

Ingbirchworth WwTW- Noise Assessment



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Ingbirchworth WwTW

Rev No	Comments	Checked by	Approved by	Date
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Job No 60188068

Reference

Date Created May 2011

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Noise Assessment

1 Introduction

- 1.1 AECOM Acoustics were commissioned by ETM Joint Venture to undertake an assessment to determine the noise impacts of the proposed replacement Ingbirchworth Wastewater Treatment Works (WwTW) at the nearest noise sensitive receptors (NSRs).
- 1.2 A 3-Dimensional noise prediction model has been constructed using the Cadna-A software package to assess the impact of noise, at noise sensitive receptors in the vicinity of the development, from the new WwTW blowers.. The noise data for the plant was provided by ETM Joint Venture.
- 1.3 A baseline noise survey has been undertaken to establish the existing day and night time ambient and background noise levels at the nearest Noise Sensitive Receivers (NSRs) in the vicinity of the WwTW
- 1.4 A brief description of the site's location and its surrounding area is offered in Section 2, and the criterion for the noise assessment is reproduced in Section 3. A description of the ambient and background noise level measurements is presented in Section 4, and the operational noise assessment of the new plant to be installed at the WwTW is presented in Section 5. Mitigation measures are discussed in Section 6 and, finally, a summary and conclusions are presented in Section 7.

2 A Brief Description of the Site & Scope of Assessment

Site Description

- 2.1 The Ingbirchworth WwTW is located to the south east of Ingbirchworth. There are residential properties in the vicinity of the WwTW; on Huddersfield Road to the northwest and northeast and properties and farms off of High Lane to the south west of the WwTW.
- 2.2 The existing WwTW is located adjacent to the proposed replacement WwTW. The existing WwTW will be demolished.
- 2.3 Due to the topography of the area the proposed WwTW will be located on land that is at a lower elevation than the nearby properties.

Scope of Assessment

- 2.4 Barnsley Metropolitan Council has requested the following information, which will be submitted as part of the planning application for the replacement WwTW:

'Undertake an acoustic assessment and produce a report for submission to the council planners describing whether noise, throughout the day and night, from the plant at the treatment works can be mitigated to an acceptable level.

The assessment shall detail the following:

Day and night time noise levels ($L_{Aeq,T}$) from the plant, in addition to this 1/3 octave analysis

Predict the noise levels at main habitable rooms (bedrooms, living rooms) and gardens at the nearest noise sensitive properties.

Mitigation measures, where appropriate to demonstrate that the following can be achieved:

- *35 db $L_{Aeq, 1hr}$ or less and 45 dB L_{Amax} within bedrooms between 23:00 hours and 07:00 hours*
- *40 dB $L_{Aeq, 1hr}$ or less within living rooms between 23:00 hours and 07:00 hours*
- *55 dB $L_{Aeq, 1hr}$ or less in outdoor living areas (gardens) between 07:00-23:00 hours'*

- 2.5 The EHO at Barnsley Metropolitan Council was consulted regarding the scope of the noise assessment and the proposed noise survey. It was agreed that a correction penalty would be applied to the predicted noise levels at noise sensitive receptors (NSR), which would compensate for any tonal noise from the WwTW blowers; as 1/3 Octave band noise data was not available for the proposed plant..
- 2.6 To predict the noise levels within the main habitable rooms of noise sensitive receptors it was agreed to predict the noise levels at the façade and assume that a façade with a partially open window would offer a sound reduction of 10 dB.

3 Assessment Criteria

BS 4142:1997 – ‘Method for rating industrial noise affecting mixed residential and industrial areas’

- 3.1 In order to assess the likely impact of noise at nearby residential properties following the introduction of the two blowers at the replacement WwTW at Ingbirchworth a noise impact assessment has been undertaken in accordance with BS 4142: 1997 “Method for rating industrial noise affecting mixed residential and industrial areas’.
- 3.2 This British Standard provides guidance on the assessment of the likelihood of complaints relating to industrial noise when industrial noise generating plant is introduced into the vicinity of residential properties.
- 3.3 The principal terms used in BS 4142 are broadly defined as follows:
- **Ambient noise** – the totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
 - **Specific noise** – the noise source under consideration;
 - **Rating level** – Specific noise corrected to allow for certain distinctive acoustic features;
 - **Residual noise** – the ambient noise remaining when the specific noise is sufficiently suppressed so as not to contribute to the ambient noise level
 - **Background noise** – the measured $L_{A90,T}$ level of the residual noise
- 3.4 The standard presents a method of rating noise levels by comparing the noise level of the new noise sources, with appropriate character correction, if necessary, i.e., the Rating Level, with the existing background noise level, i.e., the $L_{A90,T}$ of the residual noise level. .
- 3.5 The standard states that the appropriate reference time interval for daytime and night-time periods is 1 hour and 5 minutes, respectively.
- 3.6 The rating method according to BS 4142:1997 accounts for unusual acoustic features such as a whine, hiss, impulsive or irregular noise by the addition of a single 5 dB correction to the actual Specific Noise Level of the source. The character corrected Specific Noise Level is the Rating Level.
- 3.7 The BS 4142:1997 rating is determined by arithmetically subtracting the Background Noise Level from the Rating Level. In accordance with BS 4142, the likelihood of complaint is as summarised in Table 3.1.

Table 3.1 BS 4142 – The Likelihood of Complaint

Difference Between Rating and Background Noise Levels	BS 4142 Likelihood of Compliant	
-10	If the rating level is more than 10 dB below the measured background noise level, then this is a positive indication that complaints are unlikely.	
+5	A difference of around +5 dB is of marginal significance.	
+10	A difference of around +10 dB or more indicates complaints are likely.	

- 3.8 The background noise varies throughout the day and night. For plant that may operate on a 24-hour basis, it is appropriate to measure the representative lowest Background Noise Level (which would normally occur in the early hours of the morning) at the nearest residential property and to use this value for comparison against the predicted Rating Level from the new plant. If it can be shown that the Rating Level from the proposed new fixed plant is not likely to give rise to complaints for the quietest period of the night, then it follows that the noise impact will be lower at all other times throughout a 24-hour period.
- 3.9 It should be noted that the standard is not suitable for use where either the Background Noise Level or the Rating Level are very low. For the purpose of the standard, Background Noise Levels below $L_{A90,T}$ 30 dB and Rating Levels below about $L_{Ar,T}$ 35 dB are considered to be very low.
- 3.10 When either the Rating or Background noise level is measured or predicted to be very low it is general practice to revert to the guidance contained in BS 8233: 1999 where design targets for indoor ambient noise levels are provided.

BS 8233: 1999 – ‘Sound insulation and noise reduction for buildings – code of practice’.

- 3.11 BS 8233:1999 gives recommendations for the control of noise in and around buildings, and suggests appropriate criteria and limits for indoor ambient noise levels for different situations. Table 5 from BS 8233 is reproduced in Table 3.1 below:

Table 3.1 Indoor ambient noise levels in space when they are unoccupied

Criterion	Typical situations	Design range $L_{Aeq,T}$	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms	30	35
^a For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}			

Assessment Methodology

- 3.12 As previously stated, in order to assess the noise impacts associated with the two wwTW blowers to be installed at the replacement Ingbirchworth WwTW it was necessary to establish the ambient and background noise levels in the vicinity of the WwTW. Accordingly, an environmental noise survey was undertaken to quantify the existing baseline ambient and background noise levels at the nearest NSR to the WwTW. All of the noise surveys were undertaken using a Type 1 Sound level Meter. The noise monitoring was undertaken in accordance with the principles of BS 7445: 2003 'Description and measurement of environmental noise'. Further details of the noise survey can be found in Section 4. The A-weighted sound pressure level at 1 m from the blower acoustic enclosure has been provided by ETM Joint Venture.
- 3.13 To assess the change in noise levels at NSRs as a consequence of the two blowers to be installed at the WwWT, a 3-dimensional noise model was created using CadnaA® noise modelling software, which utilises the methodologies of the ISO 9613– 'Propagation of noise outdoors'. The 3-dimensional model takes the topography of the surrounding area into account.

4 Baseline Noise Survey

Existing Noise Environment

- 4.1 The noise monitoring was undertaken at the nearest noise sensitive receptor to the replacement WwTW. The nearest NSR is approximately 60 m from the proposed blowers. The other noise sensitive receptors in the vicinity are located a greater distance from the proposed blowers. The noise climate is dominated by road traffic noise from vehicles using the A629. During the night-time period it is quiet, with the occasional vehicle passing with distant road traffic noise heard occasionally..

Ambient Noise Monitoring

- 4.2 The ambient and background noise levels were established by undertaking baseline noise survey on 3rd of June 2011. The monitoring location is described below and the locations identified in Figure 4.1.

Location 1 The microphone was located outside 1 Huddersfield Road, a residential property, north west of the replacement WwTW.

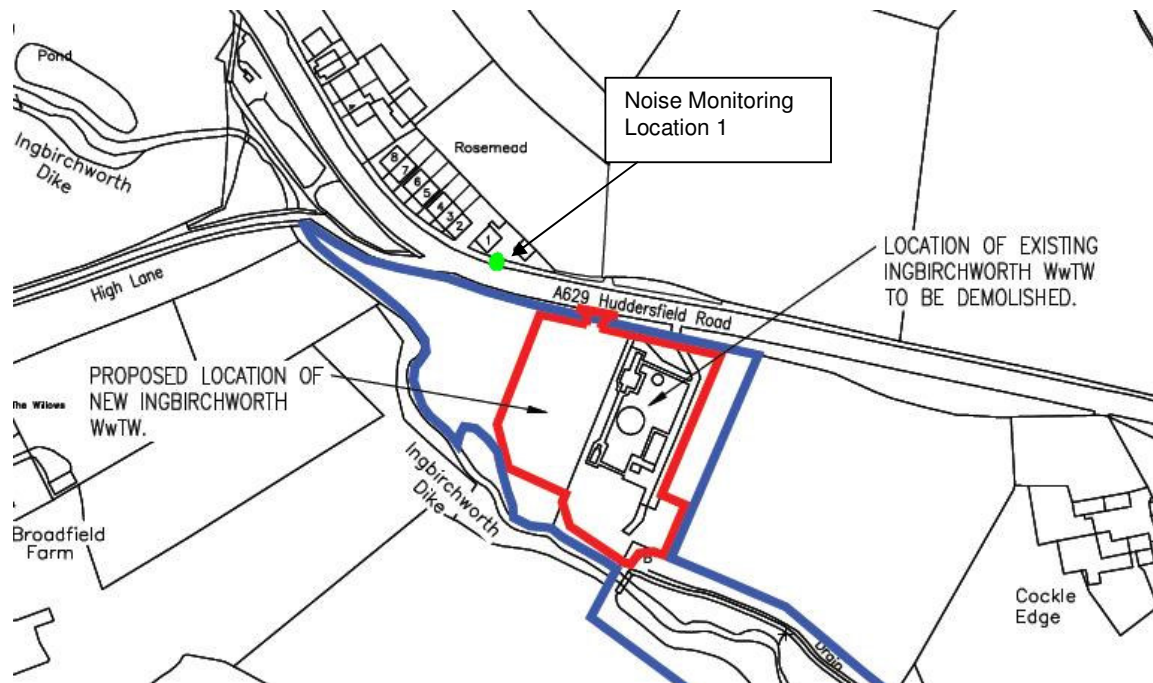


Figure 4.1 – Monitoring Location

Capabilities on project:
Environment

- 4.3 During the night-time noise monitoring at location 1, it was quiet, with the occasional vehicle passing and distant road traffic noise heard. In lulls of the distant traffic, flowing water could be heard. During the day time period the dominant noise source is from vehicles using the A629.
- 4.4 The noise monitoring survey was undertaken in compliance with BS 7445: 2003. 'Description and measurement of environmental noise' and BS 4142 'Method for rating industrial noise affecting mixed residential; and industrial areas' using the following equipment:
- B&K 2238 Type 1 Sound Level Meter s/n 2106193
 - B&K 4231 Acoustic Calibrator s/n 2326978
- 4.5 Various A-weighted noise indicators were measured including the equivalent continuous noise level ($L_{Aeq,T}$) and statistical indices such as Background Noise Level ($L_{AF90,T}$) in 5 and 15-minute periods.
- 4.6 The calibration of the equipment was checked before and after each set of measurements and there was no drift in calibration levels. All of the staff involved with noise measurements were suitably trained and experienced; being members of the Institute of Acoustics. The instrument calibration certificates can be viewed in Appendix A.
- 4.7 At each location the microphone was positioned 1.5 metres above the ground, in free-field conditions.
- Weather conditions during the monitoring period were conducive to undertaking representative environmental noise measurements; with clear skies and a gentle north easterly breeze (up to 1 m/s during the night and up to 2 m/s in the morning)

Noise Monitoring Results

- 4.8 The survey results are summarised in Tables 4.1 and 4.2 below

Table 4.1 Daytime Attended Measurements

Location	Start Date and Time	Noise Levels (15 Minute) dB			Comments
		$L_{Aeq,T}$	$L_{A90,T}$	L_{AFMAX}	
1	03/6/11 10:17:00	69.6	49.1	49.1	Dominant noise from passing traffic on A629
	03/6/11 10:32:00	69.4	50.3	50.3	

All values are in dB re 20µPa, Free-field

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Table 4.2 Night-time Attended Measurements (03/06/11)

Location	Start Time	Noise Level (5 Minutes), dB			Comments
		L_{Aeq}	L_{A90}	L_{AFMAX}	
1	01:42:50	58.5	27.5	78.5	Lorry and car pass by
	01:47:50	---	26.1	42.3	
	01:52:50	--	26.2	45.6	
	01:57:50	---	24.8	41.5	
	02:02:50	59.3	28.6	80.2	Car and lorry pass by
	02:07:50	60.6	26.7	81.3	2 cars pass by
	02:13:25	34.7	25.6	67.2	Helicopter heard in distance
	02:18:26	61.3	26.9	81.7	Van passes by
	02:23:26	63.1	26.9	84.8	3 cars and 1 lorry pass by, milk van turns down High Lane
	02:28:26	34.7	25.7	52.8	Milk van leaves High Lane
	02:33:26	---	25.6	39.4	
	02:38:26	62.4	28.0	83.8	Lorry passes by

All values are in dB re 20μPa, Free-field

- 4.9 It is considered that these measurements are representative of the ambient and background noise levels in the vicinity of the nearest noise sensitive receptors to the WwTW. The measured background noise levels ($L_{A90,T}$) will be used in the BS 4142 assessment.

5 Operational Noise Assessment

Plant Noise Data

- 5.1 ETM JV have stated the only noise generating items of plant at the replacement Ingbirchworth WwTW will be two blowers which will be installed in two separate blower kiosks. Within each kiosk there will be two blowers, one duty and one standby. Only one blower will operate within each kiosk e.g. the duty or the standby. Noise data was provided by ETM JV as A-weighted sound pressure levels measured at 1m from the acoustic enclosure containing the blower. As spectral data was not available, the noise data was modelled as single octave noise band at 500 Hz. Table 5.1 below shows the noise data provided and the typical duration of operation.

Table 5.1 Noise Data provided by ETM

Item of Plant	Location and Approximate height	A-weighted sound pressure level at 1m, dB(A)	Assumed Running Time
Blower	Inside blower kiosk 1 m above ground level.	62	24 hours per day

Noise Emission limits

- 5.2 Typically, the night-time operation of plant has the greatest potential for adverse noise impacts at nearby noise sensitive receptors to the WwTW; due to the lower background noise levels and the increased sensitivity of residents.
- 5.3 The background noise levels measured during the baseline noise survey (see Section 4) have been used as representative background noise levels for the BS 4142 assessment. As worst case, the lowest of the measured $L_{A90,T}$ levels have been used for the day and night time periods.
- 5.4 BS 4142 states that a Rating Level of 5 dB above the Background Noise Level is of 'marginal significance' when assessing the likelihood of complaints. Consequently it is recommend that the total noise from all the new plant in operation at WwTW should not exceed the night-time background level to ensure that there is not an adverse noise impact at the nearby residential properties. It has been assumed that noise from the plant will have distinguishable acoustic features which may increase the likelihood of attracting attention; therefore a 5 dB character correction has been applied to the Specific Noise Level.
- 5.5 Barnsley Metropolitan Council have requested the following internal noise limits are met within the main habitable rooms (living rooms and bedrooms)
- 35 db $L_{Aeq, 1hr}$ or less and 45 dB L_{Amax} within bedrooms between 23:00 hours and 07:00 hours
 - 40 dB $L_{Aeq, 1hr}$ or less within living rooms between 23:00 hours and 07:00 hours

- 55 dB $L_{Aeq, 1hr}$ or less in outdoor living areas (gardens) between 07:00-23:00 hours'

Model Parameters

5.6 The Cadna-A package utilises standardised noise prediction methodologies and algorithms, appropriate for use in the UK, to model the propagation of noise from source to receiver. The following key parameters and assumptions were set for the model:

- The ground absorption, G , was set to 0, i.e. acoustically reflecting for the WwTW site and surrounding built up areas. The intervening land between the site boundary and residential properties was modelled with $G = 0.8$, i.e. acoustically absorbent.
- Buildings were set as acoustically reflective, with a reflection loss of 1 dB; the maximum order of reflections was 2.
- Topographical data was provided by ETM for the WwTW site.
- A 5 m x 5 m grid Digital Terrain Model was incorporated into the noise model for the area surrounding the WwTW.
- The blowers were modelled as point sources located at a height of 1.0 m, above ground.
- Noise levels were determined at residential properties representing the nearest residential façades.
- At each location assessed receivers were positioned 1.5m above the ground level at that location to represent the ground floor and 4.5 m for the height of a typical first storey window. The predicted noise levels were free-field, A-weighted, sound pressure levels. The noise contours were generated for both the ground and first floors.
- Surrounding residential properties were modelled at a height of 8.0 m.
- The heights of the proposed structures, buildings and tanks on the WwTW site were included in the noise model.

BS 4142 Assessment

5.7 The noise model was run with both blowers operating, as all items of plant have the potential to operate during the 5 minute night time BS 4142 assessment period. Tables 5.2 and 5.3 show the measured minimum five minute background noise level; predicted Specific Noise and Rating Levels; and the predicted outcome of the BS 4142 assessment for the nearby NSRs. Figures 5.1 and 5.2 show the noise contour plot showing the propagation of noise across the site and the predicted noise levels at key receivers. As previously mentioned, a 5 dB character correction has been applied to the Specific Noise Level, for each item of plant, to give the Rating level: it has been assumed that noise from each item of plant will have distinguishable acoustic features which may increase the likelihood of attracting attention.

Table 5.2 BS 4142 Assessment Day Time Operations (based on ground level, 1.5 m)

NSRs	Background Noise Level $L_{A90,T}$ (dB)	Specific Noise Level $L_{Aeq,T}$ (dB)	Rating Level $L_{AR,1hr}$ (dB)	BS 4142 Rating (dB)
1 Huddersfield Road	49	29	34	-15 Complaints unlikely
Cockle Edge	49*	19	24	-25 Complaints unlikely
The Willows	49*	20	25	-24 Complaints unlikely
Broadfield Farm	49*	20	25	-24 Complaints unlikely

All values are in dB re 20µPa, Free-field

** Assumed the Background noise levels would be the same as Location 1*

- 5.8 It should be noted that the BS 4142 assessment methodology is not suitable when the background noise levels and Rating Levels are both very low. BS 4142 states '*for the purpose of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.*'
- 5.9 As the measured background noise levels are below 30 dB it is more appropriate to assess the night time noise levels by predicting the internal noise levels and comparing them to the design criteria stated in BS 8233.

Internal noise Levels

- 5.10 To predict the internal noise levels it has been assumed that a façade with a partially open window would offer a sound reduction of 10 dB.. As previously stated a 5 dB correction has been applied to the Specific noise level to give Rating Levels that take account for any tonal noise that maybe present from the blowers. Table 5.4 shows the predicted internal noise levels at the nearby NSRs.

Table 5.4 Predicted Internal Noise Levels (based on 1st floor levels 1.5m)

NSRs	Specific Noise Level $L_{Aeq,T}$ (dB)	Rating Level $L_{AR,1hr}$ (dB)	Internal noise levels $L_{Aeq,T}$ (dB)
1 Huddersfield Road	29	34	24
Cockle Edge	19	24	14
The Willows	20	25	15
Broadfield Farm	20	25	15

- 5.11 Table 5.4 shows that the internal noise levels are significantly lower than the internal noise limits stated by Barnsley Metropolitan Council, which are based on the reasonable design criteria of BS 8233. The

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predicted noise levels at the residential properties are significantly lower than the 55 dB limit for gardens and open spaces. Therefore, it is predicted that the operation of the blowers at the replacement Ingbirchworth WwTW will not have an adverse impact on nearby noise sensitive receptors.

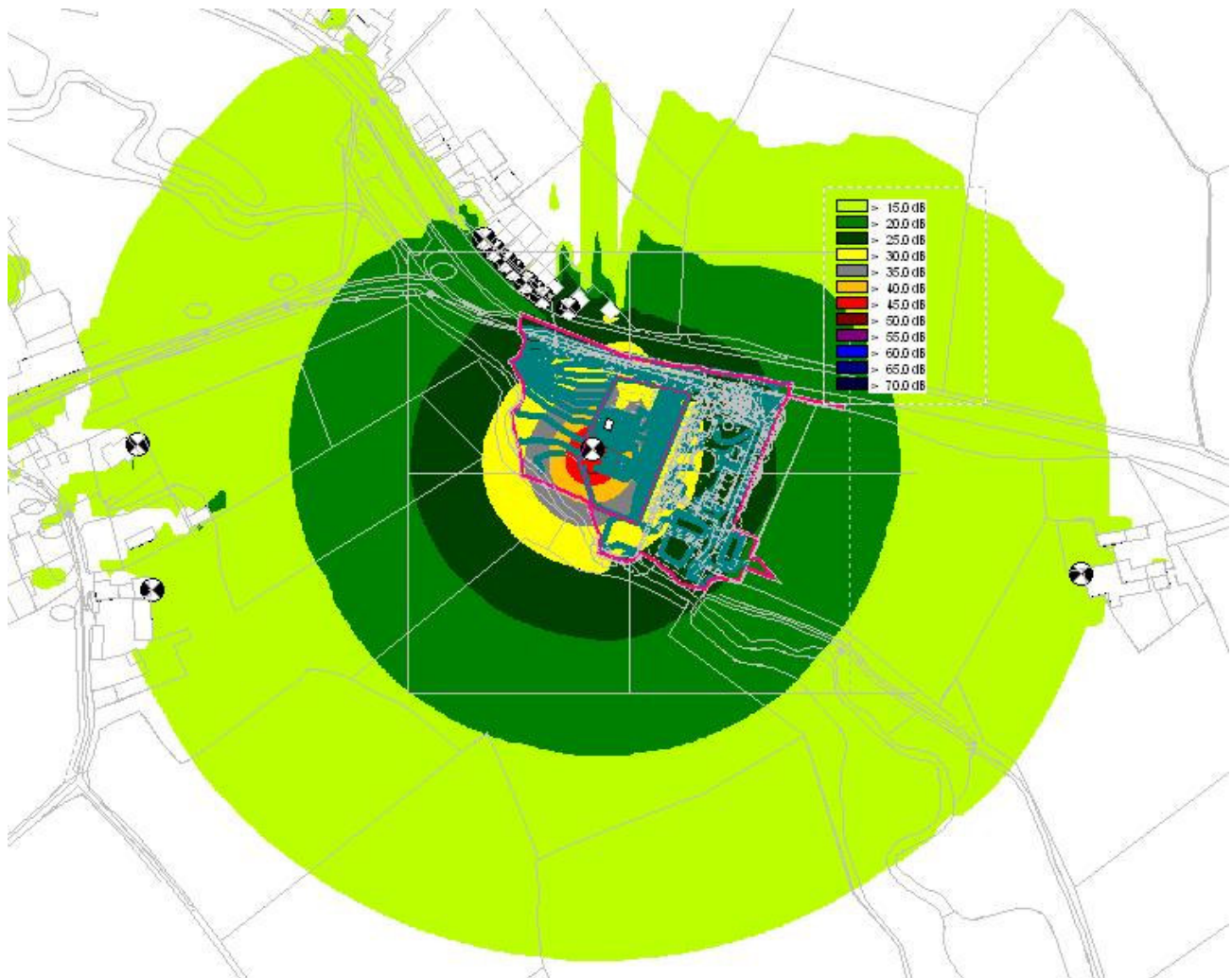


Figure 5.1 Ground Floor Noise Contour Plot of Ingbirchworth WwTW

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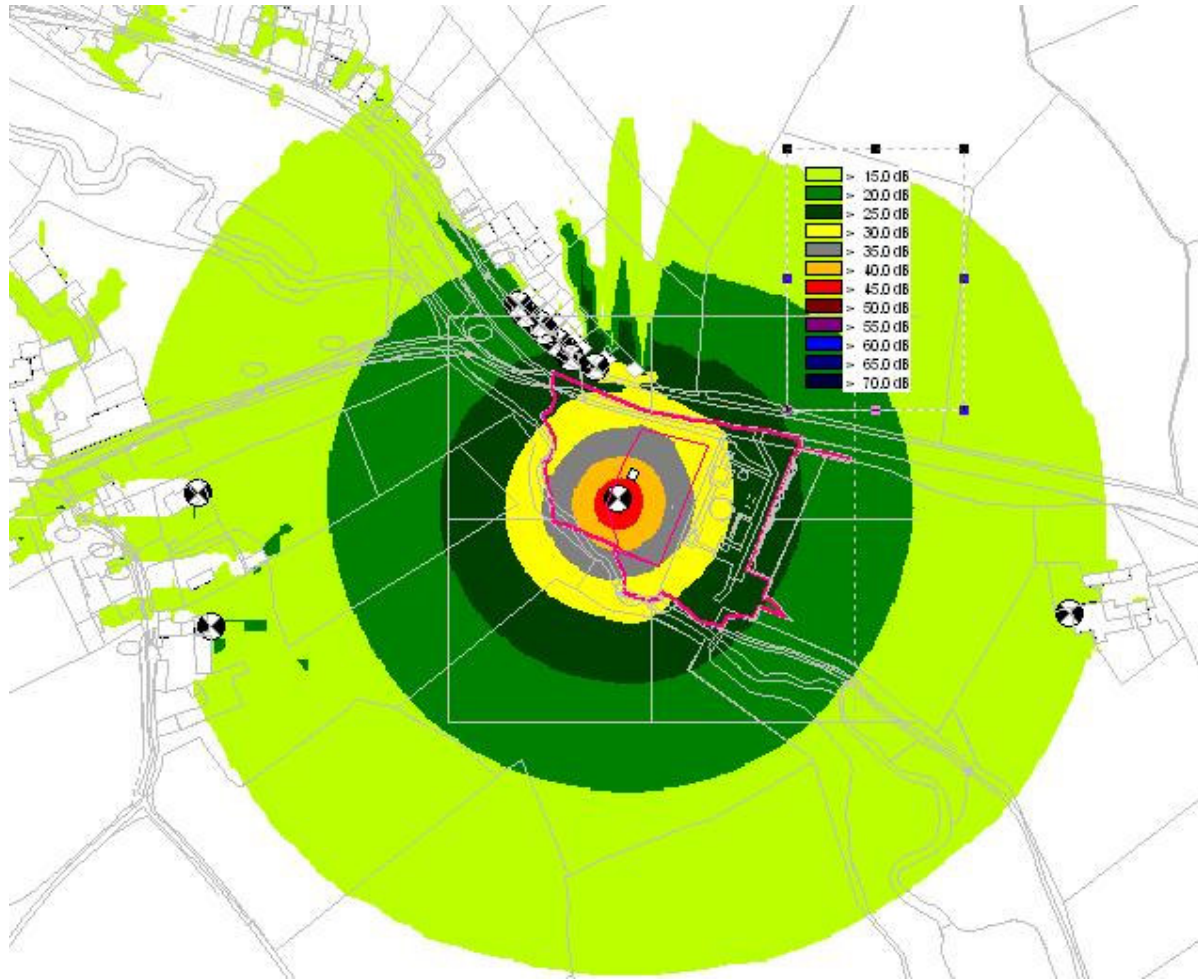


Figure 5.2 First Floor Noise Contour Plot of Ingbirchworth WwTW

6 Mitigation

Operational Mitigation

- 6.1 The BS 4142 day time assessment has indicated that in the vicinity of the replacement WwTW complaints will be unlikely.
- 6.2 The predicted internal noise levels with the two blowers operating during the night time period are below the internal noise levels stated by Barnsley Metropolitan Council, therefore no specific mitigation is required to reduce the noise levels from the blowers.
- 6.3 However, equipment and plant is usually noisier if it is defective, therefore it is important to have a regular maintenance programme for all items of plant or equipment whose deterioration may give rise to an increase in noise levels (e.g. maintenance of bearings, air handling plant, the buildings fabric as well as specific noise attenuation measures associated with plant, equipment or machinery).
- 6.4 When selecting new or replacement items of plant, the noise emissions should be considered. It is recommended that a procurement policy is adopted that requires suppliers to provide noise emissions details and preference is given to purchasing equipment with low noise emissions.
- 6.5 There are a number of site management measures which should be adopted to help minimise noise:
- 6.6 Make regular patrols of the site boundary to identify new noise sources and possible defective equipment;
- Close doors carefully instead of slamming shut;
 - Maintain a closed door policy wherever possible;
 - Wherever possible avoid dropping items from height;
 - Remind staff on the site to be considerate to neighbours, e.g. no unnecessary shouting, loud stereos etc;
 - Vehicles to only beep horn in emergency situations;
 - Wherever possible vehicles on the site should try to avoid reversing movements and consider installing or use vehicles with broadband directional reversing alarms which focus the sound within the area of immediate danger; and
 - Ensure that there is regular maintenance programme for all plant and equipment.
- 6.7 It is important to keep good relations with nearby residents; therefore there should be a proper method for dealing with complaints. Experience shows that if a company deals with complaints in a courteous and organised way and makes efforts to reduce 'avoidable' noise, then residents are far more tolerant of other noise sources that they appreciate are more difficult to reduce.

7 Summary and Conclusions

- 7.1 AECOM Acoustics were appointed to assess the potential noise impact, at the nearest noise sensitive receptors (NSRs), due to two WwTW blowers that are to be installed at the replacement WwTW, located at Ingbirchworth,
- 7.2 A baseline noise survey was undertaken to establish the existing ambient and background noise levels at the nearest noise sensitive receptor.
- 7.3 Using the noise data provided by ETM Joint Venture, a Cadna-A noise model was constructed to predict the noise levels at nearby residential properties during the day and night time periods.
- 7.4 The BS 4142 assessment has indicated that in the day time period complaints will be unlikely.
- 7.5 Due to the low night time background noise levels the BS 4142 method is not suitable for assessing the potential impacts.
- 7.6 The predicted internal noise levels will be significantly lower than the internal noise limits stated by Barnsley Metropolitan Council, which are based on the reasonable design criteria in BS 8233. The predicted noise levels at the residential properties are significantly lower than the 55 dB limit for gardens and open spaces. Therefore, the operation of the blowers at the replacement Ingbirchworth WwTW will not have an adverse impact on nearby noise sensitive receptors.
- 7.7 No specific mitigation measures are required however site management measures have been recommended to ensure that the operation of the WwTW does not give rise to adverse noise impacts, on the nearby NSRs, due to the operation of defective plant.

Capabilities on project:
Environment

Appendix A- Calibration Certificates

Certificate of Calibration Issued by University of Salford (Acoustics Calibration Laboratory) UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801		 0801
Page 1 of 2		
APPROVED SIGNATORIES Claire Lomax [✓] Andy Moorhouse [] Gary Phillips [] Danny McCaul []		
acoustic calibration laboratory The University of Salford, Salford, Greater Manchester, M5 4WT, UK http://www.acoustics.salford.ac.uk T 0161 295 3000/0161 295 3319 F 0161 295 4436 e c.lomax@salford.ac.uk		

Certificate Number: 00353/2

Date of Issue: 11 March 2011

VERIFICATION OF A SOUND LEVEL METER to BS 7580 Part 1

FOR:	AECOM Lynnfield House Church Street Altrincham Cheshire WA14 4DZ
FOR THE ATTENTION OF:	Adam Mottershead
CALIBRATION DATE:	10 March 2011
TEST PROCEDURE:	CTP08 (Laboratory Manual)

Sound Level Meter			
Make:	Brüel & Kjær	Model:	2238 Serial No: 2106193
Microphone			
Make:	Brüel & Kjær	Model:	4188 Serial No: 2141095
Preamplifier			
Make:	Brüel & Kjær	Model:	ZC 0030 Serial No: 3525
Associated Calibrator			
Make:	Brüel & Kjær	Model:	4231 Serial No: 2326978 Adaptor: UC0210

Test Engineer (initial): GP Name: Gary Phillips

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognized national standards, and to the units of measurement realized at the National Physical Laboratory or other recognized national

Capabilities on project:
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Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

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Certificate Number: 00353/2

Date of Issue: 11 March 2011

SET-UP INFORMATION

The instrument was running software module BZ7124 version 1.2.0. The reference range, reference SPL, primary indicator range, pulse range and linearity range as specified by the manufacturer have been used. The instrument was adjusted to read 93.8 dB (A) in response to the associated calibrator. This reading was obtained from the calibration certificate of the calibrator, 00353/1 and information in the manufacturer's instruction manual with the correction filters set to Frontal and windscreen filter set to off. The instrument was calibrated without a windshield. Consult manufacturer's instructions if using a windshield.

MEASUREMENTS

The levels of self-generated noise were:

A: 13.6 dB
C: 18.3 dB
Lin: 24.0 dB

At the end of the tests the indication of the sound level meter in response to the associated sound calibrator was 93.8 dB (A) which corresponds to the following level at 101.325 kPa:

Sound Pressure Level 93.8 dB (A)

This reading should be used henceforth to set up the sound level meter for field use.

THE SOUND LEVEL METER WAS VERIFIED ACCORDING TO THE PROCEDURE GIVEN IN BS7580: Part 1 1997 WITH THE FOLLOWING EXCEPTIONS:

The microphone corrections applied as specified in BS 7580: Part 1: 1997 were obtained from a frequency response measured by this Laboratory using the electrostatic actuator method. This response in isolation is not covered by our UKAS accreditation.

A stricter test than that specified in 5.5.10 and 5.5.11 of BS 7580 has been used by not applying the low level signal.

STATEMENT OF RESULT:

THE SOUND LEVEL METER CONFORMS TO BS7580: PART1 1997

Instruments used in the verification procedure were traceable to National Standards. The method of acoustic calibration employed a standard sound pressure calibrator for the 1 kHz test whilst the tests at 125 Hz and 8 kHz were performed by the electrostatic actuator method. The uncertainty of the Laboratory's 1 kHz calibrator was ± 0.11 dB. The uncertainty of the standard calibrator is not included in the applied tolerances. It is assumed that the sound level meter was manufactured in accordance with BS EN60511: 1994 Type 1, and BS EN60804: 1994 Type 1.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to the units of measurement realized at the National Physical Laboratory or other recognised national

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acoustic calibration laboratory The University of Salford, Salford, Greater Manchester, M6 4WT, UK http://www.acoustics.salford.ac.uk T 0161 295 3000/0861 295 3319 F 0161 295 4456 e c.lomax@salford.ac.uk		

Certificate Number: 00353/1

Date of Issue: 10 March 2011

CALIBRATION OF A SOUND CALIBRATOR

FOR: AECOM
Lynnfield House
Church Street
Altrincham
Cheshire
WA14 4DZ

FOR THE ATTENTION OF: Adam Mottershead

DESCRIPTION: Calibrator with housing for one-inch microphones and adaptor type UC 0210 for half-inch microphones.

MANUFACTURER: Bruel & Kjaer

TYPE: 4231

SERIAL NUMBER: 2326978

DATE OF CALIBRATION: 10 March 2011

TEST PROCEDURE: CTP06 (Laboratory Manual)

Test Engineer (initial): GPName: Gary Phillips

Calibrations marked 'Not UKAS Accredited' in this certificate have been included for completeness

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to the units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

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UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

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MEASUREMENTS

The sound pressure level generated by the calibrator was measured using a calibrated, WS2P condenser microphone as specified in the certificate. The calibration was carried out with the calibrator in the half-inch configuration.

Five determinations of the sound pressure level, frequency and total distortion were made.

The results have been corrected to the reference pressure of 101.325 kPa using manufacturer's data.

RESULTS

Coupler configuration: Half-inch
Microphone type: GRAS 40AG
Output level (dB re 20µPa): 93.91 dB $\pm$ 0.11 dB
Frequency (Hz): 999.98 Hz $\pm$ 0.12 Hz
Total Harmonic Distortion (%): 0.37 % $\pm$ 0.12 % (Not UKAS Accredited)

Average environmental conditions at the time of measurement and maximum deviation from the stated average:

Pressure: 100.052 kPa $\pm$ 0.007 kPa
Temperature: 22.4 °C $\pm$ 0.3 °C
Relative humidity: 38.3 % $\pm$ 0.2 %

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

All measurement results are retained at the acoustic calibration laboratory for at least four years.

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