Plant Noise Impact Assessment
Virgin Media Hub Site
Eastleigh

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1. Revision register

Version	Changes from previous version	Issued by	Date

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3. Summary

3.1 This report has been prepared to assess the noise impact form the installation of external mechanical services at the Eastleigh Virgin Media Hub site.

3.2 Environmental Health has indicated that they require the noise impact from the proposed plant not to exceed the 5dB below the existing background noise level.

3.3 Background noise levels at the nearest noise sensitive location have been measured. Plant details have been identified by the mechanical engineers.

3.4 Noise escape from the proposed plant has been calculated, and noise propagation modelled with proprietary software. The potential noise impact is rated and assessed in accordance with BS 4142.

3.5 With the minimum attenuator specification as shown in the table below and an enclosure as described in the report, the plant noise impact is calculated to be 6 dB below the background level, and therefore complies with the requirements of the Local Authority.

3.6 The calculated impact is rated between a level of marginal significance and a positive indication that complaints are unlikely according to BS 4142.

Attenuator	Octave Band Centre Frequency / Hz							
	63	125	250	500	1000	2000	4000	8000
Supply Fan	2	6	11	25	25	25	20	15
Condenser Fan	2	6	11	25	25	25	20	15

Table 1: Calculated minimum required attenuator insertion loss

4. Introduction

4.1 Additional mechanical services plant is proposed as part of the upgrade of the Virgin Media Hub site in Eastleigh.

4.2 The site location is shown in Figure 1.

4.3 Apex Acoustics has been commissioned to undertake a noise survey and assessment of the plant noise.

4.4 This report presents the evaluation of the potential noise impact from the proposed plant on the Nearest Noise Sensitive Location (NNSL).

4.5 This assessment is based on the proposed plant details identified by the mechanical engineers, acoustic modelling described in this report, and measurements of site background noise levels.

4.6 The potential noise impact of the sources identified is calculated and rated according to BS 4142, Reference 1.

5. Site location and Nearest Noise Sensitive Location

5.1 The location of the Media Hub is shown in Figure 1.

5.2 The Nearest Noise Sensitive Location (NNSL) is also shown in Figure 1.

6. Local authority criterion

6.1 Neil Scott at Eastleigh Environmental Health indicated that the rated plant noise impact should not exceed 5 dB below the background, L_{A90} at the NNSL when rated in accordance with BS 4142.

6.2 An outline of the method and guidance of BS 4142 is described in Appendix 1.

7. Existing noise environment

7.1 The existing noise environment was measured between 01:59 and 02:14 hrs on the Monday 1st August 2011.

7.2 The background noise measurements were taken at a time considered to be representative of worst case conditions i.e. where background noise levels are likely to be at a minimum.

7.3 The microphone was located 1.5 metres above ground level and away from other reflecting surfaces, such that the measurements are considered free-field.

7.4 Data was recorded in 1/1 octave bands at 1 second intervals throughout the fifteen minute measurement period. There was minimal wind. The temperature was around 15 °C.

7.5 The measurement position is indicated in Figure 1.

7.6 An illustration of the measurements in progress is shown in Figure 2.

7.7 The measurement position was chosen to be representative of background noise levels at the Nearest Noise Sensitive Location.

7.8 The equipment used is listed in Appendix 2.

7.9 The measured $L_{A90,15min}$ is shown in Table 2.

7.10 The time history of the residual noise level, $L_{Aeq,\ 1\ sec}$, is shown in Figure 3.

8. Source noise levels

8.1 The mechanical plant is assessed on the basis of plant details supplied by the mechanical engineers.

8.2 The plant is proposed to operate continuously during the day and night.

8.3 The location of the units has been taken from the drawings provided by the mechanical engineers, Reference 4.

8.4 It is understood that the plant will consist of two supply fans, two condenser fans and two compressors. However only one supply fan, one condenser fan and one compressor will operate at any particular time.

8.5 These plant items will be contained within an enclosure with atmosphere side attenuators to the supply and condenser fans.

8.6 Octave band sound power levels for the supply fan and condenser fan have been provided by the mechanical engineers as shown in Table 3.

8.7 Single figure A-weighted sound power levels for the compressor have also been provided by the mechanical engineers. A flat linear spectrum has been applied to the noise from the compressor for use in the assessment.

8.8 The in-duct attenuator insertion losses used in the calculations are shown in Table 4.

8.9 The exact construction details of the proposed enclosure are not yet known. However it is understood that the enclosure will comprise of sound absorbent material contained within a metal casing having a plain outer and perforated inner face.

8.10 In is anticipated that the sound reduction index of this type of enclosure will be higher than the insertion loss of the attenuators.

8.11 Therefore as an approximation for use in this assessment the compressor sound power level has been attenuated by the insertion loss of the proposed attenuators. This is a prudent assumption as in practice the majority of sound power will be transmitted through the attenuators and not through the enclosure.

9. Assessment methodology and transmission

9.1 Noise transmission and propagation is modelled using proprietary software, Cadna/A, Reference 2. This models noise propagation outdoors according to ISO 9613, Reference 3.

9.2 All building and the ground use an absorption coefficient of 0.21 for reflected ray paths.

9.3 Receivers have been positioned at a height of 4.5 m in the model to represent likely noise levels at bedroom windows.

9.4 It is considered that all sources are generally broadband without any of the distinguishing characteristics identified in BS 4142, so that no penalty is added to the specific noise calculated.

9.5 The rating level, as determined by BS 4142, is therefore considered to be the specific noise as calculated at the NNSL.

10. Results

10.1 The calculated noise levels at the NNSL due to fixed plant associated with the Media Hub are shown in Table 5.

10.2 Noise contours at a height of 4.5 m are shown in Figure 5.

10.3 The rating levels and BS 4142 assessment results are shown in Table 6.

10.4 The worst case calculated fixed plant noise rating level at the nearest noise sensitive location is 6 dB less than the measured background, $L_{A90,15min}$.

11. Conclusion

11.1 On the basis of the measurements, details and prudent assumptions in this report, it is calculated that the potential noise impact of the plant complies with the limits indicated by the Local Authority. No other attenuating features are calculated to be required.

11.2 The calculated rating level at the NNSL is 6 dB below the measured background $L_{A90,\ 15min}$. This is between a level of marginal significance and a positive indication that complaints are unlikely according to BS 4142.

11.3 If plant emitting higher octave band sound power levels than those accounted for in this report is proposed, or additional plant also proposed, the combined noise impact may still meet the Local Authority specification. The noise propagation should be remodelled if significant variations to the parameters assumed are proposed.

12. References

1. BS 4142: 1997, Method for rating industrial noise affecting mixed residential and industrial areas.
2. Cadna/A environmental noise modelling software, version 4.0.135, Datakustik GmbH.
3. ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
4. Virgin Media Community Hub, Eastleigh, Mechanical Services Drawings, Upnorth Engineering Services Ltd.

13. Glossary

13.1 The British Standards and other documents referenced should be consulted for definitions of terms and a more extensive glossary.

13.2 Ambient noise

13.3 The total sound at a given place, usually a composite of sounds from many sources near and far. Should not be confused with "background noise".

13.4 Residual noise

13.5 The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

13.6 Background noise level, $L_{A90,T}$

13.7 The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using Fast time weighting, and quoted to the nearest whole number of decibels.

13.8 Specific noise source

13.9 The noise source under investigation for assessing the likelihood of complaints.

13.10 Specific noise level, $L_{Aeq,\,T}$

13.11 The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

13.12 Rating level, $L_{Aeq,\,T}$

13.13 The specific noise level plus any adjustment for the characteristic features of the noise.

14. Tables

Parameter	Level / $L_{A90,\ 15min}$ / dB
Level at NNSL	31

Table 2: Measured background noise levels

Unit Sound Power Level / dB	dB(A)	Octave Band Centre Frequency / Hz							
		63	125	250	500	1000	2000	4000	8000
Supply Fan	75	64	75	73	75	67	65	64	54
Condenser Fan	69	65	67	66	65	64	62	58	54
Compressor	67	60	60	60	60	60	60	60	60

Table 3: Calculated or supplied sound power level from manufacturers data

Attenuator	Octave Band Centre Frequency / Hz							
	63	125	250	500	1000	2000	4000	8000
Supply Fan	2	6	11	25	25	25	20	15
Condenser Fan	2	6	11	25	25	25	20	15

Table 4: Calculated minimum required attenuator insertion loss

Parameter	Level / dB(A)
Level at NNSL	25

Table 5: Calculation noise level at NNSL

Parameter	Level / dB(A)
Measured Background, L_{90}	31
Calculated specific level, L_{eq}	25
Rating level, L_{eq}	25
Excess over background	-6

Table 6: Rating according to BS 4142 at NNSL

15. Figures

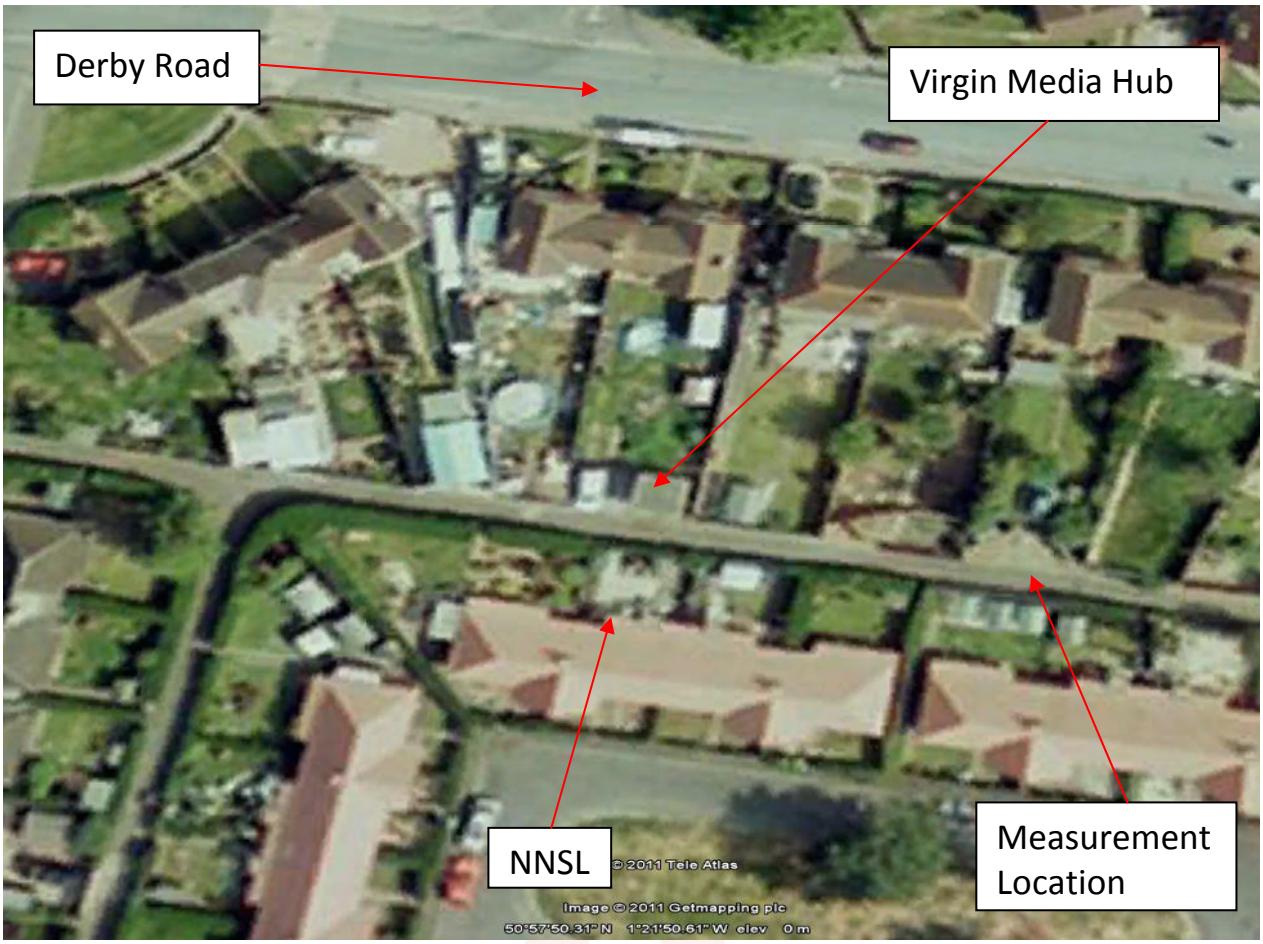

Figure 1: Site location and measurement position

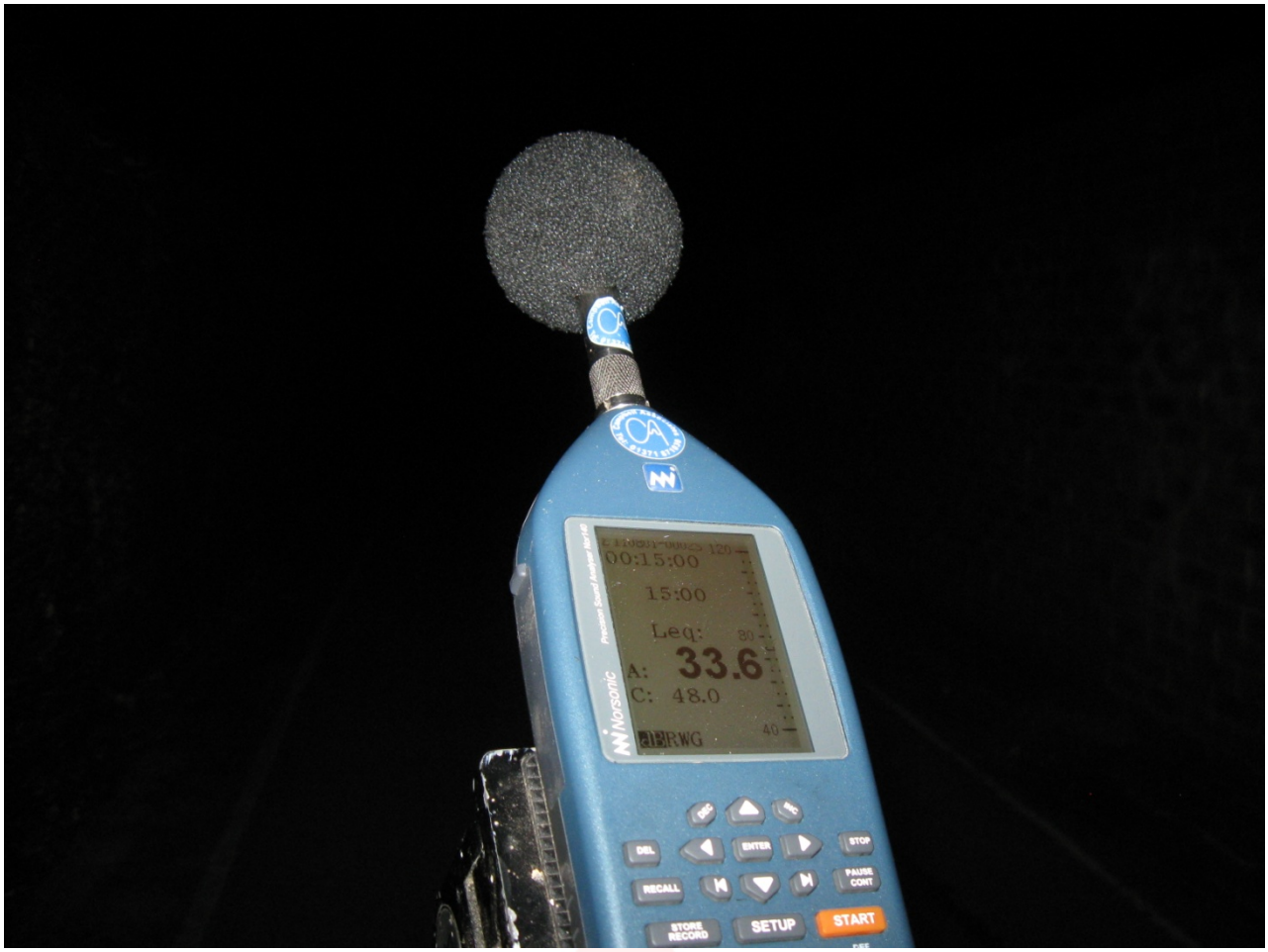

Figure 2: Measurements in progress

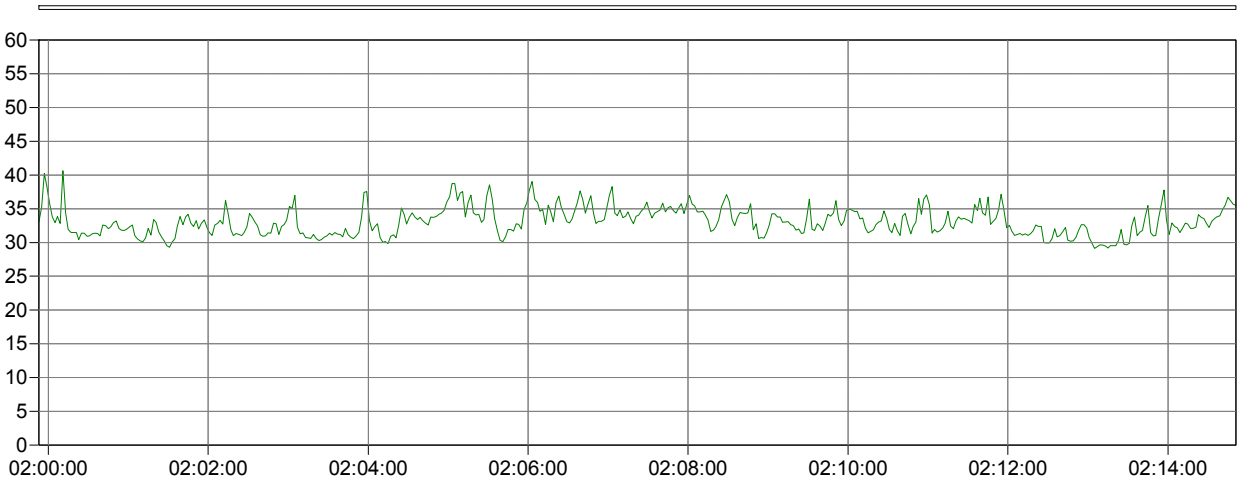

Figure 3: Extract of time history $L_{Aeq,\ 1sec}$



Figure 4: Plan view of CadnaA model

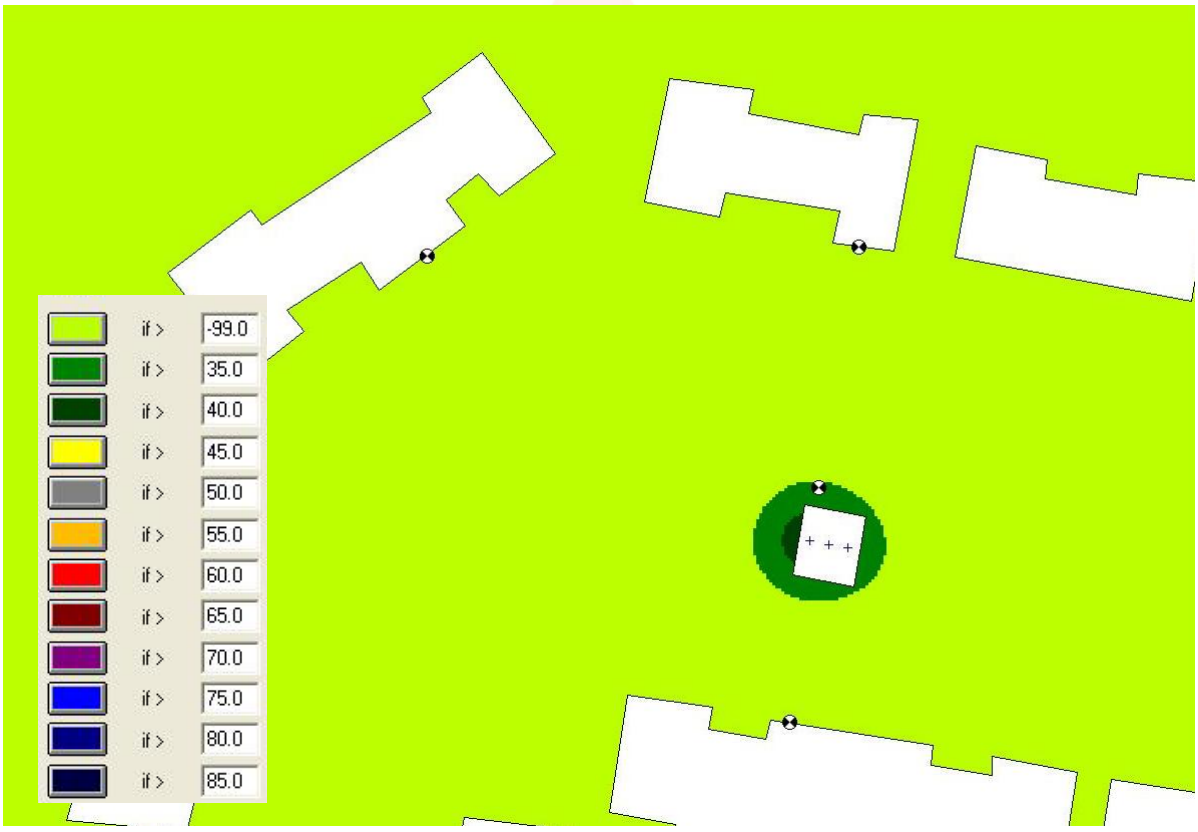

Figure 5: Plan view showing noise contours at 4.5m

16. Appendix 1: Assessment guidance of BS 4142

16.1 The principal guidance for the assessment of industrial noise impact in mixed residential areas in the UK is BS 4142, reference 1. This method involves the determination of a specific noise level due to the source in question at the Nearest Noise Sensitive Location (NNSL), thence a rating level.

16.2 The difference between the rating level and background level at the NNSL is calculated. According to BS 4142:

16.3 A difference of around +10 dB or more indicates that complaints are likely.

16.4 A difference of around +5 dB is of marginal significance.

16.5 If the rating level is lower than 10 dB below the background level (< -10 dB) then this is a positive indication that complaints are unlikely.

16.6 It may be considered that for broadband noise sources, a level of 10 dB below the background is generally indiscernible above the background noise, hence the above assessment of BS 4142.

16.7 A single penalty of 5 dB may be added to the specific level if the noise:

16.8 contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc);

16.9 contains distinct impulses (bangs, clicks, clatter or thumps);

16.10 is irregular enough to attract attention.

16.11 BS 4142 also indicates that where background levels are below 30 dB(A), and rating levels below 35 dB(A), these levels are below the scope of the assessment according to that standard. There is no other formal guidance for the assessment in these cases.

16.12 The reference time period during the night (23:00 – 07:00 hrs according to BS 4142) is five minutes; during the day (07:00 – 23:00 hrs) it is one hour.

16.13 A short glossary is included at the end of this report. References quoted should be consulted for more extensive descriptions and definitions.

17. Appendix 2: Equipment used

Equipment	Model	Serial no.
Sound Level Meter	Norsonics 140	1403423
Calibrator	Norsonics 1251	32198

Both meters and calibrators have current UKAS calibration certificates traceable to national standards.