

**North Wales Police DHQ
Site Noise Assessment**

AUTHOR: P J BRAILEY BSc, CEng, MIOA, MEI

REF: Rep-22- 212– NWP-plan-R0

Status: Issue for Planning

Hawksmoor Engineering Ltd
Aztec Centre
Aztec West
Almondsbury
Bristol
BS32 4TD

Date	Revision	Comment
23/12/2014	0	Issue for Team Review
16/07/2015	1	Issue for Planning

Tel: 01454 203540
Fax: 01454 203599

1.0 INTRODUCTION

Hawksmoor Engineering Ltd has prepared this report at the request of Jacobs Engineering Ltd to detail the measurement and assessment of the external noise climate at the site of the proposed North Wales Police DHQ.

The proposed scheme comprises a new build office block comprising three stories of accommodation and central atria together with an attached single storey custody block.

This report details the assessment of ambient noise levels external to the site and hence identifies potential impact of external noise on the design of the development and details a noise limit for external M&E plant contributing to nearby locations.

2.0 MEASUREMENT SUREVY

2.1 Survey Details

The measurement survey was undertaken on the 3rd and 4th December 2014, by Peter Brailey. Weather conditions during the survey were good, with no precipitation and lights winds, variable between force 0 and 2.

2.2 Equipment Used

Table 1 details the equipment used.

Item	Type	Serial number
Sound level meter	Rion NA28	00960044
Sound level meter	Rion NL32	00320129
Sound level calibrator	Rion NC74	34762402

Table 1: Equipment details

The sound level meter was check calibrated prior to and after measurements. No drift in calibration was noted from either meter.

2.3 Measurement Locations

The site is located to the south west of the junction of Davy way and Rackery Lane in Llay, near Wrexham, North Wales. The site is bounded by existing industrial sites on three sides. Table 2 provides details of these industrial sites. There are also more distant residential locations – Table 3 provides the details. The distances stated in Tables 2 & 3 are to the notional acoustic centre of the site.

Location	Direction	Distance	Description
Magellan Aerospace	South west	100M	2 storey industrial, with office accommodation
MWL office	North East	100M	Single storey office
ICW	South	80M	Industrial, with office accommodation to screened side of building
Honeycrown & Bike Devils	South West	100M	2 storey industrial & retail

Table 2: Industrial Locations near site.

Location	Direction	Distance	Description
Rackery Lane	East	460M	Row of residential properties fronting onto Rackery Lane
Chapel Lane	East	800M	Various residential 2 storey cottages
Rackery Hall	North	550M	Various residential properties (1 & 2 Storeys)

Table 3: Residential Locations near site.

2.4 Measurement Results

Appendix 1 of this report details the measurement results from the various locations around the site.

2.5 Site Noise Climate

The site is located within an industrial estate of predominantly industrial buildings. The principal noise sources are:

- Local traffic on Davy Way (noting that at the time of survey the junction of Davy Way with Rackery Lane was closed for re-surfacing).
- Local traffic on Rackery Lane
- Ventilation & extract systems on most of the surrounding buildings.

The noise climate is dominated by the vehicle traffic on both Davy Way and Rackery Lane and by the ventilation and extract plant associated with the other existing local industrial sites. It may be noted the noise contribution from the ventilation plant of the nearby sites is not excessive (i.e. it is not resulting in statutory noise nuisance). As noted above the vehicle traffic on Davy Way was influenced by the closure of the Davy Way to Rackery Lane junction at the time of survey. This has been considered in the assessment of the site noise measurements.

At the time of the survey limited use of external areas was noted at a number of local sites, most noticeably the Magellan site to the west (rear) of the site, and clearly influenced the Davy Way measurement location measurements.

As would be expected the noise levels reduced from the daytime levels to lesser levels at night. During the night time period it is the M&E noise sources which become dominant.

3.0 Assessment of Site Measurements

3.1 Impact of External Noise Levels on Building Design

The measurement results have been assessed and the façade incident noise levels have been determined based on the measured data. For the purposes of assessing the required performance of the existing and new building facades, it the daytime (higher) noise levels that are relevant. Allowance has been made for the reduced traffic flow on Davy way.

Table 4 summarises the conclusions.

Façade	Façade level based on measurements	Adjustment for Davy Way closure	Façade Design Noise
Rear Façade	50	0	50
Davy Way Façade	48	+4	52
Rackery Lane Façade	48	+2	50
Miners Road Façade	55	0	55

Table 4: Façade Design Noise Levels

We would note that the rear façade (local to the area of the existing sub-station on the site) is locally exposed to high noise levels originating from the adjacent Magellan site. The Minors Road façade is also exposed to noise from the ICW Ltd site resulting from an external dust filter system. The noise level is not excessively high, but the character of the noise is tonal with a distinctive event every 15 seconds (reverse flow?).

The noise levels are sufficiently low, that attenuation required from external to internal is only relevant should light weigh cladding be considered and natural ventilation used in rooms that have a low tolerance of noise intrusion. This aspect is further considered in the scheme Acoustic Design Report.

3.2 Acoustic Impact of the Proposed Building on Surrounding Properties

3.2.1 Noise sources Associated with the Proposed Development

There are a number of noise sources associated with the development of the proposed Police DHQ. These include:

- General vehicles entering and exiting the site
- Emergency vehicles exiting the site
- M&E plant associated with the building ventilation systems
- Emergency Generator

3.2.2 Vehicle Noise

The general vehicle usage associated with the proposed site usage is not considered to be a material matter. The site has previously been used for industrial purposes with associated traffic flows. The surrounding buildings are industrial in nature and hence not as sensitive to external noise as say residential or school sites would be.

Clearly there can be expected to be occasions when emergency response vehicles exit the site, potentially using warning sirens. We would anticipate the number of such occasions to be small per day, and clearly any such noise event would be of very limited duration. Given the type of

surrounding property, we are of the opinion that such noise events are not material to the overall noise climate.

3.2.3 M&E Design Criteria

3.2.3.1 Residential Property

For Residential property the assessment method is clearly detailed within both Tan 11 (Welsh Office recommendation for assessing noise within a Planning context). Tan 11 details that BS4142:1997 (since replaced with BS4142:2014) should be considered. In essence it requires the comparison of the pre-existing background noise level ($L_{A90,t}$) with the noise contribution from the plant ($L_{Aeq,t}$), as a Rating level which includes a correction for tonality and intermittency where this is a feature of the noise contribution. No absolute acceptance criterion is provided, but BS4142 clearly states a difference of +10 dB(A) would likely result in adverse reaction and a difference of -10 dB(A) would be clear indication that no adverse reaction would be expected. For the purposes of this assessment we would suggest an initial assessment criterion of Background noise level minus 5 dB(A) is used.

3.2.3.2 Commercial and Industrial Property

Tan 11 refers to BS8233 as a suitable source of assessment criteria. In our view the appropriate assessment approach is to consider the most sensitive internal space within the surround buildings where there are windows facing the proposed site. We would suggest this would be the “Executive Office – (use for study and work requiring concentration)” detailed in Section 7, Table 6 of BS8233:2014. This suggests an indoor noise level of 35 to 40 dB(A). it is also appropriate to assume such spaces may be naturally ventilated, and hence have windows open. BS8233:2014 states in Annex G (Part G1), that an open window for background ventilation can be expected to provide 15 dB(A) of external to internal level difference. We would note that the attenuation when windows are fully open, such as in high ambient temperature conditions can be expected to be lower. In our view an external to internal level difference in such conditions could be expected to be 10 dB(A). The above assessment provides a criterion of 45 to 50 dB(A) noise contribution from the new plant external to the existing buildings. We would suggest the lower level (of 45 dB(A) contribution) is the appropriate assessment basis.

Where there are no windows facing the site on adjacent properties we would suggest a limit 5 dB(A) higher. While a higher level could be justified based on the resultant internal noise levels within the adjacent property, the resulting noise levels externally would then be greater than the generally prevailing noise climate.

We would note that noise measurements obtain on and around the site are typically between 45 and 55 dB(A). We would therefore be proposing a limit for M&E noise from the new proposed development that is lower than that experience by the development site from the pre-existing developments.

3.2.4 Overall M&E Plant Noise Limit

To determine the controlling noise limit we have modelled the propagation of sound from the source to the receiver, allowing for distance and where appropriate ground effects attenuation to determine what apparent sound power would need to radiate from the site to result in compliance with the noise limit. Table 5 summaries’ this assessment.

Receiver Location	Background noise level (dB L _{A90})	Criterion	Noise contribution Limit dB(A)	Distance attenuation dB(A)	Ground effects attenuation dB(A)	Screening from existing buildings dB(A)	Nominal sound power limit dB(A)
Residential - Daytime							
Rackery Lane	51	B/G-5dB	46	61	8	10	125
Chapel Lane	41	B/G-5dB	36	66	9	10	121
Residential – Night time							
Rackery Lane	40	B/G-5dB	35	61	8	10	114
Chapel Lane	34	B/G-5dB	27	66	9	10	114
Commercial – Daytime							
Magellan Aerospace	N/A	45	45	48	0	0	93
MWL office	N/A	45	45	48	0	0	93
ICW	N/A	50	50	46	0	0	96
Honeycrown & Bike Devils	N/A	50	50	48	0	0	98

Table 5: Calculated Overall Plant Noise Limit to each Receiver Location

The above assessment clearly demonstrates that the adjacent commercial properties require an overall noise limit some 20 to 30 dB(A) lower than the nearest residential property. It is therefore achieving an appropriate noise level at the commercial property that will control the M&E plant design.

3.2.5 Plant Noise Control Strategy

The M&E plant associated with the development will largely be contained within the main plant room, housed in the upper level of the existing building. External noise sources will include the ventilation plant louvres and the external chillers.

At the current time the detail of the M&E plant is not known with certainty. However we have undertaken an initial assessment to confirm the proposed limits can be achieved. Table 6 below details the expected sources associated with the scheme and the relevant noise limits.

Source	Location	Noise level	Area	Number of sources	Building screening	Nominal apparent sound power level [1]	Typical spec
Air cooled chiller	Compound	-	-	2	8	86	93 L _{wa} per unit at full duty
External split unit condensers	Roof	-	-	6	10	81	83 L _{wa} per unit at full duty
AHU inlet and outlet louvres	Plant room walls	55 dB(A) @ 1M	Av. 3M ²	20	3 [2]	81	55 dB(A) @ 1M
Boiler chimneys	Roof	70 dB(A) @ 1M	250mm dia.	2	0	81	70 dB(A) @ 1M
Toilet extracts	Roof	60 dB(A) @ 1m	200mm dia.	8	8	74	60 dB(A) @ 1M
Miscellaneous minor sources	Variable	60 dB(A) @ 1m	variable	10	3 [2]	80	60 dB(A) @ 1M
Total						90 dB L _{wa}	

Table 6: Typical External Noise Sources

[1]: This is the sound power level that can be propagated to adjacent buildings. It does not allow for the building screening.

[2]: This attenuation assumes 50% of the sources face away from each receiver location.

Table 6 demonstrates that typical noise limits applied to external plant typically used on a development of this type can achieve the proposed noise limits.

We also note a standby generator is proposed. This unit can be expected to be tested weekly / monthly for a limited duration (30mins would be typical) in accordance with the chosen suppliers recommendations, but extended use would only occur due to the loss of site incoming power. In our experience the loss of income power is most likely if power local to the area is lost. Given the limited use we would recommend a noise contribution from this source of background plus 10 dB(A) at adjacent properties.

4.0 Conclusions

The measurement of site noise levels has established the daytime ambient noise level at typically 45 dB L_{Aeq} , with a daytime background noise level of 35 dB L_{A90} . The background noise level reduces at night to 32 dB L_{A90} .

Based on our understanding of the building uses, we have concluded the external noise climate does not require any specific consideration of the acoustic performance of the building fabric with regard to noise ingress. We would also conclude that natural ventilation can be readily expected to result in acceptable internal noise levels.

We would propose all external plant associated with the development is limited to a noise contribution 5 dB(A) below the daytime background noise level of 35 dB L_{A90} , with the exception of the standby generator.

Appendix 1 – Measurement Data**A. Rackery Road Façade (approx. 7 M from existing building façade)**

Start Time	End Time	Measurement Parameter							
		L _{Aeq}	L _{Amax}	L _{Amin}	L _{A01}	L _{A10}	L _{A50}	L _{A90}	L _{A95}
14:09:12	14:24:12	50.4	83.1	41.5	55.8	47.3	44.4	43.1	42.8
14:24:12	14:39:12	46.8	57.6	41.9	54.5	49.9	45.1	43.6	43.2
14:39:12	14:54:12	47.5	61	41.8	57.6	48.7	45.6	43.7	43.3
14:54:12	15:09:12	50.5	63.9	41.7	61.2	53.4	45.6	43.3	42.9
15:09:12	15:24:12	50.4	69.5	41	62.5	51.8	45.1	43.3	42.9
15:24:12	15:39:12	45.5	63	39.5	52.8	47.3	44.3	42.5	41.9
15:39:12	15:54:12	44.9	61.3	39.1	52.3	46.9	43.6	41.8	41.5
15:54:12	16:09:12	52.6	74.3	40.2	66.2	49.5	44.3	42.4	42
16:09:12	16:24:12	44.4	56.8	40.1	49.7	46	43.7	42.3	41.9
16:24:12	16:39:12	47.8	62.7	40.1	59.7	48.8	44.9	42.7	42
16:41:38	16:56:38	52.9	82.1	39.3	61.3	48	43.6	41.9	41.4
16:56:38	17:11:38	45.7	64.6	39.7	55.1	47.2	43.7	42.2	41.8
17:11:38	17:26:38	45.6	60.6	40.2	54.3	47.2	44.2	42.6	42.2
17:26:38	17:41:38	46.7	64.6	40.2	56.8	47.8	44.2	42.4	41.9
17:41:38	17:56:38	43.6	55	40	47.9	45.2	43.1	41.8	41.4
17:56:38	18:11:38	47.9	67	40.9	57.8	49.7	45.2	43.2	42.6
18:11:38	18:26:38	46.1	59.6	40	54.4	47.7	44.8	42.8	42.3
18:26:38	18:41:38	49.4	66.5	41.1	63.1	47.8	44.9	43.4	43
18:41:38	18:56:38	46.5	61.2	39.6	55.4	49.1	44.6	42.5	41.9
18:56:38	19:11:38	45.8	70.2	36.6	56.6	45.5	42.7	40.2	39.3
19:11:38	19:26:38	43.2	62.6	36.8	50.1	45	41.9	39.3	38.8
19:26:38	19:41:38	41.7	54	36.3	46.7	44.2	40.9	38.5	38
19:41:38	19:56:38	42.9	53.1	37.4	47.9	45.4	42.2	39.4	38.9
19:56:38	20:11:38	43.1	63.5	36.5	51.8	44.4	41.4	39.1	38.6
20:11:38	20:26:38	41.6	59.5	34.5	47.8	43.7	40.5	37.1	36.3
20:26:38	20:41:38	42.9	58.5	35.7	52.2	44.4	41.4	38.6	37.9
20:41:38	20:56:38	43.2	51	39.1	47.6	45	42.8	41.2	40.6
20:56:38	21:11:38	44.9	54.2	39.2	49.9	47.1	44.2	41.8	41.3
21:11:38	21:26:38	45	52.7	39.1	49.9	47	44.5	42.2	41.4
21:26:38	21:41:38	46	56.1	41.2	50.1	48	45.5	43.3	42.9
21:41:38	21:56:38	47.6	57.2	41.8	53.3	49.9	46.9	44.1	43.5
21:56:38	22:11:38	46.6	54.3	40.8	51.5	48.7	46	44	43.5
22:11:38	22:26:38	47.1	56.7	42	51.9	49.2	46.5	44.1	43.6
22:26:38	22:41:38	46.9	57	39.7	52.6	49.2	46.2	42.4	41.7
22:41:38	22:56:38	46.1	58.3	39.6	51.3	48.2	45.4	42.9	42.3
22:56:38	23:11:38	46.3	57.7	39.1	51.7	49.1	45.4	41.9	41.2
23:11:38	23:26:38	45.8	53.7	38.2	51.6	48.9	44.9	40.3	39.7

North Wales Police DHQ – Site Noise Assessment

23:26:38	23:41:38	45.2	56	38.7	51.8	48.2	43.6	40.4	39.9
23:41:38	23:56:38	44.9	52.6	38	50.5	48	43.6	40.4	39.9
23:56:38	00:11:38	44.1	54.6	37.6	49.8	46.8	43.1	40.3	39.7
00:11:38	00:26:38	43.6	52.8	37.1	50.3	46.3	42.3	39.8	39.4
00:26:38	00:41:38	42.3	66.1	36.9	49.4	43.9	40.7	38.9	38.5
00:41:38	00:56:38	43	56	35.6	53.1	45.4	40.4	37.6	37.2
00:56:38	01:11:38	43	55.3	36.1	51.9	46.2	40.3	37.8	37.5
01:11:38	01:26:38	41.9	59.9	36.2	47.9	44.6	40.5	38.6	38.1
01:26:38	01:41:38	41.6	54.6	36.9	47.8	44.2	40.3	38.5	38.2
01:41:38	01:56:38	41.3	66.6	36	46.9	43.5	39.7	38	37.6
01:56:38	02:11:38	41.3	52.3	36.3	49.1	44.2	39.6	38	37.7
02:11:38	02:26:38	42.4	52.5	37.1	49	45.1	41.1	39	38.6
02:26:38	02:41:38	46.2	61.8	37.4	54.4	48.3	45.6	39.5	38.9
02:41:38	02:56:38	40.2	57.5	34	46.3	42.7	39	36.8	36.4
02:56:38	03:11:38	39.8	51	34.3	47.9	42.7	37.8	36.2	35.9
03:11:38	03:26:38	40.8	50.5	35.8	46.6	42.8	40	38.1	37.8
03:26:38	03:41:38	40.3	50.9	35.7	45.7	42.5	39.3	37.7	37.4
03:41:38	03:56:38	41.4	54.5	35.4	48.7	44.4	39.7	37.5	37.1
03:56:38	04:11:38	40.3	50.4	35.6	46.6	42.3	39.3	37.8	37.5
04:11:38	04:26:38	40.1	49.9	36.5	45.3	42	39.4	38.1	37.8
04:26:38	04:41:38	41.3	52.2	38.1	47	42.8	40.6	39.5	39.2
04:41:38	04:56:38	41.5	49.1	37.3	44.5	43	41.3	39.6	39
04:56:38	05:11:38	41	48.9	37.1	44.8	42.3	40.8	39.3	39
05:11:38	05:26:38	41.4	51.1	37.9	45.8	43	41	39.6	39.3
05:26:38	05:41:38	41.9	50.7	37.2	46.9	43.9	41.4	39.2	38.8
05:41:38	05:56:38	42	55.6	37.7	47.7	43.6	41.2	39.7	39.4
05:56:38	06:11:38	42.5	51.2	37.4	47	44.6	41.9	39.8	39.2
06:11:38	06:26:38	44.8	63	40.8	51.2	45.6	43.7	42.5	42.2
06:26:38	06:41:38	45.3	52.1	42.2	48.7	46.5	45.1	44.1	43.8
06:41:38	06:56:38	46.4	64.2	41.6	54.1	47.7	45.2	43.4	43
06:56:38	07:11:38	45.6	51.8	42.4	49.8	46.7	45.4	44.1	43.8
07:11:38	07:26:38	47.6	64.4	42.7	54.2	49.6	46.3	44.8	44.3
07:26:38	07:41:38	47.8	58.4	44.4	54	48.8	47.3	46.3	46
07:41:38	07:56:38	48.9	59	44.6	54	50.8	48.3	46.6	46.3
07:56:38	08:11:38	48.3	62.7	43.7	55.6	49.3	47.6	45.9	45.4
08:11:38	08:26:38	52.4	68.9	44	62.6	56	48.3	46.3	45.7
08:26:38	08:41:38	48.9	60.1	44	56.1	52.2	47.1	45.7	45.3
08:41:38	08:56:38	47.6	57.7	42.9	52.8	49.1	47.2	45.5	45
08:56:38	09:11:38	48.5	61.8	43.8	55.7	50.5	47.2	45.6	45.2
09:11:38	09:26:38	46.7	68.6	42.9	51.9	47.7	46	44.5	44.2

B. Rackery Lane

Start Time	End Time	Measurement Parameter							
		L _{Aeq}	L _{Amax}	L _{Amax}	L _{A01}	L _{A10}	L _{A50}	L _{A90}	L _{A99}
		67.5	84.4	39.8	77.3	72.3	60.9	46.8	42.1
		70.0	85.4	47.4	80.9	73.4	64.9	53.6	50.3
		67.9	83.2	40.4	77.7	72.3	61.1	46.5	43.1
		68.1	80.8	43.4	76.3	72.1	65.7	52.6	46.1
		68.4	80.1	42.6	76.5	72.6	64.9	51.9	45.0
		67.9	83.8	42.5	77.4	71.9	64.1	51.5	45.0
		68.8	83.1	41.2	77.3	72.8	66.1	50.7	44.7
		68.0	77.0	50.0	74.9	72.7	66.3	55.7	52.0

Start	End	L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A50}	L _{A90}
23:50	23:55	53.2	75.1	39.2	56	48.3	43.3
23:55	00:00	48.5	68.8	37	50.9	44.6	40.5
00:00	00:05	48.6	68.4	37.1	52	43.2	39.4
00:05	00:10	50.1	72.4	39.7	52.7	46.9	43.2

C. Chapel Lane

Start Time	End Time	Measurement Parameter							
		L _{Aeq}	L _{Amax}	L _{Amin}	L _{A01}	L _{A10}	L _{A50}	L _{A90}	L _{A95}
		48.0	68.8	38.0	58.9	49.3	43.8	41.5	40.1
		43.5	62.1	37.4	48.5	44.8	42.8	40.9	39.5
		48.2	66.5	37.1	59.8	49.9	42.2	40.3	39.3
		47.1	69.1	35.6	57.3	50.6	41.4	39.5	38.2
		48.3	65.2	37.4	60.0	51.1	43.6	41.1	39.8
		44.3	60.0	37.6	50.9	46.0	43.4	41.3	39.9
		58.3	87.2	37.9	67.1	52.8	43.9	41.6	40.3
		61.9	90.1	37.2	69.1	53.2	42.7	40.6	39.3
		46.7	65.8	35.9	57.0	49.5	42.4	40.4	39.0
		61.0	91.2	38.4	66.9	57.2	46.7	42.5	40.8
		49.7	69.7	43.5	53.6	49.3	47.6	45.9	45.0

Start	End	LAeq	LAm _{ax}	LAm _{in}	LA10	LA50	LA90
00:20	00:25	46	71.9	31.4	47	37.9	34.2
00:25	00:30	41.7	60	29.9	44.4	38.4	34.1
00:30	00:35	48.7	70.5	31.2	55.7	38.8	34.9
00:35	00:40	43.3	65.5	32	43.4	36.9	34

d. Miners Road (rear of ICW)

Start Time	End Time	Measurement Parameter							
		LAeq	LAm _{ax}	LAm _{in}	LA01	LA10	LA50	LA90	LA95
		53.6	63.3	47.3	57.4	55.6	52.9	50.9	49.7
		53.2	69.1	46.2	57.7	55.3	52.4	50.4	49.0
		54.9	62.9	50.0	58.2	56.0	54.7	53.5	52.5
		55.1	70.7	49.4	61.9	56.3	54.3	53.0	52.0
		54.7	63.0	50.2	57.7	55.9	54.5	53.2	52.0
		55.2	63.3	51.0	57.9	56.2	55.0	53.9	52.9

e. Pavement of Davy Way

Start Time	End Time	Measurement Parameter							
		LAeq	LAm _{ax}	LAm _{in}	LA01	LA10	LA50	LA90	LA95
		61.4	85.5	43.5	75.4	57.1	49.1	46.6	45.5
		65.8	86.3	43.9	80.4	65.8	51.0	47.4	46.1
		66.5	84.7	43.9	79.8	69.5	52.1	46.9	45.7
		52.1	73.0	43.4	59.9	54.8	49.5	47.3	46.2
		57.1	77.6	44.3	69.6	57.1	50.8	48.3	46.8
		64.7	83.9	44.0	79.8	62.0	48.8	46.7	45.7