



REPORT REFERENCE:

IMP4409-2

INDUSTRIAL NOISE IMPACT ASSESSMENT

Mechanical Equipment Installation

British Standard 4142: 1997

SITE:

11 Southwood Road, Hayling Island

PO11 9PS

CLIENT:

Bagsy Lally

SURVEY DATES:

11th November 2014

Impact Acoustics Ltd

1 King John Avenue, Bournemouth, Dorset, BH11 9RS

Tel: 01202 581398

impactacoustics.co.uk

Report By	Report By
[REDACTED]	[REDACTED]
Mr. B. J. Scrivener MIOA.	Mr I. P. Broom AMIOA.

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1 EXECUTIVE SUMMARY

1.1 Instruction

Impact Acoustics have been instructed to undertake a noise impact assessment to assess kitchen extract noise at 11 Southwood Road, Hayling Island

1.2 Scope of Report

This report will assess the impact of the noise externally from the operation of the kitchen extract system. The resultant noise levels at the residential premises surrounding the plant will be assessed in accordance with the criterion defined within British Standard 4142:1997.

1.3 Summary of Results

1.3.1 Background Noise Levels

The background noise levels were recorded on 11th November 2014 and the lowest 1 hour LA90 value was established as LA90,1 hour 46 dB between the hours of 1200 and 2100 hours (daytime assessment only).

1.3.2 Noise Sensitive Properties

The kitchen extract terminates on the roof of the building with the nearest noise sensitive properties located in 2 locations surrounding the site.

1.3.3 British Standard 4142:1997

The kitchen extract system was assessed in accordance with BS4142; the resultant noise level at the nearest residential façade will result in a conclusion under British Standard 4142:1997 of *"complaints unlikely"* post noise control measures.

1.3.4 Noise Control Measures

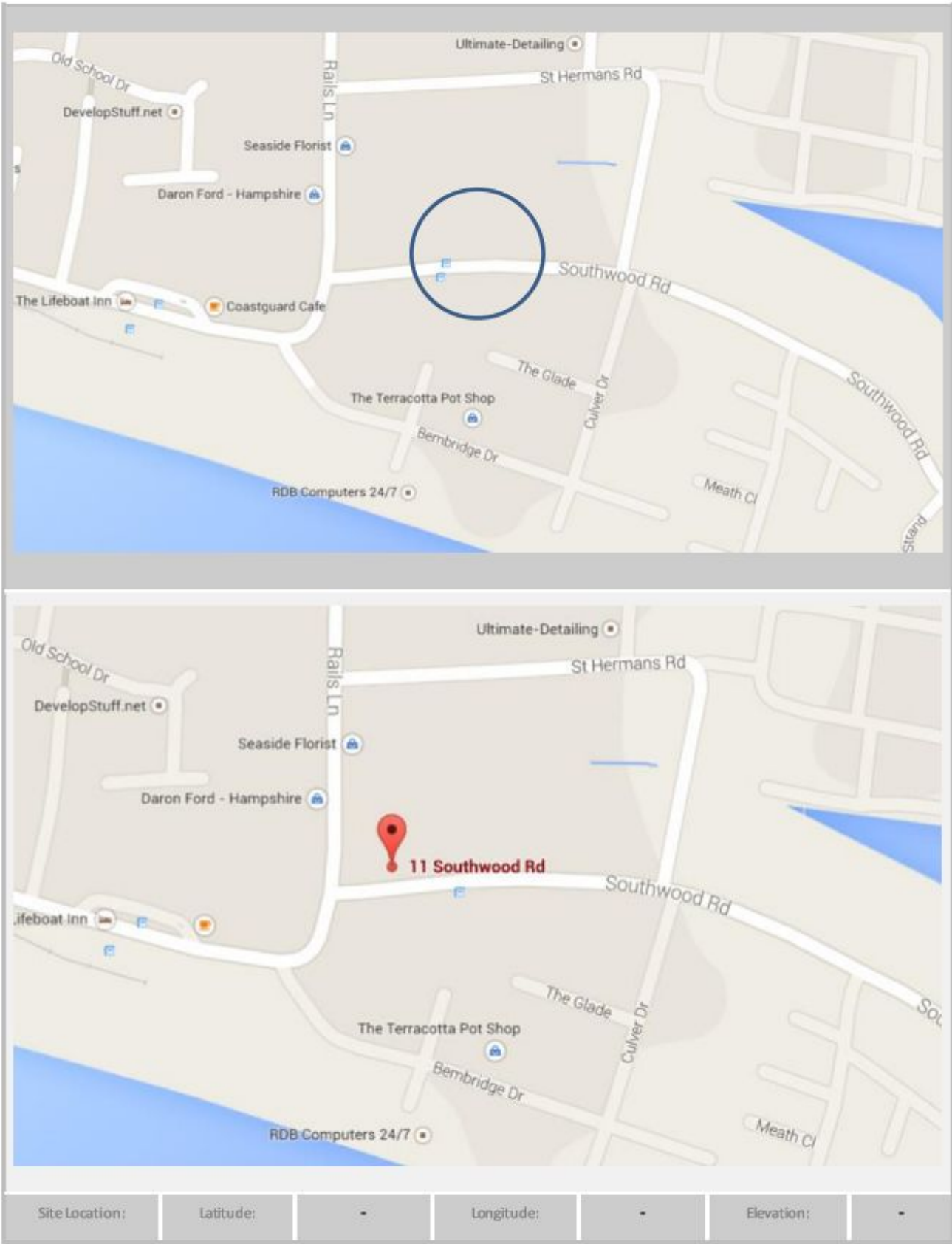
Noise Control Measures have been recommended in the form of enclosures made from marine grade ply and internally lined with acoustic absorption. Upon installation the noise emissions from the plant result in a conclusion of *"complaints unlikely"*.

1.4 Conclusion of Report

The operation of the kitchen extract was assessed in accordance with BS4142:1997. The existing kitchen extract system results in a conclusion of -13dB indicating *"complaints unlikely"* and will not have a detrimental effect on the local residential amenity following recommended noise control measures.

2 SITE LOCATION AND POSITION

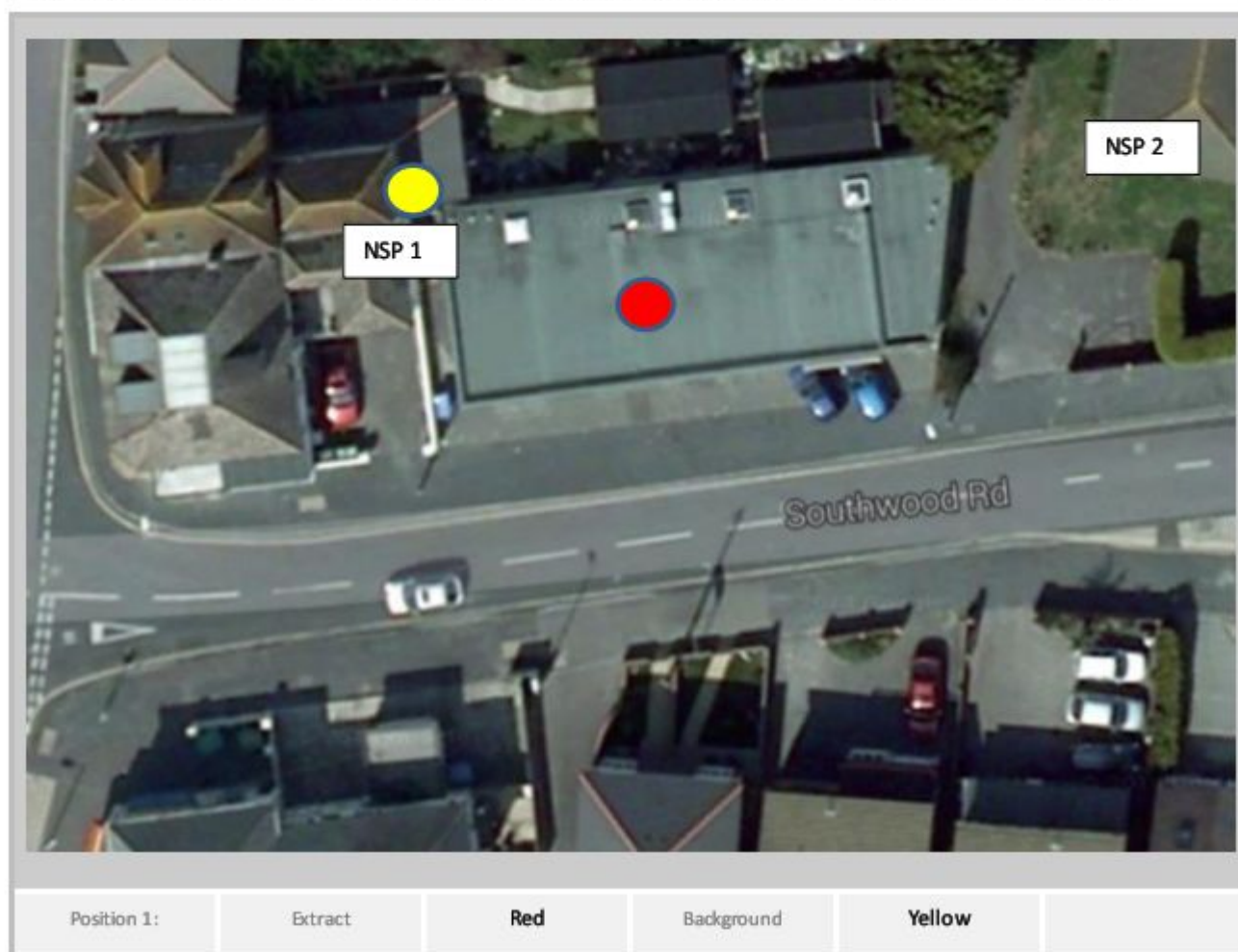
2.1 Position of Site in the Wider Area Road Network



3 BACKGROUND NOISE LEVELS

3.1 Background Measurement Position

Below are the position of the plant (red) and the position of the background measurement position (yellow)



3.2 Nearest Noise Sensitive Premises (NSP)

NSP	Proximity to plant (m)
1	12.5
2	28

4 TEST PROCEDURE

4.1 Scope of Report

This report will assess the impact of the noise externally from the operation of the kitchen extract system. The resultant noise levels at the nearest residential premises will be assessed in accordance with the criterion defined within British Standard 4142:1997.

4.2 Scope of BS 4142:1997

In the assessment of the plant, consideration has been given to the scope of British Standard 4142:1997, which in section 1, details the lower limits for the rating and background noise levels:

*"The method is not suitable for assessing the noise....when the background and rating noise are both very low....
Note. For the purposes of this standard, background noise levels below 30 dB and rating levels below 35 dB are considered to be very low."*

It is considered that both the background noise levels and the rating noise levels fall within the scope of British Standard 4142:1997, though the rating levels at night are below the criteria defined in note 1 of section 1.

4.3 Specific Noise Levels

4.3.1 Assessment Position

The assessment position was established as number 5 Rails Lane at first floor level overlooking the plant.

4.3.2 Calculations

The specific noise source was calculated by measuring the extract noise at 1m from exit point, correcting for residual noise and correcting for geometric divergence.

4.4 Background Noise Levels

4.4.1 Assessment Position

In line with the requirements of British Standard 4142:1997 the background noise levels should be measured at the assessment position.

4.5 Rating Levels (Character Correction)

A character correction of +5 dB is added to the specific noise level to establish the rating level if any of the following is present at the assessment position.

BS4142:1997 – Section 8.2 Character Correction		Unlikely to be audible to local residents	Correction
Distinguishable, Discrete Continuous Note	Whine	Has the potential to be audible or present	+5 dB
	Hiss	Unlikely to be audible or present	
	Screech	Unlikely to be audible or present	
	Hum	Unlikely to be audible or present	
Distinguishable Impulses	Bangs	Unlikely to be audible or present	+0 dB
	Clicks	Unlikely to be audible or present	
	Clatters	Unlikely to be audible or present	
	Thumps	Unlikely to be audible or present	
Irregularity attracting attention		Unlikely to be audible or present	+0 dB

4.6 Assessment and Conclusion

The rating level is subtracted from the background level to determine the assessment level during the day time and night time periods. The assessment level is then compared against one of the three distinct categories within British Standard 4142:1997 to determine the likelihood of complaints from the proposed plant.

5 NOISE CRITERION

5.1 National Planning Policy Framework ("NPPF")

5.1.1 Scope of Document

The National Planning Policy Framework ("NPPF") published in March 2012 sets out the Government's National Planning Policies for England and how these can be applied by local communities when developing their local plans or deciding planning applications to best reflect the needs and priorities of the local communities. Current planning law requires Local Authorities to determine planning applications in accordance with the local development plan unless there are material considerations which require them to reach a different decision.

5.1.2 Specific Reference to Noise

Section 123 of the NPPF which falls under the title *"Conserving and enhancing the natural environment"* provides the following aims:

"Planning Policies and decisions should aim to:

Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established..."

5.2 Noise Policy Statement for England ("NPSE")

5.2.1 Scope of Document

The Noise Policy Statement for England ("NPSE") published in March 2010 provides guidance on the management of noise from sustainable development without placing unreasonable cost or time restraints on sustainable developments. The document has the following noise policy vision:

"Noise Policy Vision

Promote good health and quality of life through the effective management of noise within context of Government policy on sustainable development"

NPSE defines that the long term vision is supported by the following three Noise Policy Aims:

"Avoid significant adverse impact 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."

5.2.2 Lowest Observed Adverse Effect Level ("LOAEL")

The NPSE defines the principle of an absolute minimum threshold in 2.20:

"LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected."

5.2.3 Significant Observed Adverse Effect Level

The NPSE defines the principle of an absolute maximum threshold in section 2.21:

*"SOAEL – Significant Observed Adverse Effect Level:
This is the level above which significant adverse effect on health and quality of life occur."*

The NPSE states makes reference to the SOAEL in paragraph 2.22:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different time."

5.2.4 First Aim of the NPSE

The first aim of the NPSE is:

"Avoid significant adverse impact on health and quality of life"

I consider that to meet the first aim of the NPSE the resultant noise levels as a result of the proposed development should be below the Significant Observed Adverse Effect Level – SOAEL at the noise sensitive properties.

5.2.5 Second Aim of the NPSE

The second aim of the NPSE is:

"Mitigate and minimise adverse impacts on health and quality of life"

I consider that to meet the second aim of the NPSE the resultant noise levels as a result of the proposed development should be below the Significant Observed Adverse Effect Level – SOAEL but above the Lowest Observed Adverse Effect Level – LOAEL at the nearest noise sensitive properties.

5.2.6 Third Aim of the NPSE.

Where possible, the noise levels as a result of the proposed development at the nearest residential property should be lower than the existing noise levels improving the noise climate for the local community.

5.3 National Planning Practice Guidance ("NPPG")

On 6th March 2014 the Department for Communities and Local Government ("DCLG") launched an online resource providing a National Planning Practice Guidance. The section entitled "Noise" provides the following general advice and relates to paragraph 123 of the NPPF.

5.3.1 Observed Effect Levels

The NPPG references the 2 absolute levels detailed in the NPSE and the single absolute level detailed in the Night Noise Guidelines published in 2009 by the European Union ("NNG")

Observed Effect Level	Description
Significant Observed Adverse Effect Level SOAEL	The level of noise exposure above which significant adverse effects on health and quality of life occurs.
Lowest Observed Adverse Effect Level LOAEL	The level of noise exposure above which adverse effects on health and quality of life can be detected.
No Observed Adverse Effect Level NOAEL	The level of noise exposure below which no effect at all on the health and quality of life can be detected.

5.3.2 Noise Exposure Hierarchy

The NPPG provides useful guidance on decisions involving noise ensuring they take into account the social and economic benefits but without causing undesirable exposure from unwanted noise:

Perception	Example of Outcome				Increasing Effect Level	Action
	Can Noise be Heard	Change in Behaviour	Change in Character of Area	Change in Quality of Life		
Not Noticeable	No	No	No	No	No Observed Effect	No Specific Measures
Noticeable and not Intrusive	Yes	No	Slight	No	No Observed Adverse Effect	No Specific Measures
Noticeable and Intrusive	Yes	Small	Yes	Perceived	Lowest Observed Adverse Effect	Mitigate and Reduce to a Minimum
Noticeable and Disruptive	Yes	Material	Yes	Diminished	Significant Observed Adverse Effect	Avoid
Noticeable and very Disruptive	Yes	Extensive and Regular	Yes	Significant Harm	Unacceptable Adverse Effect	Prevent

5.3.3 How can adverse effects of Noise be Mitigated

The NPPG details four broad types of mitigation to reduce noise which include: Engineering, layout, using planning conditions or obligations and mitigation.

5.4 Night Noise Guidelines (“NNGL”)

The European Union and the World Health Organisation jointly published a document entitled “Night Noise Guidelines” in 2009 (“NNGL”). The overall goal of the document was detailed within the summary pages:

“The goal of the NNGL project was to provide and expand scientific advice to the European Commission and its Member States in developing future legislation in the area of night noise exposure, control and surveillance. The key objective of the project was to reach a consensus of experts and key stakeholders on the following subjects:

a) Guideline values for night noise to protect the public from adverse health effects....”

5.4.1 No Observed Adverse Effect Level (NOAEL)

The section entitled “*Threshold for Observed Effects*” within the executive summary of the NNGL a list of the absolute level at which there is sufficient evidence available for the no observed adverse effect level (NOAEL):

Effect of Noise	Description	Indicator	Threshold (NOAEL)
Biological Effects	EEG awakening	$L_{Amax,side}$	35 dB
	Motility, onset of motility	$L_{Amax,side}$	32 dB
	Changes in duration of various stages of sleep, in sleep structure and fragmentation of sleep	$L_{Amax,side}$	35 dB
Sleep Quality	Waking up in the night and / or too early in the morning	$L_{Amax,side}$	42 dB

6 EXTERNAL MECHANICAL NOISE

6.1 Measurement of Specific Noise Source

6.1.1 Day Time Levels – 07:00 to 23:00

Measurement of “plant on” was undertaken at 1m from source due to inaudibility at assessment position. NOTE a smaller time slice for the “on plant” was taken due to source being ‘of steady state’. The plant is surrounded by a hard flat surface, however for uniformity and when extrapolating for specific noise source, there is no correction for reflections as this is measured in the source below.

Measurements undertaken between 1800 -2100 on Wednesday 22 nd October 2014.			
Plant State	Duration	LAeq,T	LAF90,T
on	30:00	69	-
off	60:00	61	52
on	30:00	69	-
off	60:00	59	50
Correction for Residual level: $10 \cdot \log(10^{(69/10)} - 10^{(59/10)})$ = 69 dB			

6.2 Geometric Divergence (A_{div})

A correction is made for the distance between the source and assessment position using the following formula defined in section 7.1 of ISO 9613-Part 2:1996.

Formula	Symbols
$A_{div} = 20 \cdot \log_{10} (d/d_0)$	A_{div} = Reduction due to Geometric Divergence (dB) d = Distance from source to receiver (m) d_0 = reference distance (1m)

6.3 Ground Absorption (A_{gr})

A correction is made for the effect of the ground between the source and receiver depending on whether it is considered hard or soft ground.

6.4 Atmospheric Absorption (A_{atm})

As the source was less than 100m from the receiver position (assessment position) no correction was made for atmospheric absorption.

6.5 Barrier Effect (A_{bar})

A correction is made for any barrier in the direct line of site between the source and the assessment position and is detailed in section 7.4 of ISO 9613-Part 2:1996. For clarity the K_{met} meteorological correction has been ignored and C_2 equals 40 and C_3 equals 1.

Formula	Symbols
$A_{bar} = 10 \cdot \log_{10} [3 + (40 \cdot \delta / \lambda) - A_g]$ *Note1 where $\delta = a + b - r$ and $\lambda = c / f$	A_{bar} = Effective barrier attenuation (dB) A_g = Total Ground Absorption (dB) *Note 1: Only apply the A_g correction if $A_g > 0$ δ = Path difference (m) a = Distance from source to barrier head (m) b = Distance from barrier head to assessment position (m) r = Distance from source to assessment position (m) λ = Wavelength of sound (m) c = Speed of sound – Assumed to be 342 ms^{-1} f = Octave band centre frequency (Hz)

6.6 Day Time Calculations (07:00 to 23:00)

6.6.1 Source 1 – Kitchen Extract System

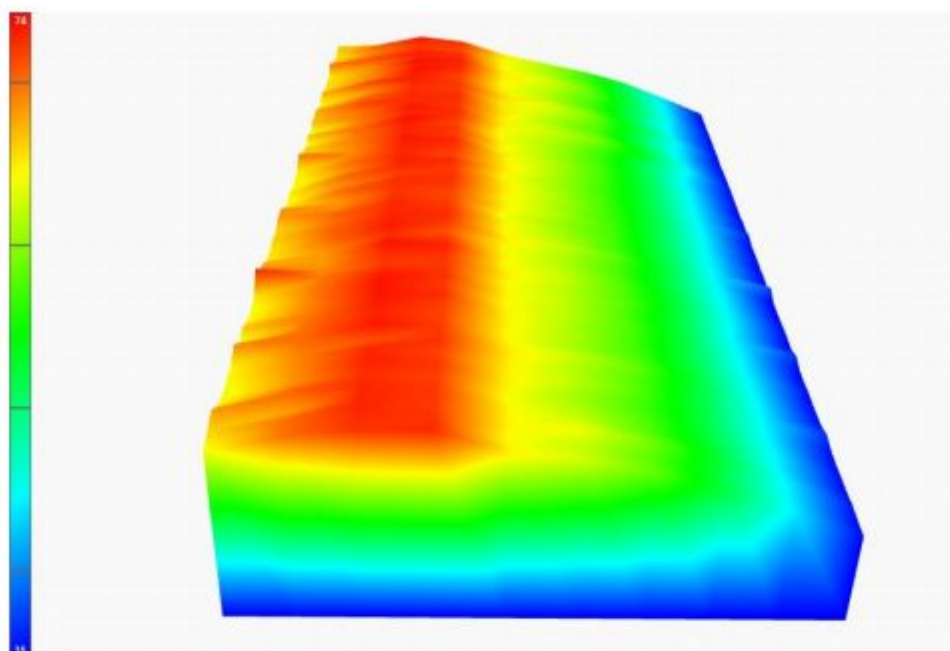
Kitchen Extract System	Sum (dB)
Specific Noise Source @ 1m	69
Geometric Divergence (A_{div}) – 12.5m	-22
Atmospheric Absorption (A_{atm})	–
Ground Absorption (A_g)	–
Barrier Correction (A_{bar})	–
Resultant Noise Levels (L_p)	47

7 Tonal Assessment

7.1 Source Tonal Assessment

In accordance with BS7445: Section 4.1.3:

"..a prominent tonal component may be detected in one third octave spectra if the level of a one-third octave band exceeds the level of the adjacent bands by more than 5 dB..."



It can be seen that there are no adjacent bands where the levels either side are in excess of 5dB. In addition in accordance with BS4142, the plant did not exhibit an audible characteristic (hum or buzz) therefore no characteristic penalty has been applied for assessment.

8 ASSESSMENT

8.1 Day Time Assessment (16 hour - 07:00 to 23:00)

Rating Industrial Noise affecting Mixed Industrial and Residential Areas			
British Standard 4142:1997 Day Time (07:00 to 23:00)			
Source	Operating Times		Source Position
Kitchen Extract	12:00 – 21:00		On roof of 11 Southwood Road
Assessment Position	Residential Properties to south and east		
Background Position	At front of site		
Distance	Approximately 25m from NSP		
Item	Calculation	Clause	Commentary
Specific Noise Level <i>L_{Aeq}</i> 1 hour	47 dB	6.3	Specific noise level was calculated
Acoustic Feature Correction	+5	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	52dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level as there was no audible characteristic.
Background Noise Level	46 dB	7.1.	The background noise level was measured at assessment position.
Assessment Level	+6dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997 ^[3]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	+6dB		
Conclusion	The assessment level is “above marginal significance”		

8.2 National Planning Policy

Noise Policy Statement for England (NPSE) - 2010

National Planning Policy Framework (NPPF) 2012

Any Time (24 hours per day)

Source	Operating Times	Source Position
Kitchen Extract	07:00 to 23:00	On the roof at 11 Southwood Road
Assessment Position	Residential Properties above Site	
Item	$L_{Amax,fast}$	Commentary
Maximum Level from Extract	47 dB	At the nearest noise sensitive property
LOAEL	35 dB	NNGL – Biological Effects – Motility or onset of motility
SOAEL	45 dB	NNGL – Sleep quality – Waking up early in the night or early in morning
Assessment	The proposed noise levels from the facility will be above both the LOAEL and SOAEL. The levels do not comply with the 1st, 2nd and 3rd aims of the Noise Policy Statement for England 2010.	

9 NOISE CONTROL MEASURES

In order to reduce the conclusion by >16dB to meet the criterion of -10dB below background; it is recommended that the following is installed. The orientation of the splitters should not be facing the nearest noise sensitive residence.



Enclosure with Splitter Outlet Attenuators

18mm Marine grade ply with 50mm acoustic insulation lined within.

Dimensions of enclosure to meet 50mm around profile of plant

INSTALLATION SHOULD NOT BE UNDERTAKEN UNTIL STRUCTURAL APPROVAL. APPROX WEIGHT 30KGM2

Orientation	w/o Noise Control @ 1m	W Noise Control @ 1m	Insertion loss @ 1m
Front	84	70	14
Left	80	60	20
Right	80	60	20
Back	78	55	23
Above	80	60	20
OVERALL		19.4dB	

Octave Band Centre Frequency (Hz)						
63	125	250	500	1000	2000	4000
6	9	15	21	22	22	22
Insertion Loss (dB)						

The above shows the resulting insertion loss of a previously installed enclosure by Impact Acoustics. The resulting assessment is shown below:

10 ASSESSMENT – POST NOISE CONTROL

10.1 Day Time Assessment (16 hour - 07:00 to 23:00)

Rating Industrial Noise affecting Mixed Industrial and Residential Areas			
British Standard 4142:1997 Day Time (07:00 to 23:00)			
Source	Operating Times		Source Position
Kitchen Extract	12:00 – 21:00		On roof of 11 Southwood Road
Assessment Position	Residential Properties to south and east		
Background Position	At front of site		
Distance	Approximately 25m from NSP		
Item	Calculation	Clause	Commentary
Specific Noise Level <i>L_{Aeq} 1hour</i>	47 dB	6.3	Specific noise level was calculated
Acoustic Feature Correction	+5	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	52dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level as there was no audible characteristic.
Noise Control reduction	19dB		Reduction in level due to enclosure
Rating Level w Noise Control	33dB		
Background Noise Level	46 dB	7.1.	The background noise level was measured at assessment position.
Assessment Level	-13dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997 ^[3]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	-13dB		
Conclusion	The assessment level is “complaints unlikely”		

10.2 National Planning Policy

Noise Policy Statement for England (NPSE) - 2010

National Planning Policy Framework (NPPF) 2012

Any Time (24 hours per day)

Source	Operating Times	Source Position
Kitchen Extract	07:00 to 23:00	On the roof at 11 Southwood Road
Assessment Position	Residential Properties above Site	
Item	$L_{Amax,fast}$	Commentary
Maximum Level from Extract	33 dB	At the nearest noise sensitive property
LOAEL	35 dB	NNGL – Biological Effects – Motility or onset of motility
SOAEL	45 dB	NNGL – Sleep quality – Waking up early in the night or early in morning
Assessment	The proposed noise levels from the facility will be below both the LOAEL and SOAEL. The levels do comply with the 1st, 2nd and 3rd aims of the Noise Policy Statement for England 2010.	

11 CONCLUSIONS

11.1 Background Noise Levels

11.1.1 Background Noise Levels

The background noise levels were recorded on Wednesday 12th November 2014 and the lowest 1 hour LA90 value was established as LA90,1 hour 46 dB between the hours of 1300 and 2100 hours.

11.1.2 Noise Sensitive Properties

The kitchen extract terminates on the roof of the building with the nearest noise sensitive properties located in 2 locations surrounding the site.

11.1.3 British Standard 4142:1997

The kitchen extract system was assessed in accordance with BS4142; the resultant noise level at the nearest residential façade will result in a conclusion under British Standard 4142:1997 of *"complaints unlikely"* post noise control measures.

11.1.4 Noise Control Measures

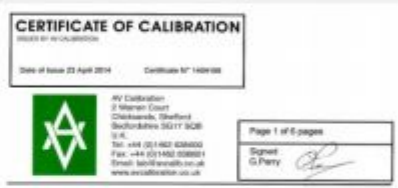
Noise Control Measures have been recommended in the form of enclosures made from marine grade ply and internally lined with acoustic absorption. Upon installation the noise emissions from the plant result in a conclusion of *"complaints unlikely"*.

11.2 Conclusion of Report

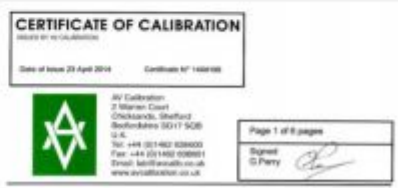
The operation of the kitchen extract was assessed in accordance with BS4142:1997. The existing kitchen extract system results in a conclusion of -13dB indicating *"complaints unlikely"* and will not have a detrimental effect on the local residential amenity following recommended noise control measures.

12 APPENDIX A - MEASUREMENT EQUIPMENT

12.1 Sound Level Meter

Calibration Details		Scan of Calibration Certificate Header
Manufacturer	Casella Measurements	
Type	CEL633 C1	
Serial Number	3439495	

12.2 Microphone

Calibration Details		Scan of Calibration Certificate Header
Manufacturer	Casella Measurements	
Type	CEL 251	
Serial Number	00092	

12.3 Calibrator

Calibration Details		Scan of Calibration Certificate Header
Manufacturer	Casella Measurements	
Type	CEL 120 / 1	
Serial Number	3239935	

12.4 Check on Site

An operational check was performed at the beginning and end of the test by applying the above calibrator to the sound level meter and performing a standard meter check to ensure the meter was working correctly. Upon collection the meter was checked and it was determined that it had not sustained any damage and the results indicated that the measurements were valid.

13 APPENDIX B – REQUIRED INFORMATION SUMMARY BS4142

Section 10: BS4142:1997	Item	Description
a)	Source Under Investigation	
1)	Source – Extractor	External Plant on the roof at 11 Southwood Road
2)	Hours of Operation	1200 - 2100
3)	Mode of operation	Operates continuously
4)	Location of Source	See Report
b)(i)	Dominance/Audibility	The plant will be inaudible and not dominant during operating hours
c)(i)	Assessment Position (Source measurement)	3.5m from façade of adjacent nsp (see figure)
e)	Operational Tests	
1)	Calibrator	The associated calibrator was used
2)	Before Tests/After Tests	94dB/94dB
f)	Weather conditions	
1)	Wind speed	<3m/s
2)	Temperature	16°C
3)	Precipitation/Humidity	-
4)	Fog	No fog present for any measurements
g)	Date and time of measurement	11 th November
i)	Measurement Time Intervals	See Report
j)(i)	Reference time interval	-
j)(ii)	Reference time interval	-
k)	Resultant Levels	See Results
l)	Background noise levels	See Results
m)	Excess of Background	See Results

14 APPENDIX C – BACKGROUND NOISE MEASUREMENTS

14.1 11th November and Assessment Position

Time	Laeq	Lamax	LA90
16:00	55.1	73.7	49.7
17:00	56.5	75.1	51.0
18:00	54.6	73.1	49.0
19:00	55.9	74.4	49.3
20:00	54.4	75.0	46.1

