton.
- 8.2 The report presents a summary of the baseline noise survey undertaken in 2018 to inform the Noise and Vibration ES Chapter produced as supporting documentation for the planning application.
- 8.3 Detailed consultation has been undertaken with Public Protection at York City Council to understand their requirements in relation to the planning condition and agree the assessment methodology and suitable noise criteria.
- 8.4 Adopting the latest site arrangement drawing, assumptions have been made as to the complement of fixed plant likely to be installed at the site. Manufacturers' noise data and library noise source data held by Vibrock Limited have been adopted in the predictions of noise from fixed plant when operating concurrently.
- 8.5 Worst-case assumptions have been made regarding noise attenuating features of the kitchen air extract system and the noise levels from the sub-station. Additionally, the predictions have assumed all plant will operate continuously during day and night-time periods. Predictions have been made at the existing residential noise sensitive receptors presented in the Noise and Vibration ES Chapter.
- 8.6 The BS4142:2014 assessment indicates a low impact from the operation of fixed plant at all assessed receptors both during day and night-time periods, with one exception. At the nearest receptor of Sheepwalk Farm Cottages during the night-time a low likelihood of adverse impact has been predicted as a result of the operation of the kitchen extract system.
- 8.7 It has been stated that the outcome of the worst case assessment does not specifically warrant any mitigation over and above that embedded within the design of the extract system itself. Good Acoustic Design advice has been presented to assist with final plant selection, installation and ongoing maintenance.

9.0 REFERENCES

1. British Standard (BS) 4142:2014 + A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound, 2019.
2. British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings. British Standards Institution, 2014.
3. WHO Environmental Noise Guidelines for the European Region. World Health Organisation 2018.
4. WHO Guidelines for Community Noise. World Health Organisation, 1999.
5. International Organization for Standardization (1996), ISO 9613-2:1996(E) Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation.
6. The Chartered Institution of Building Services Engineers (CIBSE), Guide B, Heating, ventilating, air conditioning and refrigeration, 2005.
7. Department of Environment, Food and Rural Affairs (DEFRA), Control of Odour and Noise from Commercial Kitchen Exhaust Systems, 2005.

TABLE 1

Fixed Plant Noise Data

Sound Power Level (L_{WA} re. 10^{-12} Watts) Data Used in the Calculations, dB

Model	Comment	Octave Band Centre Frequency Hz								dBA
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
SLC560-1EC Axial fan	1628 RPM	72	74	69	72	72	72	69	69	81
MSBM024AJ – Condenser ¹	32°C operating temp.	75	71	66	59	55	55	54	52	64
Vent Axia Fan / TX12PL	High Speed	65	66	61	59	53	51	53	51	61
Sub-station - Transformers	-	84	85	80	79	70	66	64	57	79
Note 1: Acoustic spectrum data are calculated by addition of sound power levels of compressor and fan motor at operational speed according to manufacturer's catalogue, Appendix B.										

TABLE 2

Table 2.1

Predicted Cumulative Fixed Plant Sound Pressure Level (Free Field)

Receptor ID / Name	Octave Band Centre Frequency Hz (dB)								Specific Sound Level dB(A) L _s
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
R1 / Spring House Farm	16.2	7.4	-1.9	0.8	-1.3	-10	-35.6	-80.2	3
R2 / Sheepwalk Farm Cottages	25.9	25.1	13.6	17	15.1	14.2	8.9	-1.3	21
R3 / Warren House Farm	17.2	15.5	4.3	7.9	5.2	1.2	-12.7	-51.8	10
R4 / Chequer Hall Farm	19	18	5.3	8.7	4.7	-1.8	-18	-70.3	10

TABLE 3

BS 4142:2014 + A1:2019 Assessment

Table 3.1

BS 4142 Assessment of day-time noise impact from fixed plant at proposed development

Time Period: Daytime (07:00 –23:00 hours)

Description	R1 Spring House Farm	R2 Sheepwalk Farm Cottages	R3 Warren House Farm	R4 Chequer Hall Farm
Predicted specific noise level at residential receptor	$L_s = 3$ dB	$L_s = 21$ dB	$L_s = 10$ dB	$L_s = 10$ dB
Acoustic character correction, in accordance with BS 4142:2014+A1:2019	0 dB	2 dB	0 dB	0 dB
Predicted noise rating level at receptor	$L_{A_r,T} = 3$ dB	$L_{A_r,T} = 23$ dB	$L_{A_r,T} = 10$ dB	$L_{A_r,T} = 10$ dB
Representative background sound level at assessment location (see Section 4)	$L_{A90,T} = 34$ dB	$L_{A90,T} = 30$ dB	$L_{A90,T} = 30$ dB	$L_{A90,T} = 29$ dB
Assessment level (Rating level –background sound level)	-31 dB	-7 dB	-20 dB	-19 dB
Assessment of impact (BS 4142 methodology)	Low Impact	Low Impact	Low Impact	Low Impact
Assessment commentary	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Table 3.2

BS 4142 Assessment of night-time noise impact from
 fixed plant at proposed development

Time Period: Night-time (23:00 –07:00 hours)

Description	R1 Spring House Farm	R2 Sheepwalk Farm Cottages	R3 Warren House Farm	R4 Chequer Hall Farm
Predicted specific noise level at residential receptor	$L_s = 3$ dB	$L_s = 21$ dB	$L_s = 10$ dB	$L_s = 10$ dB
Acoustic character correction, in accordance with BS 4142:2014+A1:2019	0 dB	2 dB	0 dB	0 dB
Predicted noise rating level at receptor	$L_{Ar,T} = 3$ dB	$L_{Ar,T} = 23$ dB	$L_{Ar,T} = 10$ dB	$L_{Ar,T} = 10$ dB
Representative background sound level at assessment location (see Section 4)	$L_{A90,T} = 26$ dB	$L_{A90,T} = 22$ dB	$L_{A90,T} = 22$ dB	$L_{A90,T} = 27$ dB
Assessment level (Rating level –background sound level)	-23 dB	+1 dB	-12 dB	-17 dB
Assessment of impact (BS 4142 methodology)	Low Impact	Low likelihood of adverse impact	Low Impact	Low Impact
Assessment commentary	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	The lower the rating level is relative to the background sound level, the less likely it is that the specific sound source will have an adverse or significant adverse impact.	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.	Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

FIGURE 1

Sketch General Arrangement –Drawing 141-sk01

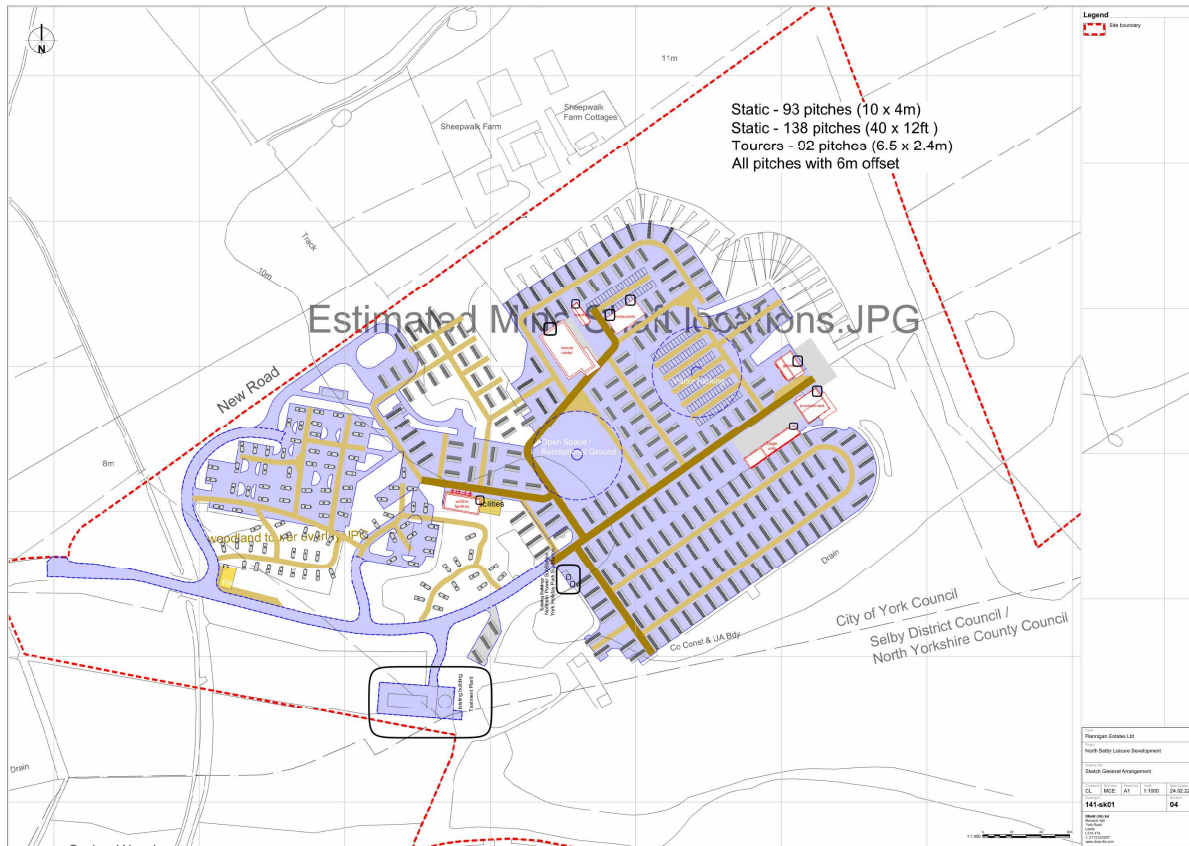
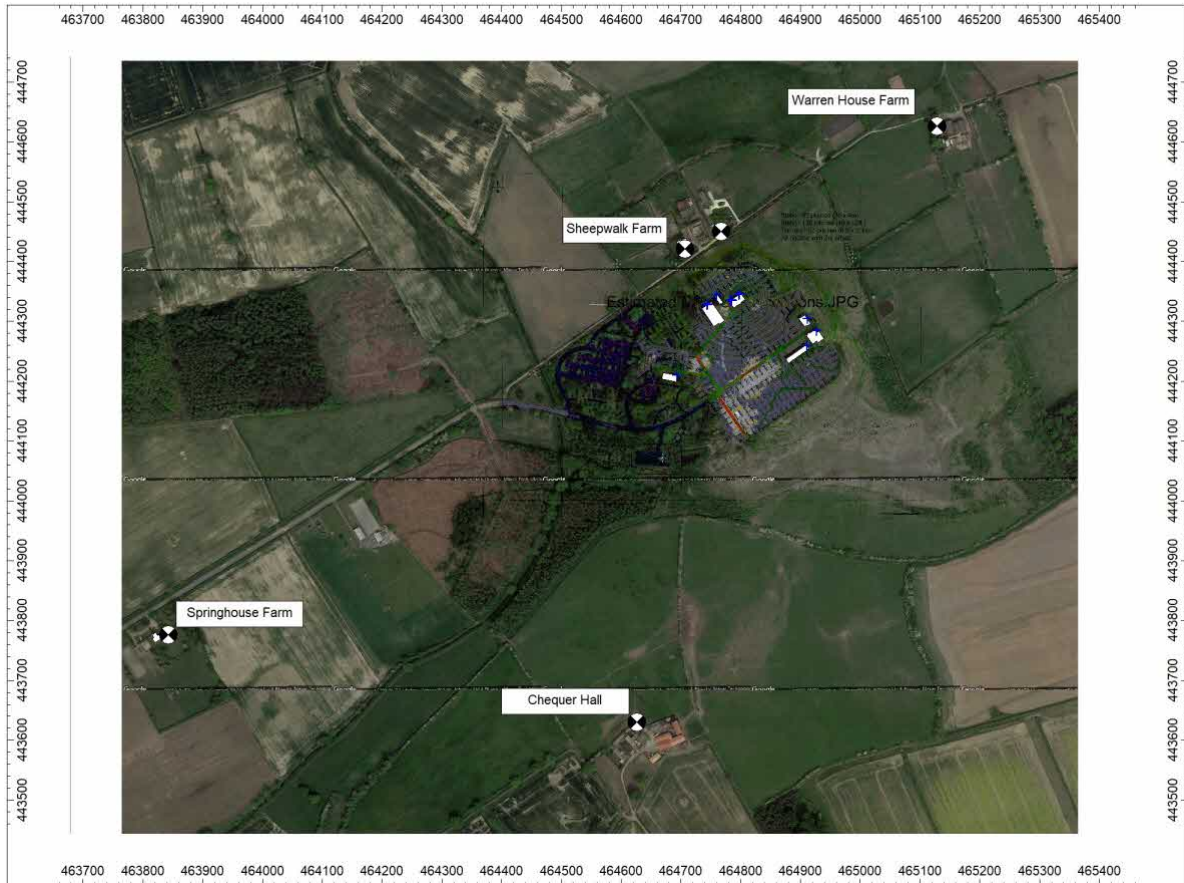


FIGURE 2

BS4142:2014+A1:2019 Assessment Locations



APPENDIX A

Acoustic Terminology

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A-weighting' and written as dB(A).

The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to $40 + 40 = 80$ dB(A) but rather $40 + 40 = 43$ dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

The following table gives typical noise levels in terms of dB(A) for common situations.

Approximate Noise Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library
50	Quiet office, no machinery
60	Normal conversation
70	Inside a saloon car
80	Vacuum cleaner
100	Pneumatic drill
120	Threshold of pain

Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

The L_{Aeq} or A-weighted equivalent continuous noise level index is used to average the noise energy over a period of intermittent noise levels. It is the level of steady sound of equivalent energy and is usually referred to as the ambient noise level.

The L_{A90} index represents the noise level exceeded for 90% of the measurement period and is used to indicate the quieter sections of the measurement period. It is usually referred to as the background noise level.

The L_{Amax} index is the maximum root mean square A-weighted noise level occurring during the measurement period.

APPENDIX B

Manufacturer Fixed Plant Sound Power Level Data

SLC560-1EC Axial fan

REVOLUTION SLC



Sound Data

Single Phase 220V to 277V / 50Hz or 60Hz

Product Code	Control Voltage V		Sound Power Level dBW @ Octave Band Hz								Total dB
			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
SLC560-1EC	10	Inlet	73	74	78	79	78	77	75	73	85
		Outlet	77	74	77	79	78	78	75	74	86
	8	Inlet	68	73	69	74	72	72	69	67	80
		Outlet	72	74	69	72	72	72	69	69	81
	5	Inlet	63	61	63	63	62	61	56	54	70
		Outlet	64	62	64	62	62	61	56	56	71
	2	Inlet	47	39	45	47	55	56	40	39	59
		Outlet	48	39	42	45	57	58	43	40	61
SLC630-1EC	10	Inlet	79	78	82	82	81	81	78	76	89
		Outlet	83	79	84	80	81	81	79	77	90
	8	Inlet	73	75	75	79	78	77	74	69	85
		Outlet	77	77	75	79	79	78	74	72	86
	5	Inlet	67	65	63	63	65	65	60	55	73
		Outlet	68	65	63	64	65	65	60	57	73
	2	Inlet	49	43	41	44	57	55	40	40	60
		Outlet	49	42	44	45	55	60	44	42	62

Danfoss Optyma SlimOP-MSBM024AJ

Catalogue Optyma™ Slim Pack - Performance data R404A/R507 MBP

Model	Code	Version	Compressor	Electrical code (1)	Tamb [°C]	Cooling capacity Q [kW] (2)							EcoDesign (3)				Sound power level dB(A)	Sound pressure level @ 10m dB(A)
						Te [°C]							Q [kW]	P [kW]	COP	SEPR		
						-20°C	-15°C	-10°C	-5°C	0°C	5°C	10°C						
OP-MSYM009MY	114X7108	W05	MLY90RAB	G	27	-	0.814	1.007	1.217	1.443	1.684	1.941						
					32	-	0.737	0.914	1.108	1.319	1.546	1.790	0.957	0.480	1.99	63	32	
					38	-	0.644	0.802	0.978	1.171	1.381	1.609						
					43	-	0.568	0.709	0.869	1.047	1.244	1.459						
OP-MSYM012MP	114X7109	W05	MPT12RA	G	27	-	1.115	1.365	1.631	1.914	2.213	2.526						
					32	-	1.010	1.239	1.486	1.751	2.033	2.331	1.300	0.646	2.01	65	34	
					38	-	0.883	1.089	1.313	1.556	1.817	2.097						
					43	-	0.779	0.964	1.169	1.394	1.638	1.902						
OP-MSYM014MP	114X7110	W05	MPT14RA	G	27	-	1.130	1.396	1.685	1.999	2.335	2.693						
					32	-	1.031	1.276	1.546	1.841	2.160	2.502	1.340	0.795	1.69	60	29	
					38	-	0.913	1.133	1.380	1.652	1.950	2.274						
					43	-	0.814	1.014	1.241	1.494	1.775	2.084						
OP-MSBM018AJ	114X7111	W05	CAJ9510Z	G	27	1.184	1.477	1.818	2.209	2.651	3.146	3.694						
					32	1.078	1.351	1.666	2.024	2.429	2.881	3.382	1.746	0.903	1.93	64	33	
					38	-	-	1.480	1.800	2.160	2.561	3.005						
					43	-	-	1.324	1.612	1.933	2.292	2.688						
OP-MSBM024AJ	114X7097	W05	CAJ9513Z	G	27	-	1.822	2.288	2.820	3.418	4.082	4.808						
					32	-	1.638	2.067	2.557	3.108	3.720	4.392	2.168	1.045	2.07	64	33	
					38	-	1.417	1.804	2.243	2.738	3.288	3.895						
					43	-	1.235	1.586	1.983	2.431	2.930	3.482						
OP-MSBM026AJ	114X7093	W05	TAJ4517Z	E	27	1.595	2.029	2.522	3.078	3.700	4.388	5.141						
					32	1.416	1.824	2.285	2.802	3.379	4.017	4.717	2.398	1.231	1.95	67	36	
					38	1.199	1.575	1.996	2.465	2.987	3.565	4.200						
					43	-	1.368	1.754	2.182	2.657	3.184	3.765						
OP-MSBM026AJ	114X7083	W05	CAJ4517Z	G	27	1.626	2.039	2.517	3.061	3.674	4.356	5.104						
					32	1.459	1.844	2.285	2.788	3.353	3.982	4.675	2.399	1.172	2.05	67	36	
					38	1.259	1.609	2.007	2.459	2.967	3.533	4.159						
					43	-	1.413	1.776	2.185	2.644	3.157	3.728						

Vent Axia TX12PL

Traditional T-Series Panel/Ceiling Fan

- Extract/intake model in 4 sizes: 6", 7", 9" and 12"
- Colour: soft tone grey
- Patented electronic shutter system ensures quiet, trouble-free operation
- For the very best from your fan use the Ecotronic controller
- East fit connector Top Socket, standard on all models



UK's No. 1 Commercial Fan

Vent-Axia T-Series Panel/Ceiling models are suitable for mounting at any angle in internal partitions, ceilings, ducts and, with louvre grilles, through external walls. When installed only the louvre grille is visible. The range features a unique speed control pack which enables high, medium or low speed to be preset to suit a specific room size or required duty.

Models

Complete Fan

Model
TX6PL
TX7PL
TX9PL
TX12PL

Stock Ref

W161610
W162610
W163610
W164610