Appendix 7 – Noise Survey and Assessment

Noise Assessments - Storrington and Avington
Storrington Noise Assessment
IGas Energy plc.

Assignment Number: L100078-S00
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Storrington Noise Assessment
L100078-S00

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Project Assessment - Storrington Noise Assessment
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Table of Contents

EXECUTIVE SUMMARY

A noise assessment has been conducted at the IGas Storrington well site in support of renewal of the planning permission for the site SR/68/96.

The planning application will be to retain the well site and equipment at Storrington and to continue to produce hydrocarbons until 31 December 2017. Current production levels at the wellsite are approximately 80 bopd, which is taken off site in one to two tankers per week. It is understood that there are no plans to drill any additional wells.

Condition 6 of the planning consent requires that a noise monitoring scheme be submitted and approved as part of the permission. The noise monitoring scheme 'Storrington development noise monitoring scheme' AT4118/S1/BCP [Reference 1] was submitted and approved in 1997 and is considered to be still appropriate.

Condition 8 requires noise levels at the façade of any residential property to not exceed 45 dB $L_{Aeq,1h}$ during the periods in which well drilling operations are being carried out and 35 dB $L_{Aeq,1h}$ at all other times.

Measurements were conducted during the night-time hours on the 16th / 17th April 2013 in accordance with the monitoring scheme in order to discharge planning condition 8.

The noise environment during the survey period was dominated by the nearby road A283 and other sources of noise. The site was generally inaudible at most residential locations.

Due to such low contributions from the wellsite, a calculation has been used to assist in assessing the contribution of the site at noise sensitive receivers. Two methods were used:

- Correcting L_{A90} levels measured at each receiver location; and
- Prediction of the noise contribution from the wellsite at receiver locations using measurements conducted at the wellsite boundary.

The maximum calculated contribution due to the site at the façade of the closest noise sensitive receiver is 26 dB L_{Aeq}. This is well below the planning noise limit of 35 dB L_{Aeq}.

1 INTRODUCTION

The IGas Storrington well site is located in West Sussex, adjacent to the South Downs National Park. IGas wishes to renew the planning permission for operation of the wellsite and has requested a noise assessment in order to discharge planning condition 8 of SR/68/96.

The planning application will be to retain the well site and equipment at Storrington wellsite and to continue to produce hydrocarbons until 31 December 2017. Current production levels at the wellsite are approximately 80bopd, which is taken off site in 1 to 2 tankers per week. There are no plans to drill any additional wells.

The objective of the study is to determine the noise levels due to current operations at the three closest noise sensitive receiver locations to the site, and confirm that these are below the limit set out in the planning condition.

Measurements were conducted during the night time hours on the 16th and 17th April 2013. Measurements were conducted in line with the 'Storrington development noise monitoring scheme' AT4118/S1/BCP [Reference 1].

In this report, all sound pressure levels are quoted in dB re 20 μPa and all sound power levels in dB re 1 pW.

2 DESCRIPTION OF ACOUSTIC TERMS

When listening to noise which occurs out in the open (e.g. from road traffic, aircraft, birds, wind in the trees etc.), it is common experience that the noise level is not constant in loudness, but is changing in amplitude all of the time. Therefore, in order to numerically describe the noise levels, it is beneficial to use statistical parameters. It has become practice to use indices which describe the noise level which has been exceeded for a certain percentage of the measurement period, and also an index which gives a form of average of the sound energy over a particular time interval. The former are termed percentile noise levels and are notated L_{A90}, L_{A50}, L_{A10} etc. and the latter is termed the equivalent continuous noise level and is notated by L_{Aeq}. It is worth noting that if the noise level does not vary with time, then all the parameters, in theory, normalise to a single value.

With regard to the percentile levels, the L_{A90} is the sound pressure level which is exceeded for 90% of the measurement time. It is generally used as the measure of background noise in environmental noise standards. The L_{A10} is the sound pressure level which is exceeded for 10% of the time and is often used to describe traffic noise.

The L_{Aeq} (sometimes denoted $L_{Aeq,T}$) is the equivalent continuous noise level and is an energy averaged value of the actual time varying sound pressure level over the time interval, T. It is used in the UK as a measure of the noise level of a specific industrial noise source when assessing the level of the specific source against the background noise. It is also used as a measure of ambient noise (i.e. the "all-encompassing" sound field).

The term 'A' weighting implies a measurement made using a filter with a standardised frequency response which approximates the frequency response of the human ear at relatively low levels of noise. The resulting level, expressed in 'A' weighted decibels, or dBA, is widely used in noise standards, regulations and criteria throughout the world.

For a more detailed analysis of the frequency characteristics of a noise source, then noise measurements can be made in bands of frequencies, usually one octave wide. The resulting levels are termed octave band sound pressure levels. The standard octave band centre frequencies range from 31.5 Hz (about three octaves below middle 'C' on the piano) to 8 kHz (about five octaves above middle 'C'). This covers most of the audible range of frequencies (usually taken to be around 20 Hz to 20 kHz). Both the 'A' weighted and 'C' weighted noise levels can be calculated using the octave band data. Octave band noise levels are usually quoted as linear data – i.e. without an 'A' or 'C' weighting filter being applied.

The term decibel is a relative quantity and should always be referenced to an absolute level. In this report, all sound pressure levels (denoted L_P) are expressed in dB ref 20 μPa.

Subjectively, and for steady noise levels of a similar character, a change in noise level of 2 - 3 dBA is normally just discernible to the human ear. A difference of 10 dBA represents a doubling or halving of subjective loudness.

Sound power (denoted L_W) is the acoustical power radiated from a sound source. The advantage of using the sound power level, rather than the sound pressure level, in reporting noise from industrial sites is that the sound power is independent of the location of the site, distance from the measurement point and environmental conditions. If the sound power of a source is known, then it is possible to calculate the sound pressure level at a distance away from the source, accounting for the attenuation due to propagation, as discussed above. In this report, all sound power levels are expressed in dB ref 1 pW.

3 PLANNING NOISE CONDITION

Planning condition SR/68/96 contains two conditions relating to noise:

Condition 6 requires that a noise monitoring scheme be submitted and approved as part of the permission. The noise monitoring scheme 'Storrington development noise monitoring scheme' AT4118/S1/BCP [Reference 1] was submitted and approved in 1997.

Condition 8 states:

"all equipment used at any stage of the development of the site for the production of oil and gas or the generation of electricity shall at all times be silenced to a standard such that the maximum noise levels from the on-site operations measured at the facades of any residential property liable to receive increased noise levels due to the on-site operations do not exceed 45dB(A) L_{Aeq}/1hr during the periods in which well drilling operations are being carried out and 35dB(A)L_{Aeq}/1hr at all other times. The noise levels shall be measured in accordance with DoE guidance MPG11 and the British Standard 7445. If so required by the MPA tests shall be carried out by the operator in order to demonstrate that the equipment conforms to the above mentioned standards and, in the event that it does not, all use of that equipment shall cease until measures have been taken to silence it to an acceptable standard."

The limits have been expressed as façade levels which includes a reflection from the façade of a building. When comparing with free-field levels (i.e. measurements conducted in the absence of an acoustically reflective façade) a correction must be made (façade levels are nominally 3 dB higher).

Putting the planning condition in context, L_{Aeq} limits are 10 dB lower than those outlined in WHO guidelines for community noise (1999) [Reference 2] for the night time period.

4 SITE DESCRIPTION AND NOISE SENSITIVE RECEIVERS

The Storrington well site is located in West Sussex to the west of the village of Storrington, adjacent to the South Downs National Park, with the A283 running between the boundary of the park and the wellsite.

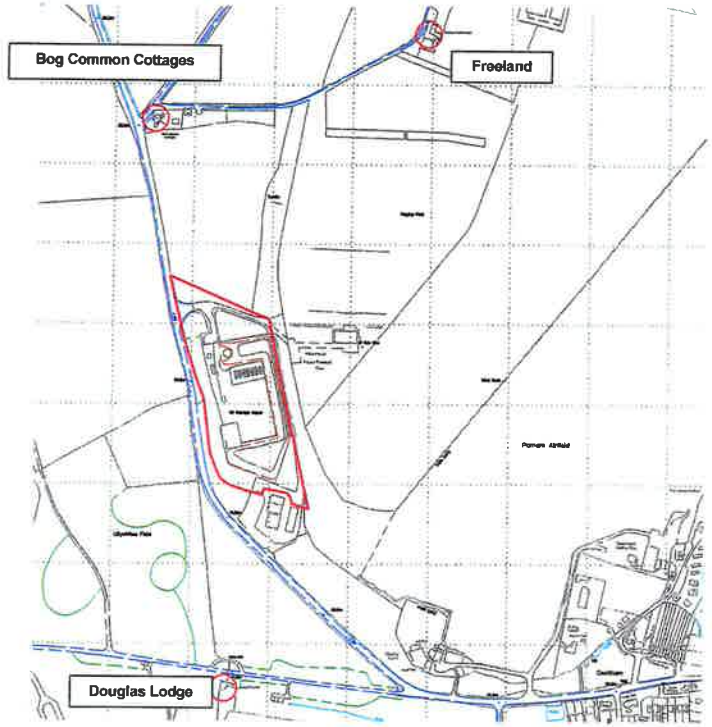

Figure 4.1 Storrington Wellsite and Area Map

The closest noise sensitive receivers to the wellsite are the residential properties marked in red in Figure 4.1, as follows:

- Douglas Lodge, 350 m to the South;
- Bog Common Cottages, 370 m to the North;
- Freeland, 500 m to the North East.

Noise generating equipment on the site includes beam pumps (nodding donkeys), water injection pumps and power generation.

5 METHODOLOGY

In order to determine current operational noise levels, a noise survey was undertaken over a single night-time period between 23:00 and 02:00 on 16th / 17th March 2013.

Measurements were undertaken in accordance with 'Storrington development noise monitoring scheme' AT4118/S1/BCP [Reference 1]. This comprised 10 minute samples of overall A-weighted L_{eq}, L_{Max}, L_{90}, L_{50}, L_{10} and L_1 indices in addition to un-weighted L_{eq} and L_{90} octave band levels. Measurements were conducted with a Brüel and Kjær 2260 Type 1 sound level meter. Local meteorological conditions during the survey were recorded, including wind speed and direction, temperature and relative humidity.

In addition, a measurement was taken at the perimeter of the wellsite, as an indication of the current noise emission from the site.

6 RESULTS AND DISCUSSION

Noise measurements were undertaken using a Brüel & Kjær 2260 analyser, calibrated with a 4231 acoustic calibrator. No significant calibration drift was observed during the survey. Full results of the noise survey are presented in Appendix A including a measurement at the plant boundary. A summary of noise levels at the closest noise sensitive receiver locations is presented in **Error! Reference source not found.**.

Location	Wind Direction	Range of noise measurements		Noise Environment Description
		Ambient, dB L_{Aeq}	Background, dB L_{A90}	
Douglas Lodge	S	32 – 37	21 – 25	Road noise dominates, wellsite inaudible
Bog Common Cottages	S	41 – 51	21 – 26	Road noise dominates, wellsite sometimes audible
Freeland	S	27 – 37	20 – 26	Road noise dominates, wellsite audible
Site Boundary 100m from acoustic centre	S	37	35	Wellsite dominates, Beam pump major noise source

Table 6.1: Noise Levels at Sensitive Receiver Locations (dBA)

Noise levels in the vicinity of the wellsite are dominated by road noise from the A283, and other more distant roads which had regular traffic movements, even during the quietest period of the night. The wellsite was generally inaudible except at Freeland which was less dominated by road noise. The measured L_{Aeq} values are therefore not representative of contributions from the wellsite.

It is believed that car movements on the closest roads, planes and bird calls contributed to the noise environment for less than 10% of the time during the quietest measuring period, therefore the L_{A90} is considered the most useful measure of noise contributions from the wellsite, which serves to better exclude the other extraneous non continuous sources.

For relatively steady state industrial noise, such as that produced by the wellsite, the difference between L_{Aeq} and L_{A90} is typically 1 to 2 dB (the L_{Aeq} noise level being higher). In order to quantify the ambient noise contribution from the wellsite adding 2 dB to the L_{A90} will give a reasonable indication of the L_{Aeq}. Predicted L_{Aeq} values using this method can be found in Table 6.2.

For additional confidence a measurement was taken at the site gate, where noise from the site dominates the noise environment. Since the beam pump was subjectively the key contributor from the wellsite calculations of sound power have been conducted assuming the beam pump as a point source. This gives the site a sound power of 85 dB L_{WA}. ISO 9613 [Reference 3] has been used in order to predict the contribution from the wellsite at noise sensitive receiver locations. A summary of the noise contribution at each receiver, from the wellsite using both the prediction method and correction of measured L_{A90} values during the quietest night time measurement period is presented in Table 6.2.

Location	Estimated ambient L_{Aeq} from measured L_{A90} values + 2 dBA	Predicted ambient L_{Aeq} (dBA) using ISO 9613 propagation model
Douglas Lodge	23	21
Bog Common Cottages	23	20
Freeland	22	17

Table 6.2: Estimated Noise Contribution from Wellsite at Noise Sensitive Receiver Locations

It should be noted that the ambient noise estimation using a correction to the measured L_{A90} will also include contribution from other noise sources, such as roads, so it would be expected that these numbers are higher.

The maximum noise contribution at the closest noise sensitive receiver from the above analysis is 23 dB L_{Aeq}. This gives a maximum façade level of 26 dB L_{Aeq}. This is well below the planning noise limit of 35 dB L_{Aeq}.

Noise at the receiver locations was generally broadband in nature and included contributions from nearby roads, planes, wildlife and other ambient noise events. During the quietest period of the night the characteristic squeak of the beam pump noise was just audible at Freeland and Bog Common Cottages.

7 CONCLUSION

A noise assessment has been conducted at the Storrington Wellsite in support of renewal of the planning permission for the site SR/68/96. Measurements were conducted during the night time hours on the 16th / 17th April 2013 in accordance with the monitoring scheme (AT4118/S1/BCP) in order to discharge planning condition 8, which has an operational noise limit of 35 dB L_{Aeq}. It is concluded that:

- Noise from the site was often inaudible at the noise sensitive receivers.
- The maximum noise due to the site at the façade of the closest noise sensitive receiver is 26 dB L_{Aeq}.
- Noise from site is well below the planning noise limit of 35 dB L_{Aeq}.

8 REFERENCES

1. 'Storrington development noise monitoring scheme' AT4118/S1/BCP Acoustic Technology Technical Report.
2. Guidelines for Community Noise, World Health Organisation, 1999.
3. ISO 9613-2:1996, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

APPENDIX A NOISE SURVEY DATA

Appendix A.1 Octave Band Data

Location	Time	Type	Octave band centre frequency, Hz									Overall, dBA
			31.5	63	125	250	500	1k	2k	4k	8k	
A	23:10:15	L_{eq}	47	43	37	29	29	35	30	20	16	**37**
B	23:34:16	L_{eq}	50	50	46	41	43	50	43	32	20	**51**
C	23:49:36	L_{eq}	48	42	39	37	35	32	26	18	15	**37**
A	00:04:39	L_{eq}	42	45	35	24	26	32	27	19	14	**34**
B	00:20:58	L_{eq}	43	40	36	33	34	40	32	21	14	**41**
C	00:35:44	L_{eq}	45	41	38	36	29	32	25	15	13	**35**
A	00:51:29	L_{eq}	46	45	34	23	23	29	25	15	13	**32**
C	01:11:03	L_{eq}	43	37	30	20	20	24	19	15	14	**27**
B	01:25:18	L_{eq}	39	42	38	34	33	39	32	21	14	**41**
Site gate	01:40:14	L_{eq}	45	41	42	41	32	28	25	18	15	**37**
A	23:10:15	L_{90}	41	36	29	23	22	20	15	11	12	**25**
B	23:34:16	L_{90}	40	36	27	22	21	20	14	12	12	**26**
C	23:49:36	L_{90}	42	38	31	19	20	21	14	11	11	**26**
A	00:04:39	L_{90}	38	35	28	20	19	17	12	11	11	**23**
B	00:20:58	L_{90}	39	34	26	20	19	17	12	12	12	**23**
C	00:35:44	L_{90}	41	37	28	18	17	19	13	10	11	**24**
A	00:51:29	L_{90}	38	33	25	18	14	12	9	10	11	**21**
C	01:11:03	L_{90}	38	33	26	14	13	15	11	10	11	**21**
B	01:25:18	L_{90}	35	29	20	14	13	13	10	10	11	**20**
Site gate	01:40:14	L_{90}	41	38	40	38	30	24	22	14	12	**35**

Appendix A.2 Statistical Indices, Meteorological Data and Comments

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ENVIRONMENTAL NOISE SURVEY SHEET

Job No:	L100078-S00
Surveyor Details:	Nathan Thomas

Storrington Wellsite

Date:	16/04/13 – 17/04/13
SLM Type:	Bruel & Kjaer 2260
SLM Serial No:	2168661

			Local Weather						Subjective Audibility (0 - 4)*						Sound Pressure Level, dB					Comments
Location No.	Start time	Duration (mins)	Wind Speed, ms^{-1}		Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in trees and vegetation	Roads	Birdsong	Footsteps	Planes	L_{Aeq}	L_{Amax}	L_{A10}	L_{A50}	L_{A90}	**General Comments** Noise environment is dominated by other sources, mainly road noise and the site is either inaudible, or just audible at community receivers. L_{A90} considered most reflective index for evaluation of underlying noise contribution from site.
A	23:10:15	10.00	0.8		S	9	88	6		2	4		1		37	52	40	30	25	Passing cars on A283 dominate. Nearby water flow noise. Site not audible.
B	23:34:16	10.00	0.4		S	9	88	6		2	4	2	2	1	51	67	52	31	26	Passing cars on A283 dominate. Some aircraft noise. Nearby water flow noise. Site not audible.
C	23:49:36	10.00	1.7		S	9	88	6	2	2	2	2		1	37	56	40	31	26	Passing cars on A283 audible. Some aircraft noise. Birdcalls from owls. Site audible. Periodic squeak from beam pumps (~6s).
A	00:04:39	10.00	0.4		S	9	94	6		2	3	2	1		34	50	38	26	23	Passing cars on A283 dominate. Wind rustling in trees. Birdcalls from Owls. Site not audible.
B	00:20:58	10.00	0.8		S	9	94	6	2	2	2	2	2	1	41	62	32	26	23	Passing cars on A283 audible. Some aircraft noise. Nearby water flow noise. Site faintly audible (including light periodic squeak).
C	00:35:44	10.00	1.4		S	9	94	6	2	2	2	2			35	55	37	27	24	Passing cars on A283 audible including racing motorbikes. Some aircraft noise. Birdcalls from owls. Site audible. Periodic squeak from beam pumps (~6s).
A	00:51:29	10.00	1.3		S	9	96	6		2	3	2	1		32	49	29	23	21	Passing cars on A283 dominate. Wind rustling in trees. Birdcalls from Owls. Site not audible.
C	01:11:03	10.00	1.1		S	9	96	6	2	2	2	2			27	42	31	24	21	Passing cars on A283 audible. Some aircraft noise. Birdcalls from owls. Site audible. Periodic squeak from beam pumps (~6s).
B	01:25:18	10.00	1.2		S	9	96	6	2	2	2	2	2		41	67	27	21	20	Passing cars on A283 audible. Some aircraft noise. Nearby water flow noise. Site faintly audible (including light periodic squeak).
Site gate.	01:40:14	0.45	0.9		S	9	96	6	4						37	42	38	36	35	Site noise dominates, particularly beam pump (nodding donkey) which is the source of the periodic squeaking noise

* *0 = inaudible, 1 = barely audible, 2 = audible, 3 = clearly audible, 4 = dominant*

Locations: A –Douglas Lodge, B – Bog Common Cottages, C - Freeland