

Technical note:

Addendum of works to the Noise Suitability Report (Dec21): assessment of noise from the Earl Shilton Wastewater Treatment Works.

1. Introduction

This technical note has been produced to assess the noise impact upon proposed residential dwellings located on the adjacent development site to the Wastewater Treatment Works (WwTW) and presents validation results for the modelling of transportation sources. This technical note is to be read in conjunction with the outline planning application documents, in particular the Site Suitability Assessment report dated December 2021 ref: 42523-WOOD-XX-XX-RP-ON-0001_S3_P02.

It was originally agreed with the local planning authority that, due to COVID-19 restrictions, site surveys would be undertaken at a later date once restrictions had eased. Therefore, it was agreed, for the assessment of potential effects on the Proposed Development due to the existing Wastewater Treatment Works (WwTW), the industrial sound from this facility is capable of giving rise to a BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*¹ rating level of 10dB above the background sound level at the dwellings adjacent to it. This was to provide a conservative assessment.

The addendum assessment is undertaken in accordance with BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*² to quantify and characterise existing noise levels based on measured noise levels due to the existing WwTW. Using BS8233:2014² for the assessment will allow initial dwelling design irrespective of whether an adverse impact is predicted using BS4142:2014+A1:2019¹ methodology and will allow initial mitigation measures to be specified.

Although consultation on the overview of the survey were discussed with the Environmental Health Officer at Hinkley and Bosworth Council, no consultation has been undertaken with regard to the location of monitoring positions for the survey. However, given experience of several similar assessments, the following assessment is considered a robust approach to determining the noise emission from the WwTW and the impacts upon future receptors.

To assess noise from the WwTW a noise model has been produced using measured data from onsite surveying. The assessment is based on the results from the modelling exercise and assessed in accordance with BS 8233:2014².

¹ British Standards Institute (2019). BS 4142:2014 Methods for rating and assessing industrial and commercial sound. BSI, London.

² British Standards Institution, 2019. BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*, BSI, London.

2. Data Gathering

A number of key information requirements were identified in order to facilitate preparation of the noise assessment. The information obtained to assess the potential noise impacts of operations is discussed in this section.

2.1 Sensitive receptors and descriptions

The nearest noise sensitive receptors (NSRs) are proposed to be located to the east, south and west of the WwTW, with the closest dwellings approximately 50 m from the WwTW boundary. The assessment has focused on the likely noise impacts at the closest NSR.

2.2 Survey methodology

Source noise surveys

A noise source survey was undertaken at locations around the boundary of the WwTW. The purpose of these surveys was to establish what activities currently occur on the site and to provide data for model inputs. The results from the noise source survey can be seen in **Table 2.1**.

The survey took place on the evening/night of Thursday 8th September 2022. Sound pressure levels were measured to characterise various plant items located at the WwTW. Using aerial photography and onsite observations, the main contributors of noise at the monitoring locations were determined to be a bank of pumps located on the eastern side of the WwTW site and filtration tanks located at the southern part of the WwTW site. Measurements were paused whenever vehicles passed by the site. Observations of the WwTW plant consider the noise to be steady and is represented by the L_{90} (i.e. the lowest 10 percent) of sound pressure levels at the measurement locations close to the WwTW.

A summary of the noise source survey can be found in **Table 2.1** detailing the measurement and the resulting sound pressure levels at the monitoring location.

Table 2.1 Summary of sound levels from source measurements

ID	Description	Reference distance (m)	Measurement Length (hh:mm:ss)	$L_{Aeq, T}$ (dB)	$L_{Amax, T}$ (dB)	$L_{A90, T}$ (dB)
MP1	Corner of pump house (east boundary)	35	00:14:00*	44	46	44
MP2	Filtration tanks (south boundary)	25	00:06:00*	44	47	42

*Pauses in the measurements were made for periods of traffic.

Tonality

An assessment of tonality has been undertaken in accordance with the objective method presented in BS4142:2014¹. A correction penalty of +6 dB is applied if a tone is present. The test for the presence of a tone compares the sound level when the tone is present in a one-third-octave band with the sound pressure levels in the adjacent one-third-octave bands. For a prominent tone to be identified as present, the sound level in the one-third-octave band of interest is required to

exceed the sound levels of both adjacent one-third-octave bands by some constant level difference. The level differences between adjacent one-third-octave bands that identify a tone are:

- 15dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

The measurement undertaken at MP1 when assessed using the objective method shows the presence of a tone at 160 Hz. If this was considered a dominant noise source this would attract a penalty of 6 dB. However, when assessed in the context of the site, the prevailing noise is attributed to traffic noise, and is predicted to be at least 10 dB above noise contributions from the WwTw. As such tonality will only be audible during the quietest periods of the night and is considered to not be dominant in the environment.

The assessment concluded no tonality was present at MP2.

3. Noise Modelling Study

Methodology

To predict sound levels at the nearest noise sensitive receptors a noise model has been produced using SoundPLAN 8.2, a software package which implements the prediction methodology contained within ISO 9613-2:1996.

SoundPlan modelling software utilises publicly available topography data and digital terrain mapping to generate a 3D environmental model. The model implements the following factors to predict noise propagation:

- Sound source location;
- Relative distances between sound sources/receivers;
- Location and dimensions of object barriers including man-made or natural;
- Ground contours, determining the relative ground heights; and
- Ground absorption effects due to soft/hard ground.

Ground absorption areas entered for the site and surrounding area (0= hard ground) and for the surrounding fields (1= soft ground).

4. Model validation for transportation sources

A noise model of the transport sources has been produced using predicted traffic flows. The assessment of transport noise is based on a future year, with the development fully built out and occupied, in order to investigate site suitability in the foreseeable future with predicted growth in road vehicle movements.

The average measured $L_{A10,T}$ sound pressure level is presented in **Table 4.1** alongside the predicted noise level at the monitoring location. Subjectively, on site observations confirmed that road traffic noise is the dominant noise source within the study area.

Table 4.1 Measured and predicted noise level comparison

Monitoring location	Measured sound level, dB LA10,18h	Predicted sound level, dB LA10,18h	Difference, dB	Comments
MP3 (Day)	78	75	+3	Difference within ± 3 dB: acceptable
MP3 (Night)	66	68	-2	Difference within ± 3 dB: acceptable

The results presented in **Table 4.1** indicate that the predicted and measured $L_{A10,18hr}$ levels are in agreement, within a tolerance of ± 3 dB. The results of the comparison therefore indicate that results from the noise model are valid for the purposes of the assessment.

5. BS 8233:2014 Assessment

BS8233:2014¹ presents design criteria for noise within habitable rooms in new residential developments to avoid adverse impacts on sustainability for the intended use. In summary, these include:

- Resting in Living Rooms: 35 dB $L_{Aeq,16h}$ (daytime)
- Dining in Dining Rooms / Areas: 40 dB $L_{Aeq,16h}$ (daytime)
- Sleeping or resting in Bedrooms: 35 dB $L_{Aeq,16h}$ (daytime) / 30 dB $L_{Aeq,8h}$ (night-time).

It is stated within the guidance that where development is considered necessary or desirable, a relaxation of up to 5 dB of these levels may be available, and reasonable conditions still achieved.

In the absence of detailed design (dimensions and building envelope build-up) glazing and ventilation advice is based on the rigorous calculation method in BS8233:2014² and the assumption of a 19m³ room with 1m² glazing area. It is widely accepted that the attenuation loss provided by an open window is approximately -15dB.

Open and closed window calculations have been undertaken using the highest predicted façade level to give an indicative internal noise level and indication of what glazing and ventilation strategies will be available for dwellings. Once detailed drawings have been provided, rigorous calculations can be performed in line with methodology presented in BS8233:2014².

The windows, and any unmitigated air path provided for ventilation, e.g. trickle ventilators, are normally the weakest part of a brick and block facade. Standard double glazed glass windows with a thickness configuration of 4(4-16)4 have an insulation of approximately 25 dB R_w+C_{tr} .

The noise break in assessment has been undertaken using the highest predicted noise level to ensure a robust assessment and provide a minimum specification for all receptors with a line of sight to the WwTW. **Table 5.1** presents the noise break-in assessment.

Traffic noise is predicted to be the prevailing dominant noise across the site during the daytime and the night-time. The combined plant noise and traffic noise levels are used to determine the required sound insulation strategy for first floor bedrooms. For daytime noise levels, the previous, existing, advice with regard to sound insulation for the road traffic noise stands.

Table 5.1 Indicative ventilation strategy

	Predicted external level dB $L_{Aeq,t}$	Predicted internal level with an open window dB $L_{Aeq,t}$	Predicted internal level with a closed window dB $L_{Aeq,t}$	Indicative ventilation approach
Night-time	60	45	28	Standard glazing configuration (i.e. 4(6-16)4) and attenuated trickle ventilation (minimum performance 42 D_{ne})

The predicted internal noise levels are achieved with the windows closed during the day and night-time with trickle ventilation.

The measured plant noise from the WwTW does not significantly change the glazing or ventilation requirements at the Proposed Development, as these are driven by road noise levels across the site.

6. Conclusions

A noise survey has been undertaken to validate the road noise model carried out for the Site Suitability Assessment report dated December 2021 ref: 42523-WOOD-XX-XX-RP-ON-0001_S3_P02. Daytime road noise levels were 3dB higher than modelled results and night-time levels were 2dB lower. Broadly the conclusions of the original assessment are unchanged, however, the increased daytime levels should be considered in the detailed design of any glazing and ventilation design at properties with a direct line of sight to the A47.

A noise assessment has been completed to assess any potential noise impact from the WwTW upon proposed dwellings on the adjacent development site. This assessment has included attended noise surveys to determine any prevailing noise sources from the WwTW that impact the development site. These surveys have been used to inform the modelling exercise and subsequent noise break-in calculations, which have been used to provide an indicative ventilation strategy.

The ventilation strategy advice has been completed in line with the guidelines presented in BS8233:2014². Implementation of this strategy will ensure internal noise levels are met and adequate protection against noise ingress.

The plant noise from the WwTW is tonal, but the traffic noise across the site drives the sound insulation requirements and there does not need to be any specific noise protection to mitigate the plant noise that is not already required for the road traffic noise emanating from the A47. As such, recommendations provided within 42523-WOOD-XX-XX-RP-ON-0001_S3_P02 are considered equally relevant.

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Document revisions

No.	Details	Date
1	Initial version	31/10/2022