Residential Development of Land off York Close, Gillow Heath, Biddulph: Noise Assessment

Seabridge Developments Ltd

Echo Acoustics Ltd

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EXECUTIVE SUMMARY

The results of a noise measurement survey and desk-based assessment are presented, with respect to the proposed residential development of a site off York Close, Gillow Heath, Biddulph.

The assessment finds that the site (BD062) is marginally affected, along its eastern boundary, by low levels of plant equipment noise from the adjacent United Utilities waste water treatment works (WWTW), with slightly elevated levels of low frequency noise.

Suitable mitigation measures are proposed in order to protect residential amenity of future occupants of the site during the night.

Consequently, the assessment concludes that the site can be suitably developed and that noise need not be a reason for refusal of planning.

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1. INTRODUCTION AND SITE DESCRIPTION

1.1 Echo Acoustics Ltd was commissioned by Seabridge Developments Ltd to undertake an assessment of noise affecting a proposed residential development sites on land off York Close, Gillow Heath, Biddulph.

1.2 The sites is currently is undeveloped scrubby open land (Figure 1) located between existing residential housing on its southern and western sides, and a United Utilities waste water treatment works (WWTW) on its northern and north-eastern side. The site's eastern-most edge adjoins a small area of land leading to a brook beyond which is agricultural land. The sewage works appears to be the principal source of noise in the area other than distant urban/traffic noise and occasional aircraft overflights.

Figure 1: Proposed development site and its surroundings

1.3 The site has been identified as a proposed housing allocation in the Local Planning Authority's (LPA) draft Local Plan, designated as site BD062 (Figure 2).

Figure 2: LPA draft site allocations

1.4 In a pre-application consultation response sent by the Local Authority Environmental Health Department (EHD) in July 2016, in respect of this site, the following comment was made:

"*The Environmental Health Department has received numerous complaints relating to noise since May 2016, specifically machinery noise is being reported as causing sleep disturbance through the night. This noise relates to the normal operation of the treatment works and has been witnessed by officers of the Environmental Health section, it is mainly a low frequency noise which is likely to cause significant intrusion into neighbouring properties. Although no action has been taken due to the fact that the treatment will be operating to Best Practicable Means this would not mean there would not be adverse impacts to the amenity of residents. It would be inadvisable to develop the proposed land for residential properties without a full understanding of noise impacts and the ability to mitigate against those impacts.*

Complaint Update

In May and June 2016 there were 8 named complaints received against the treatment works from neighbours from all directions of the site. These complaints were based on severe noise and odour impacts, they were substantiated by witnessing officers and Severn Trent was contacted. The company had experienced technical issues with machinery, which required excavation of a lagoon causing significant odours in the vicinity. The noise impacts relate to standard operating noise at the site which has more significance during the night in hot weather due to windows being open through the night time". NB: reference to "Severn Trent" should actually be to "United Utilities".

1.5 This report presents the results of a noise measurement survey and a desk-based assessment of the significance of the Waste water treatment works noise with respect to future residential amenity on your proposed development sites. Where appropriate the report presents suitable noise mitigation requirements for the site including recommendations with respect to site design and layout.

1.6 A glossary of acoustic terminology is presented at Appendix A.

2. GUIDANCE

2.1 Planning policies are set at both a national and local level. With respect to national policy, assessment of the suitability of a site for residential development was previously guided by Planning Policy Guidance Note 24 "Planning and noise" (PPG 24)[1], issued by the Department of the Environment in 1994. This document gave guidance to local authorities on the use of their planning powers to minimise the adverse impact of noise, using clearly defined prescriptive noise exposure categories.

2.2 On 28 March 2012, the Government published the National Planning Policy Framework (NPPF) and cancelled numerous planning guidance/policy documents including PPG 24.

2.3 With regard to noise, the NPPF ("the Framework") does not provide specific policies or defined noise limits, but rather is intended to enable the planning system to support the Government's aims and objectives with respect to sustainable development, and provides a general framework within which planning applications for development "*must be determined in accordance with the* [local] *development plan*".

2.4 None of the current local or national planning policies preclude residential development of the site.

2.5 The National Planning Policy Framework does state that "*the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*".

2.6 Additional national planning guidance is provided in the Government's Noise Policy Statement for England[2] (NPSE – "the Noise Policy"), to which the Framework makes specific reference as the main source of national guidance specifically on planning and noise.

2.7 The Noise Policy has a long term vision to "*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*". The vision is supported by three key aims intended to promote sustainable development with respect to noise so that "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life* ".

[1] Department of the Environment (DoE), 1994. Planning Policy Guidance Note 24 *Planning and Noise*.

[2] Dept for Environment, Food and Rural Affairs (DEFRA), [2010] "Noise Policy Statement for England" http://www.defra.gov.uk/environment/quality/noise/npse/ (accessed 28 March 2012)

2.8 Health is defined by the World Health Organisation as "*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being*" and the Noise Policy makes "*a distinction between 'quality of life' which is a subjective measure that refers to people's emotional, social and physical well being and 'health' which refers to physical and mental well being*".

2.9 However, the Noise Policy recognises that it is not currently possible to define a single objective noise level having specific effects on people, hence the emphasis on "promoting" improvements to health and quality of life through effective management of noise, considered in the context of the wider environment and factors other than noise.

2.10 Additional guidance is given in the Planning Practice Guidance Note (PPG) on noise, issued in March 2014 alongside the NPPF. This "*advises on how planning can manage potential noise impacts in new development*". The PPG suggests the following noise exposure hierarchy, based on average responses to noise.

Table 1: PPG noise exposure and response hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level (NOEL)			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			

Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a	Observed Adverse Effect	Mitigate and reduce to a minimum
	perceived change in the quality of life.		
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.11 Beyond this, however, the guidance is relatively generic. It avoids specifying 'acceptable' environmental noise levels as the acceptability of a source of is both subjective and contextdependant.

2.12 More specific design-led guidance, with respect to suitable noise levels for residential properties, is provided in BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*.

2.13 The Standard gives recommendations for internal noise levels for residential dwellings in order to protect residential amenity, based on health-based research, as follows:

- Living rooms during the day – 35 dB $L_{Aeq,16hour}$
- Dining rooms during the day – 40 dB $L_{Aeq,16hour}$
- Bedrooms during the day – 35 dB $L_{Aeq,16hour}$
- Bedrooms during the night – 30 dB $L_{Aeq,8hour}$

2.14 Note that these are not specific criteria or 'target' noise levels, merely indicative recommendations which will be context-dependant. However, most Local Authorities tend to apply the recommended noise levels as relatively strictly-defined criteria.

2.15 In most standard modern properties, the walls and roof provide relatively high levels of sound insulation of greater than 40 dB; the weakest part of a building facade, with respect to noise, is generally the windows. Modern construction methods for new residential properties incorporate standard thermal double-glazing which, the standard suggests, will provide approximately 33 dB R_w of sound attenuation when closed. The standard does not specifically give sound attenuation values for partially open windows, although the worked example (G.1) at Annex G of the Standard indicates that a partially open window would provide 15 dB of sound attenuation.

2.16 Suitable day time noise levels for external areas (gardens and patios) are given as being 50 to 55 dB L_{Aeq}.

2.17 The standard does not provide guidance on maximum (L_{Amax}) noise levels but the 1999 World Health Organisation (WHO) *Guidelines for Community Noise* suggest that maximum noise levels in bedrooms at night should not regularly exceed 45 dB L_{Amax}.

2.18 Assessment of noise arising from commercial uses, in this case, the Waste water treatment works, is conventionally assessed in accordance with the guidance contained in BS 4142: 2014 *Methods for rating and assessing industrial and commercial sound*. BS 4142 provides a method for determining the noise arising from an industrial or commercial site, defined as the site's 'specific' noise level (dB L_{Aeq}) to which is added a correction for tonal, impulsive or intermittent elements, to provide the site's 'rating' noise level (dB $L_{Ar,Tr}$). The rating noise level is then compared with the background (dB L_{A90} or 90th percentile) noise level as measured or calculated outside a building, usually a residential property.

2.19 The standard applies a 'penalty' to tonal, impulsive and intermittent noises, as separate entities. The simplest method is a subjective assessment with a sliding scale of up to +6 dB for tonal noise, up to +9 dB for impulsive noise and +3 dB for intermittency. The objective methods provided only allow for the assessment of tonal noise.

2.20 The standard indicates significance of noise effects according to varying degrees of "*adverse impact*": a difference between the background noise and industrial ("rating" noise) of +10 dB "*is likely to be an indication of a significant adverse impact, depending on the context*" whilst "*a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context*" and that " *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*".

2.21 The Standard includes a specific requirement that assessments should take account of "*context*" in determining the significance of any predicted impact, which is critical in providing a reasoned and pragmatic assessment, avoiding rigid adherence to limit values at the exclusion of any other considerations. The standard also includes an element of correction for "*uncertainty*", the assessment of which is largely subjective.

3. METHODOLOGY AND ASSUMPTIONS

3.1 The assessment incorporated a noise measurement survey during the day and night time on the 10 and 11 May 2017, comprising measurement of the WWTW noise at the development site boundary and "background" noise measurements (in the absence of WWTW noise) away from the WWTW. The measurement positions are indicated in Figure 3.

Figure 3: Plan view of measurement position

3.2 The measurements at the site boundary included an hour-long daytime measurement, 45minute night time measurement and two short sample measurements of specific noise from the WWTW at the boundary.

3.3 In addition to the broadband data recorded, 1/3 octave-band frequency data were recorded and the meter also simultaneously recorded the 1-second equivalent continuous noise data for detailed post-processing, as appropriate.

3.4 The surveys were undertaken using a CEL 633 Class 1 integrating, averaging sound level meter with the microphone mounted on a tripod at a height of 1.5 metres above the ground.

The meter was placed inside a locked, weatherproof case. The meter was field-calibrated before and after the survey and no significant variation in calibration tone was observed.

3.5 Weather during the survey was generally warm and dry with negligible to very light winds, mostly from the north or north-west.

3.6 The survey and assessment was carried out by Mike Potts, Director and Principal Acoustic Consultant at Echo Acoustics Ltd. Mr Potts is a Full Member of the Institute of Acoustics (MIOA) with over 17 years' experience in undertaking acoustic surveys and assessments across a wide range of sectors, both in the UK and overseas.

4. RESULTS, ASSESSMENT AND DISCUSSION

Results/measurement data

4.1 The measurement data are presented in Table 2 including the ambient and background noise data measured with no significant contribution from the WWTW.

Table 2: Summarised noise measurement at Location 1

Start Date & Time	Duration (mins)	Measured noise (dB)			
		L_{Amin}	L_{A90}	L_{Aeq}	L_{AFmax}
15:08	15	34.1	36.0	43.1	62.6
15:23		34.6	36.0	43.8	68.6
15:38		33.8	35.5	50.3	74.5
15:53		34.1	35.5	46.9	64.5
Overall:		***33.8***	***35.8****	***47.0***	***74.5***
17:01	4	40.2	41.0	51.8	64.9
00:24	15	40.5	41.5	42.6	62.1
00:39		40.1	41.0	41.6	47.1
00:54		40.0	41.0	43.2	72.9
Overall:		***40.0***	***41.0****	***42.5***	***72.9***
00:17	5	41.6	42.5	45.4	66.3
Background/ambient without WWTW noise					
16:11	15		33.5	41.3	
01:25			28.5	33.8	

** Data are median values as insufficient data for determination of modal value.*

4.2 Qualitatively, the WWTW gave rise to a general 'broadband', uncharacteristic noise associated with the movement of water and the operation of various items of plant equipment, but also gave rise to a cyclical or intermittent noise that seemed to emanate from an item of unidentified equipment located in or around the building at the WWTW's north-eastern corner. This was clearly audible during the day but barely so at night. Figures 4 and 5 present the 1/3 octaveband frequency spectra recorded during the 4-minute day time and 5-minute night time sample measurements at the site boundary

Figure 4: Day time sample measurement 1/3 octave frequency spectrum

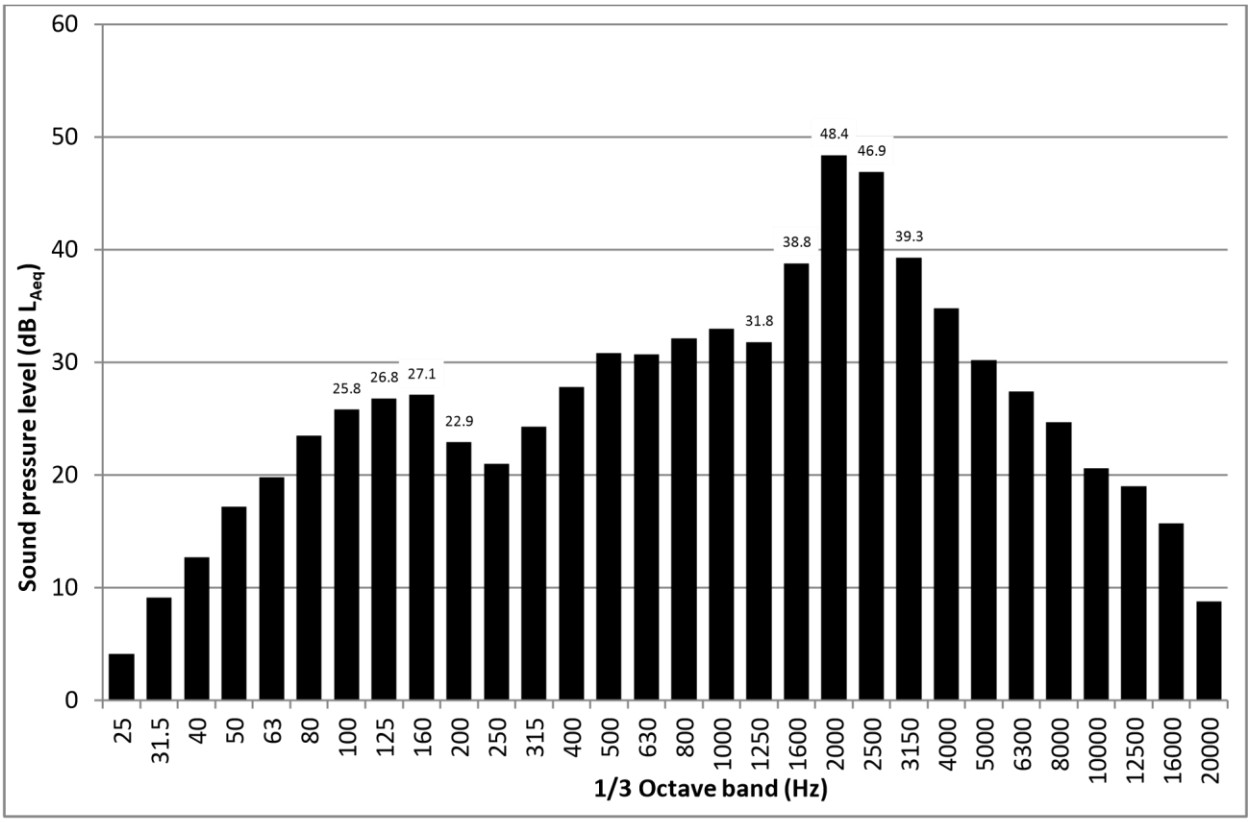
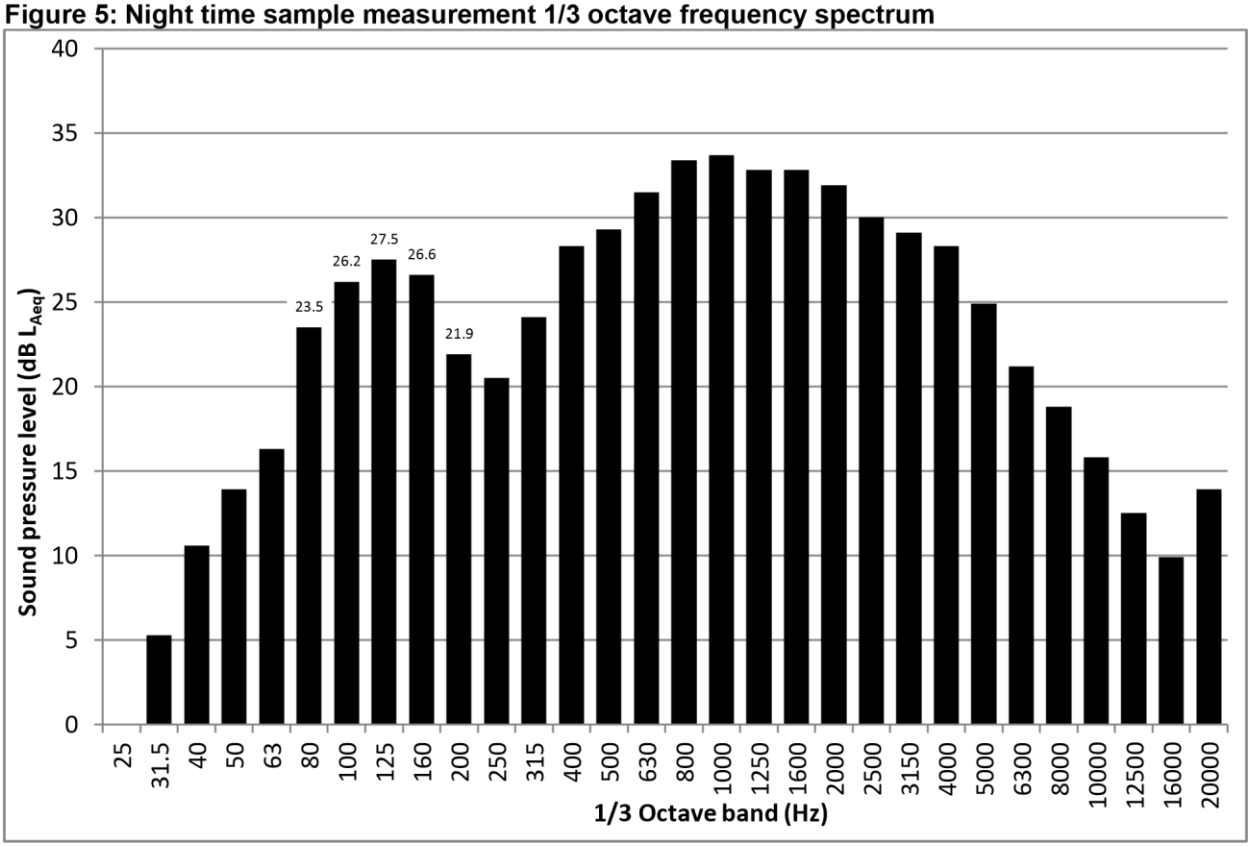


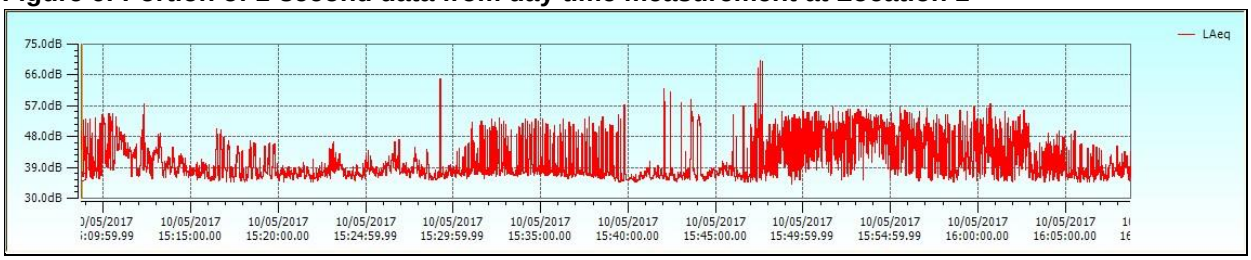
Figure 5: Night time sample measurement 1/3 octave frequency spectrum



4.3 The frequency data show a relative elevation of noise, both during the day and night time, in the low frequency region between approximately 80 Hertz (Hz) and 200 Hz, but there is no 'tone' to the noise due to a single dominant frequency. At higher frequencies, during the day time there is a relative elevation of noise across the 2000 Hz and 2500 Hz 1/3 octave-band frequencies; this was barely audible as a distinct noise, albeit at a very low level, but was not significantly 'tonal' due to being spread over a wider frequency range.

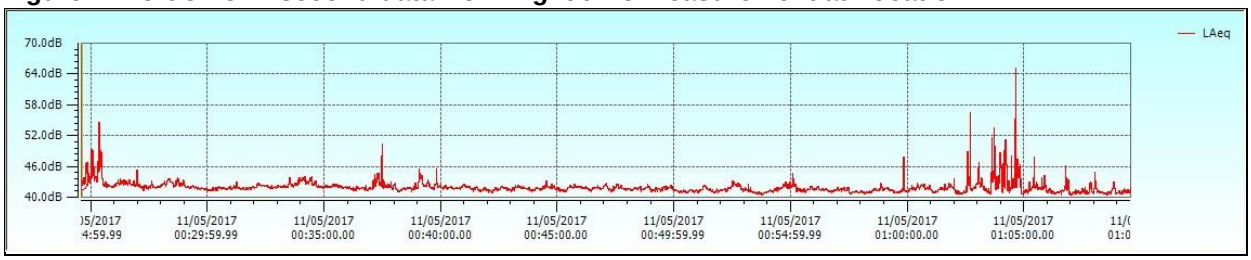
4.4 Figures 6 and 7 present a sample of the 1-second noise data recorded at the site boundary over the 1-hour day time and 45-minute night time periods respectively.

Figure 6: Portion of 1-second data from day time measurement at Location 1



4.5 The periods of elevated noise visible on the chart in Figure 7 are entirely due to bird song in the surrounding trees. In the absence of this, it can be seen that the WWTW noise reduces significantly to below 40 dB L_{Aeq}.

Figure 7: Portion of 1-second data from night time measurement at Location 1



4.6 The elevated 'peaks' of noise are due to movement of myself near the meter. Otherwise, the levels are seen to be marginally greater than 40 dB L_{Aeq}; notably, the levels are slightly higher than during the day time; it cannot be determined whether this is due to different WWTW operating conditions during the night time or a localised meteorological effect. Audibly, no significant difference between the day and night time noise was observed. **BS 8233 assessment**

4.7 Table 3 presents the calculated internal noise levels in future residential properties, allowing for 15 dB of sound attenuation through an open window and 33 dB R_W of attenuation through closed double-glazing.

Table 3: Calculated internal broadband noise levels

Time	Measured noise (dB)	
	L_{Aeq}	L_{AFmax}
Day (external)	47.0	-
Night (external)	42.5	72.9
Windows closed		
Day (internal)	14.0	-

Night (internal)	9.5	39.9
Windows open		
Day (internal)	32.0	-
Night (internal)	27.5	57.9 *(47.1?)*

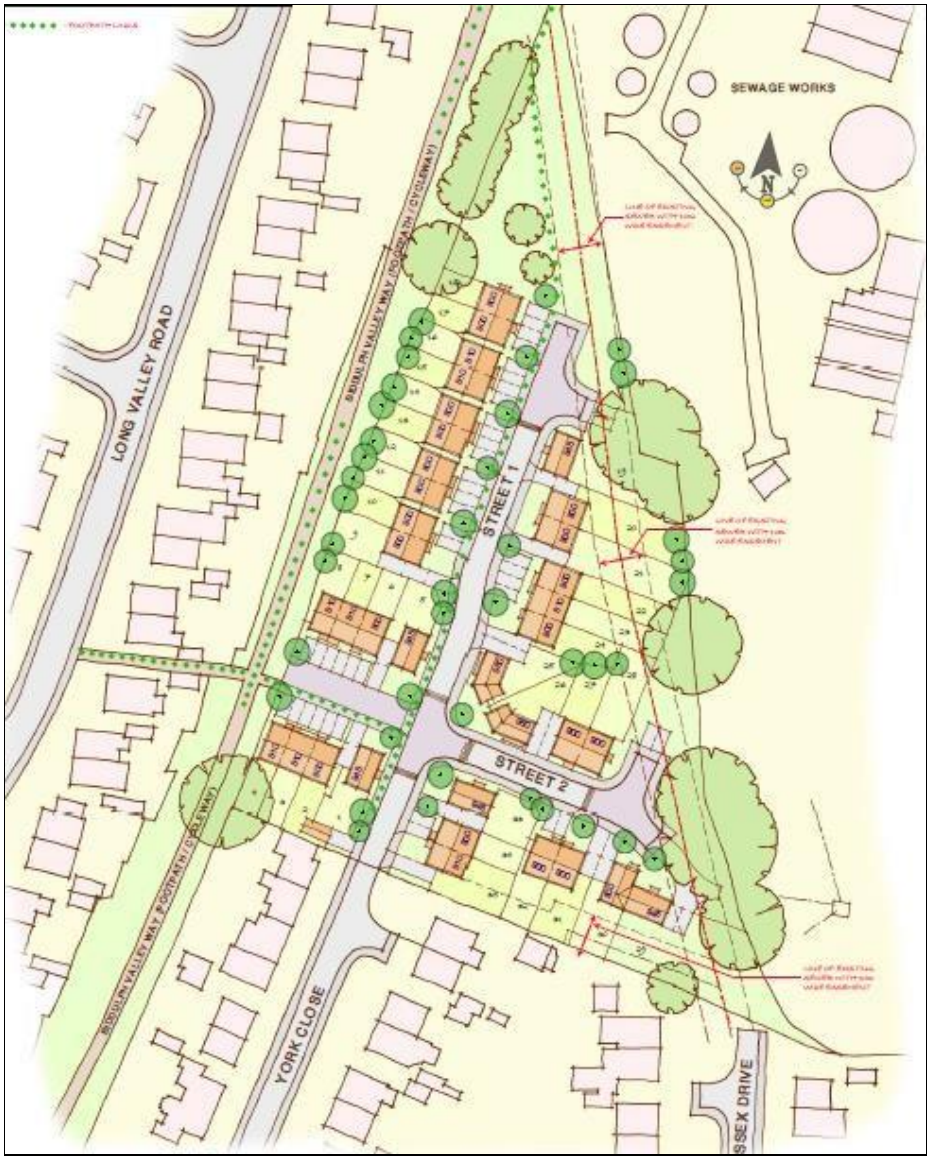
4.8 The broadband data in Tables 2 and 3 indicate that, during the day and night time, internal and external noise levels from the WWTW would be commensurate with the preservation of residential amenity, in accordance with guideline values provided in BS 8233 and the WHO guidelines.

4.9 It is worth observing that the elevated level of night maximum night time noise is due to movement near meter; in the absence of this, the level was recorded as being 47.1 dB L_{Amax}, in the absence of survey operator movement (Table 2). This would give rise to an internal noise level, with windows open, of 32.1 dB L_{Amax}.

4.10 The day time audible noise, across the 2000 Hz and 2500 Hz frequency region, was just audible and was not considered to be particularly intrusive.

4.11 However, the broadband data do not fully reflect the relative elevation of noise in the lower frequency region between 80 Hz and 200 Hz. The levels involved, and the lack of any tonality, do not represent a significant cause for concern with respect to day time internal noise in the future properties. However, being of a relatively low frequency, this aspect of the noise may intrude into bedrooms on warm, still nights, particularly should windows be open on facades closest to and facing the WWTW i.e. east-facing facades of properties along the development area's eastern boundary. A draft layout is presented in Figure 8.

Figure 8: Draft site development layout



4.12 Consequently, **mitigation measures will be required with respect to this noise**, in bedrooms on east-facing and north-facing facades of the properties closest to the development area's eastern boundary.

4.13 Properties behind the 'first row' of houses will be sufficiently screened from any WWTW noise by those houses whilst those to the south of the development area, on street 2, are sufficiently distant that noise is unlikely to be a significant issue.

BS 4142 assessment

4.14 The BS 4142 assessment utilised the data presented in Table 1, as follows:

- Day time ambient sound (with WWTW sound) 47.0 dB $L_{Aeq, 1hr}$
- Day time residual sound (without WWTW sound) 41.3 dB $L_{Aeq, 15min}$
- Day time background sound (without WWTW sound) 33.5 dB $L_{A90, 15min}$

- Night time ambient sound (with WWTW sound) 42.5 dB $L_{Aeq, 15\ min}$
- Night time residual sound (without WWTW sound) 33.8 dB $L_{Aeq, 15\ min}$
- Night time background sound (without WWTW sound) 28.5 dB $L_{A90, 15\ min}$

4.15 The majority of the sound arising from the WWTW is of a generally broadband nature with no distinguishing features that would warrant the application of any "rating penalties", as described in BS 4142.

4.16 Table 4 presents the BS 4142 assessment.

Table 4: BS 4142 assessment

Aspect/feature	Result
Day time	
Ambient sound level	47.0 dB $L_{Aeq, 1hr}$
Residual sound level	41.3 dB $L_{Aeq, 15\ min}$
WWTW specific sound level	45.6 dB $L_{Aeq, 1hr}$
Background sound level (median)	33.5 dB $L_{A90, 15\ min}$
Rating penalty	0 dB
Rating sound level outside properties (specific + penalty)	**45.6 dB $L_{Ar, 1hr}$**
Impact (rating level – background level)	**12.1 dB**
Assessment indicates likelihood of significant adverse effect, depending on context	
Night time	
Ambient sound level	42.5 dB $L_{Aeq, 15\ min}$
Residual sound level	33.8 dB $L_{Aeq, 15min}$
WWTW specific sound level	41.9 dB $L_{Aeq, 15min}$
Background sound level (median)	28.5 dB $L_{A90, 15\ min}$
Rating penalty	0 dB
Rating sound level outside properties (specific + penalty)	**41.9 dB $L_{Ar, 15\ min}$**
Impact (rating level – background level)	**13.4 dB**
Assessment indicates likelihood of significant adverse effect, depending on context	

4.17 The assessment indicates a likelihood of significant adverse effect although this does not reflect the qualitative observation of the nature and character of the WWTW noise at the site boundary, with the WWTW providing a relatively low level of noise to the area.

4.18 One of the negative aspects of BS 4142 is that the assessment is relatively simplistic and merely relates to noise "outside" a building and makes no allowance for transmission through the building fabric and windows. Table 3 clearly demonstrated that the WWTW noise levels are significantly below the BS 8233 and WHO guideline noise levels. The rating noise levels are also below the existing ambient noise levels.

4.19 Consequently, it is my professional opinion that limited 'weight' should be given to the results of the BS 4142 assessment. That is not to say that noise from the WWTW can be entirely discounted. The assessment has identified that the relative elevation in the low

frequency noise region will require the specification of some mitigation measures. **United Utilities Consultation / Complaints**

4.20 Noise assessment has been undertaken by Echo Acoustics in respect of the adjoining land to the east. The applicant for that assessment has confirmed[3] that he has previously had a meeting with a representative of United Utilities, during which it was confirmed that United Utilities has no objection to the proposed developments on the site boundaries.

4.21 It was also noted during that meeting that during the previous six years of recording by the Company, only three complaints had been received from neighbours. However, since the proposal for development had come forward, this number had risen to ten.

4.22 It is worth noting the observations of the Local Authority Environmental Health Department in their July 2016 pre-application consultation response in respect of this site (BD062), detailed in paragraph 1.4 of this report, that "*In May and June 2016 there were 8 named complaints received against the treatment works from neighbours from all directions of the site. These complaints were based on severe noise and odour impacts, they were substantiated by witnessing officers and Severn Trent was contacted. The company had experienced technical issues with machinery, which required excavation of a lagoon causing significant odours in the vicinity*".

4.23 The majority of the recent complaints, therefore, are clearly related to a specific, abnormal maintenance issue which, it is understood, has now been resolved.

4.24 United Utilities also raised the matter of delivery noise, with two tanker deliveries of chemical products normally arriving on-site at 11:00am and 9:00pm, although these times may vary slightly. This would be expected to generate a short period of noise associated with both tanker lorry and on-site fixed pumps operating. This is likely to take place towards the WWTW's northeastern end, well away from the proposed development area.

5. MITIGATION MEASURES

5.1 The assessment has indicated that, whilst noise levels from the WWTW are not particularly high, properties closest to, and facing, the WWTW's southern boundary may be subject to marginally elevated levels of low frequency noise in the 80 Hz to 200 Hz frequency region. Whilst not particularly high, the potential for the building fabric, specifically the windows, to filter out higher frequency noise gives rise to a potential for slightly elevated lower frequency noise in bedrooms at night i.e. low frequency bias.

5.2 In order minimise the ingress of relatively elevated lower frequency noise during the night time, it is recommended that glazing in bedrooms in the north- and east-facing facades of the properties closest to the development area's eastern boundary, be up-rated to comprise glazing where the two panes of glass have a difference in thickness of at least 30% in order to reduce the ingress of low frequency noise. A typical glazing specification, derived using the Pilkington Spectrum Online application, is presented in Appendix B.

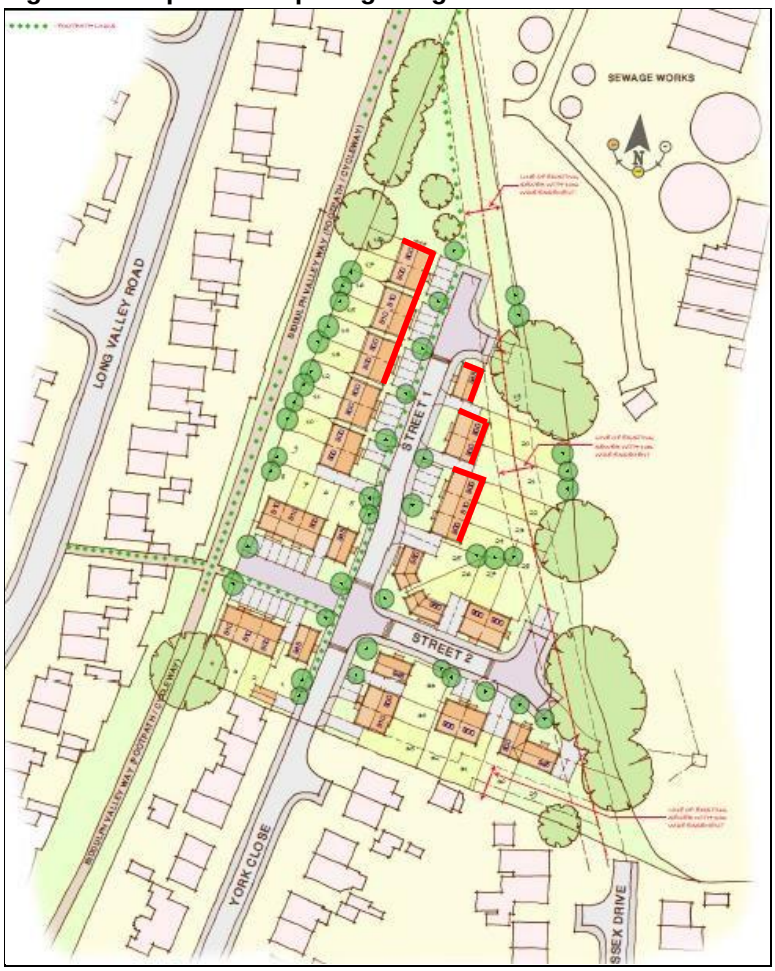
[3] E-mail received by Echo Acoustics Ltd, from R Simcock 27 May 2017

5.3 It will then be necessary to provide alternative means of achieving suitable levels of background ventilation in these bedrooms such that windows do not need to be opened for ventilation.

5.4 This can be achieved by the provision of acoustically-treated ventilation; passive throughwindow window trickle ventilators will suffice and there is no need to provide mechanical ventilation in order to achieve suitable noise levels. In all cases, windows should be capable of being opened for personal choice.

5.5 The properties for which this will be necessary are identified in Figure 9.

Figure 9: Properties requiring mitigation measures



5.6 With these measures in place, it is concluded that the site BD062 can be suitably developed for residential use.

6. SUMMARY & CONCLUSION

6.1 The assessment has shown that the proposed development site BD062 is principally affected, along its eastern boundary, by low level noise from the operation of plant equipment on the adjacent United Utilities waste water treatment works (WWTW), an element of which contains marginally elevated levels of low frequency noise in the 80 Hz to 200 Hz frequency region.

6.2 In order to ensure no likelihood of disturbance in bedrooms in east-facing facades along the eastern site boundary, the following noise mitigation measures are recommended:

- Bedrooms on east-facing facades of the properties closest to the eastern side of the development area should be provided with up-rated glazing, an example of which is presented in Appendix B, as well as acoustically-treated passive ventilation.
- However, in all cases, windows should remain capable of being opened for personal choice or fire-escape if necessary.

6.3 With the provision of these measures, suitable levels of external and internal noise will be achieved, commensurate with the preservation of residential amenity for future occupants of the development area.

6.4 It is concluded, therefore, that site BD062 can be suitably developed for residential use, that the layout is both feasible and developable, and that noise need not be a reason for refusal of planning permission.

7. APPENDICES

Appendix A: Glossary of acoustic terms

Ambient noise: the noise from all sources, both near and far, at any given time. Conventionally defined using the A-weighted equivalent continuous noise level (L_{Aeq}) [see below].

Background noise level (dB L_{A90}):In the UK, the 90th percentile noise level (L_{A90}) is generally used to define 'background' noise. This is a statistical parameter describing the noise level that is exceeded for 90% of the measurement or assessment time. Its value lies in the fact that it is a statistical value, towards the lower end of a measured range of data, and which is relatively 'stable' i.e. not adversely affected by occasional high-energy noise events.

Decibel (dB): a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 micro-Pascals (µPa), the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A) / A-weighting: decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change (in steady noise) of 3 dB(A) is the minimum perceptible under normal conditions and a change of 10 dB(A) corresponds roughly to halving or doubling the *loudness* of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

$L_{Aeq,T}$*:* the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). L_{Aeq} is used to describe many types of noise and can be measured directly with an integrating sound level meter.

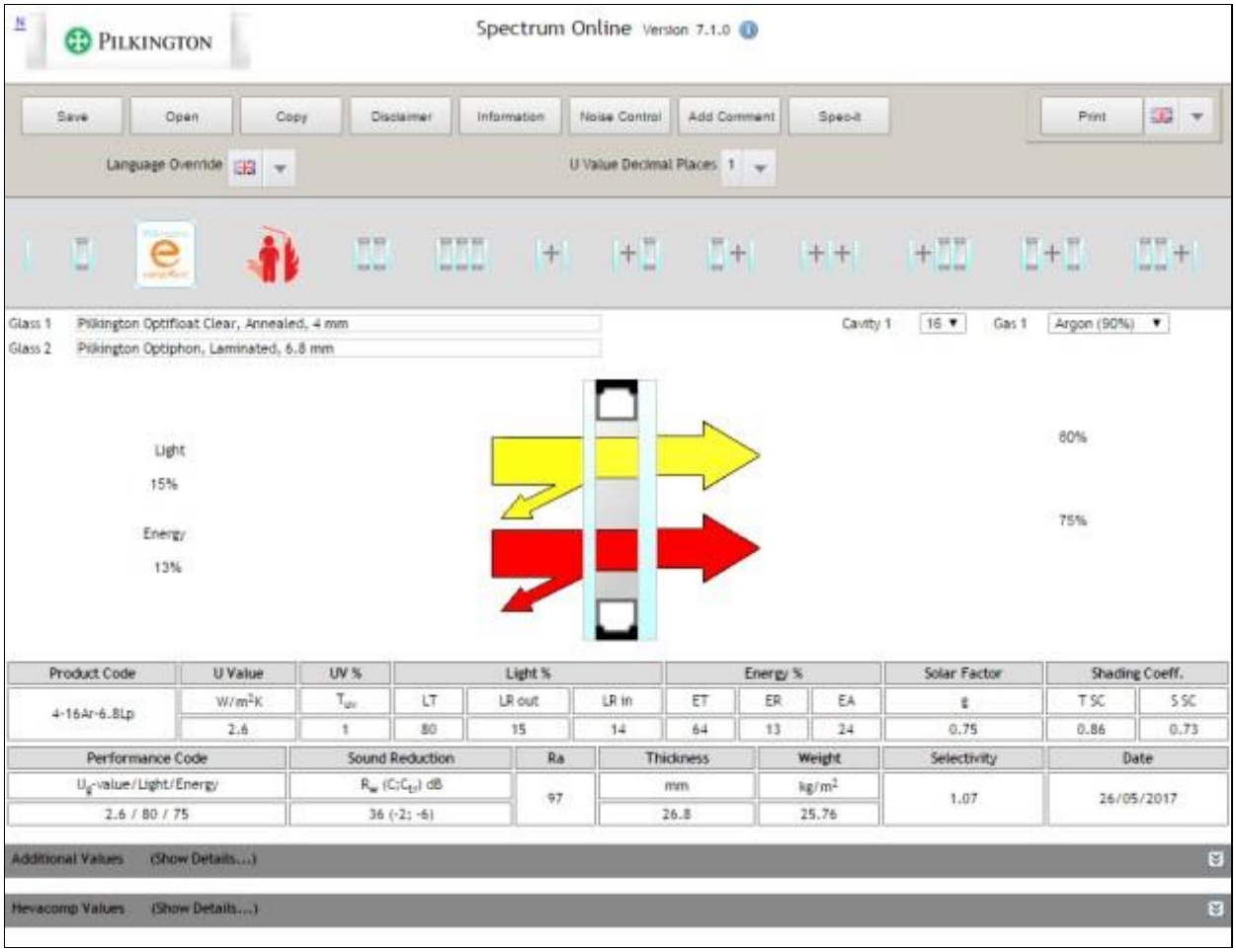
L_{Amax}*:* the maximum single-event noise level attained during a measurement period.

Noise: any audible sound. Often defined as unwanted sound. Can be damaging to hearing if it is too loud or can be just annoying if it interferes with the normal enjoyment of others. Sound / *sound pressure:* a fluctuation in air pressure over the static ambient pressure.

Sound pressure level: the sound pressure relative to a standard reference pressure of 20 µPa (20×10^{-6}) on the decibel scale.

Appendix B: Up-rated glazing

Figure 10: Example glazing specification for bedrooms in east-facing facades of eastern-most properties



Product Code	U Value	UV %	Light %			Energy %			Solar Factor	Shading Coeff.	
4-16Ar-6.8Lp	W/m²K	T_{uv}	LT	LR out	LR in	ET	ER	EA	g	T SC	S SC
	2.6	1	80	15	14	64	13	24	0.75	0.86	0.73

Performance Code	Sound Reduction	Ra	Thickness	Weight	Selectivity	Date
U_g-value/Light/Energy	R_w ($C;C_{tr}$) dB	97	mm	kg/m²	1.07	26/05/2017
2.6 / 80 / 75	36 (-2; -6)		26.8	25.76		