

Viridor Waste Management Limited

Dunbar Energy from Waste Facility

PPC Application Noise Assessment

August 2007

Prepared by:
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January 2008


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The preparation of this report by RPS has been undertaken within the terms of the Brief using all reasonable skill and care. RPS accepts no responsibility for data provided by other bodies and no legal liability arising from the use by other persons of data or opinions contained in this report.

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1 Introduction

1.1 This report provides an assessment of the potential noise and vibration effects arising from the operation of the facility against Best Available Techniques (BAT) and provides the information required to complete those sections of the Pollution Prevention and Control (PPC) permit that are relevant to noise and vibration. The report includes the following sections:

- *Noise Units, National Standards and Guidance* - a summary of relevant information provided by national guidance documents.
- *Regional and Local Guidance Documents and Consultation* – a summary of relevant information provided by regional and local guidance documents. A summary of consultations with East Lothian Council (ELC) and the Environment Agency (EA) are also provided.
- *Assessment Methodology and Significance Criteria* – a description of the methodology used to predict and assess the noise and vibration effects and the criteria used to determine their significance.
- *Baseline Conditions* – description of the results of monitoring of daytime and night-time noise levels are provided in order to determine the existing noise climate in the vicinity of the proposed site. A description of the significant noise sources that affect the area in the vicinity of the proposed site is also provided.
- *Predicted Effects* – quantitative or qualitative assessment of noise and vibration levels at the nearest noise sensitive receptors (NNSRs) during the operation of the facility and the determination of the significance of any resulting effect.
- *Summary and Conclusions* – a summary of the noise assessment and conclusions with regards to BAT.

2 Noise Units, Standards and Guidance

Noise Units

- 2.1 Noise is defined as unwanted sound. The range of audible sound is from 0 dB to 140 dB. The frequency response of the ear is usually taken to be about 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.
- 2.2 For variable noise sources such as traffic, a difference of 3 dB is just distinguishable. In addition, a doubling of a noise source would increase the overall noise by 3 dB. For example, if one item of machinery results in noise levels of 30 dB(A) at 10 m, then two identical items of machinery adjacent to one another would result in noise levels of 33 dB(A) at 10 m. The "loudness" of a noise is a purely subjective parameter but it is generally accepted that an increase/decrease of 10 dB corresponds to a doubling/halving in perceived loudness.
- 2.3 External noise levels are rarely steady but rise and fall according to activities within an area. In an attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:
- L_{Amax} noise level*
- 2.4 This is the maximum noise level recorded over the measurement period.
- L_{Aeq} noise level*
- 2.5 This is the "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard (BS) 7445 [1] as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".
- 2.6 It is a unit commonly used to describe community response plus, construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

L_{A10} noise level

- 2.7 This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

L_{A90} noise level

- 2.8 This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Specific noise level (SNL)

- 2.9 The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given reference time interval ($L_{Aeq, T}$).

Rating level (RL), L_{AR,TR}

- 2.10 The SNL, plus any adjustment for the characteristic features of the noise, such as a continuous tone or intermittent banging that would increase the likelihood of complaint.

National Standards and Guidance

IPPC Sector Guidance Note – Incineration of Waste and Fuel Manufactured from or Including Waste

- 2.11 The IPPC Technical Guidance Note applicable to Energy from Waste Facilities, S5.01 [2] contains the following advice with regard to noise and vibration:

“Indicative BAT requirements for noise and vibration

Describe the main sources of noise and vibration (including infrequent sources), the nearest noise-sensitive locations and relevant environmental surveys which have been undertaken, and the techniques and measures used for the control of noise.

1 The Operator should employ basic good practice measures for the control of noise, including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise (for example, bearings, air handling plant, the building fabric, and specific noise attenuation kit associated with plant, equipment or machinery).

2 The Operator should also employ such other noise control techniques to ensure that the noise from the installation does not give rise to reasonable cause for annoyance, in the view of

the Regulator and, in particular, should justify where Rating Levels ($L_{Aeq,T}$) from the installation exceed the numerical value of the Background Sound Level ($L_{A90,T}$).

3 Further justification will be required should the resulting field rating level ($L_{AR,TR}$) exceed 50 dB by day and a facade rating level exceed 45 dB by night, with day being defined as 07:00 to 23:00 and night 23:00 to 07:00.

4 In some circumstances "creeping background" (i.e. creeping ambient) may be an issue. Where this has been identified in pre application discussions or in previous discussions with the local authority, the Operator should employ such noise control techniques as are considered appropriate to minimise problems to an acceptable level within the BAT criteria.

5. Noise surveys, measurement, investigation e.g. on sound power levels of individual items of plant) or modelling may be necessary for either new or existing installations, depending upon the potential for noise problems. Where appropriate, the Operator should have a noise management plan as part of its management system."

Horizontal Guidance Note IPPC H3 – Horizontal Guidance for Noise

- 2.12 H3 [3] cites the use of BS 4142 [4] for assessing whether industrial noise is likely to give rise to complaints from residents and states (Part 2, page 57, A2.1.2.1) "*This standard does not offer any guidance on BAT, although H3 states that the alleviation of complaints should be one of the criteria considered in the determination of BAT*".

BS 4142 'Method for rating Industrial Noise Affecting Mixed Residential and Industrial Areas, 1997'

- 2.13 BS 4142 describes a method for assessing industrial and background noise levels outside residential buildings and for assessing whether the industrial noise is likely to give rise to complaints from the occupiers of residential buildings.
- 2.14 The method is based upon a comparison between the RL of the noise from the specific source being considered and the background noise level (measured as an L_{A90}), in the absence of the specific source. The noise level from the specific source is increased by 5 dB if the source has any distinctive characteristics (tones or impulses such as whines, hums or bangs), or if it is irregular enough to attract attention and becomes known as the RL.
- 2.15 Since background noise levels vary throughout the a 24-hour period, it has been necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the project, in accordance with BS 4142. BS 4142 suggests that the RL should be determined for a 1-hour period during the daytime (taken to be from 07:00 to 23:00 hours) and for a 5-minute period during the night-time (taken to be from 23:00 to 07:00 hours).

- 2.16 For the daytime period, the Sector Guidance indicates that the free-field RL should be taken and for night-time, the façade level should be taken. The difference between the free-field and façade level is generally taken to be a rounded value of 3 dB for the RL (due to reflection effects associated with a specific source) but no correction is applied to the background level as there is usually no specific source influencing this metric and hence reflection effects don't occur.
- 2.17 The standard states that if the RL of the noise exceeds the background noise by around 10 dB or more, complaints are "likely". An increase of 5 dB is deemed to be of "marginal significance" whilst a difference of minus 10 dB or more indicates that "complaints are unlikely".
- 2.18 In situations where the L_{A90} background noise level at night is "low" (less than 30 dB L_{A90}) and the RL is low (less than 35 dB L_{A90}), the standard states that the rating method of BS 4142 is not applicable. In these circumstances, it is standard practice to assess the noise effect by considering sleep disturbance criteria and other aspects such as noise change. However, the night-time background noise levels are in excess of 30 dB L_{A90} in this area and hence this circumstance does not occur.

Concawe

- 2.19 Concawe / ATL Report No 4/81: The Propagation on Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities [5] gives a method of calculating sound propagation over larger distances. The method is capable of assessing a range of meteorological conditions; for this assessment, a moderately worst-case condition is assumed, with a light downwind breeze carrying noise from the site to the surrounding receptors.

Effects Upon Avian Species

- 2.20 There is no formal guidance on the effects of temporary noise on the activities of birds. A study for the Environment Agency by WS Atkins [6] concluded that *'Whilst it may be tempting to conclude from the above data and discussion that a level of 40-45 dB L_{eq} provides a useful benchmark, the literature is not sufficiently robust to suggest that this could be used as a no-effect threshold due to large intra and inter-species variations and uncertainties regarding the way in which some of the earlier research was conducted. Site specific assessments are therefore necessary to demonstrate site and species-specific thresholds'*.

- 2.21 It is considered that wildlife may be more sensitive to startle due to impulsive noises, rather than ‘annoyance’ due to a change in overall levels and also habituation may occur to any type of noise provided levels are not sufficient to interfere with communication. Therefore, consideration has been given to changes in the frequency of occurrence and magnitude of impulsive noises, and to the introduction of new impulsive sources.
- 2.22 For ecological (avian) receptors, as a result of inter and intra species variation, temporal variation and the research difficulties of distinguishing noise effects from other disturbance forms, there is currently significant uncertainty with respect to clearly identifying thresholds for continuous and impulsive noise events below which there is certainty that noise is not having an adverse effect on the integrity of a protected site. As such, significant noise impacts can only be deemed to have occurred when observable disturbance behaviour is observed.
- 2.23 Therefore, based upon the difficulties in defining the significance of effects upon a SSSI, it is proposed that the following elements should be considered:
- Whether the level at the SSSI exceeds the 40-45 dB L_{Aeq} range
 - How the above range compares to baseline levels in the same area
 - The characteristics of the noise

Regional and Local Guidance Documents and Consultation

East Lothian Council (ELC)

- 2.24 A response to the Environmental Statement Scoping Report was received from ELC on 3 August 2007. The following point related to noise and vibration:

Noise / Odours

- 3.21 *The ES must include detailed information on expected noise / odour output from the operational facility given its function, scale and location. Increased traffic associated with the proposed development may result in increased noise levels. Construction noise may also be a potential issue. The extent of these impacts must be assessed by the ES and any mitigation measures detailed. This should address both the construction and operational phases of the proposed development. The key receptors will be people living and working near the development and / or adjacent to roads that may experience an increase in traffic volumes and other species that may be affected by such and increase.*
- 2.25 Other responses to the scoping report were received from:
- East Lothian Council, Development Control;

- East Lothian Council, Environment Policy and Projects;
- East Lothian Council, Transportation Planning Officer;
- Health and Safety Executive, Hazardous Installations Directorate;
- Scottish Environment Protection Agency (SEPA);
- Scottish Executive Environment Directorate, Climate Change Division;
- Scottish Executive Environment Directorate, Planning Division;
- Scottish Water;
- JMP Consulting;
- Scottish Natural Heritage; and
- Historic Scotland.

None of these other responses specifically addressed noise and / or vibration.

Baseline Noise Survey Locations

- 2.26 The baseline noise surveys provided for this assessment were undertaken at locations identified as being representative of the surrounding residential properties. These were at Easter Meilke Pinkerton and Broxmouth.
- 2.27 It is considered that the survey locations included in this assessment are representative of the closest, and hence potentially most significantly affected, residential receptors and, therefore, there is no justification for an assessment of more distant, less sensitive residential receptors.
- 2.28 No assessment has been made of the effects of noise from the development on the adjoining landfill, quarry or cement works. There is no national or international guidance concerned with the likelihood of complaints from commercial / industrial areas affected by industrial noise.

Post Development Monitoring

- 2.29 Post development monitoring is addressed in this report. However, it may not be appropriate to undertake post development monitoring at the baseline monitoring locations. This is because the noise levels at these locations would be influenced by a number of noise sources and, therefore, a comparison between baseline and post development monitoring would not enable a meaningful assessment of the noise emissions from the facility to be undertaken.
- 2.30 Post development noise criteria, for example, as described by a planning condition, should be based upon noise levels that are measured at the site boundary. These criteria are usually determined by a comparison between the rating and background noise levels at the nearest sensitive receptors from which the rating level is corrected for distance to determine the noise levels at the site boundaries that would satisfy the criteria.

Noise Contour Maps

- 2.31 The assessment includes a noise contour map of the rating level from the facility. However, it would not be usual, or practicably possible, for noise contour mapping of baseline background noise levels to be provided. The generation of background noise contours would require an extensive programme of long-term noise surveys, which would be particularly onerous and time-consuming. The baseline noise surveys have determined the background noise level at the potentially most affected sensitive receptors to enable a sufficiently robust assessment. It is considered that the request for contours of baseline background noise level to be unreasonable, impractical and unnecessary.

Emergency Situation, Vibration and Real World Data

- 2.32 All of the three remaining points are addressed within this chapter.

3 Assessment Methodology and Significance Criteria

Baseline Survey Methodology

- 3.1 The noise assessment methodology requires a comparison to be made between the existing daytime and night-time noise environments at the Nearest Noise Sensitive Receptors (NNSRs) and the future Ratings Levels (RLs) that would be expected to occur, at those locations, with the EfW being operated. Existing noise levels were determined by a field study.
- 3.2 The field study comprised two, long-term unattended noise surveys at separate locations in the area. The noise monitors were installed at locations that were representative of the NNSRs to the EfW facility, which are houses to the north and southwest of the site, at Easter Meikle Pinkerton and Broxmouth. The survey locations are shown in Figure 1.
- 3.3 The long-term survey logged measurements over a period of 7 days. All surveys were undertaken at freefield locations with the microphone at a height of 1.5 m above ground level.
- 3.4 The instrumentation was calibrated both prior to and immediately following the surveys to ensure that no significant drift had occurred over the survey period. All instrumentation was within the manufacturers' periods of calibration, as specified in BS 7445 [7].
- 3.5 BS 4142 requires a 'representative background noise level' to be adopted for the assessment. There is no government or BS guidance that states what is considered to constitute 'representative' and the night-time period can be subject to a wide variation as it includes the evening/night and night/morning 'shoulder' periods. One approach that is commonly adopted, and has been adopted for this project, is to use the average L_{A90} between 07.00 and 23.00 hours for the daytime period and the average between 23.00 and 07.00 hours for the night-time period.

Prediction of Noise Emissions from the Facility

- 3.6 Noise levels arising from the operation of the facility have been predicted using WS Atkins NoiseMap noise modelling software, implementing the methodology contained within BS5228 and Concawe. Source terms have been obtained from Keppel Seghers, the technology supplier for the project, BS 5228 Part 1 and the DEFRA update to BS 5228 for items of mobile plant.

Significance Criteria

- 3.7 The operational effects of static sources have been assessed using the methodology contained within BS 4142. The following criteria have been developed from the IPPC Technical Guidance Note S5.01:
- RLS not to exceed the background noise level at NSRs by more than 5 dB;
 - RLS, $L_{AR,TR}$ (07.00 – 23.00 hours) < 50 dB at NSRs; and
 - RLS, $L_{AR,TR}$ (23.00 – 07.00 hours) < 45 dB at NSRs.
- 3.8 Significant operational vibration effects are unlikely and, therefore, a quantitative assessment is not required.

4 Baseline Conditions

Site and Area Description

- 4.1 The proposed location of the facility is within the Dunbar Landfill Site, Oxwellmains, which is owned and operated by Viridor Waste Management Ltd. The Dunbar site currently operates as a landfill, adjacent to a quarry and cement works operated by Lafarge and these activities would continue once the proposed facility became operational. The site lies between the A1 and the railway south of Dunbar. The surrounding area is predominantly rural, with coastal parkland to the north. The proposed facility site occupies an area of land designated for use as landfill. The area on which the facility is proposed comprises an area of the former quarry infilled with quarry spoil, not yet utilised as landfill. A plan of the area around the site is provided in Figure 1.
- 4.2 The site is situated in a generally semi-rural area, with agricultural land dominating the surrounding landscape. However, the location of the site within a landfill, with Lafarge cement works and Torness Power Station in the surrounding 5 km gives the site an industrial background.
- 4.3 The site is remote from areas of residential development. The following residential properties / areas have been identified, the nearest being approximately 500 m from the proposed facility main building.
- 4.4 The nearest residential properties are:
- Eastern Pinkerton, approximately 500 m to the southwest of the site;
 - Meikle Pinkerton, approximately 800 m to the southwest of the site;
 - North Lodge, approximately 1000 m to the south of the site;
 - Catcraig, approximately 1100 m to the north of the site;
 - Little Pinkerton, approximately 1400 m to the west of the site;
 - Thurston Manor, approximately 1500 m to the south of the site;
 - Broxburn, approximately 1600 m to the northwest of the site;
 - Broxmouth, approximately 1800 m to the northwest of the site;
 - Skateraw, approximately 2100 m to the east of the site;
 - Innerwick, approximately 2400 m to the southeast of the site;
 - Newtonlees, approximately 3000 m to the northwest of the site;
 - Dunbar, approximately 4000 m to the northwest of the site;
 - Spott, approximately 4000 m to the west of the site;
 - Oldhamstocks, approximately 6500 m south to the of the site;
 - Cockburnspath, approximately 8000 m to the southeast of the site;

The assessment has also considered the following noise sensitive receptors:

- Barns Ness, which is approximately 1200 m to the northeast of the site; identified as important for wildfowl.

Survey Locations and Noise Environment

Long-term – 4 Easter Meikle Pinkerton

- 4.5 The survey was undertaken at the end of the property's area of hardstanding, with a restricted view towards the development site at approximately 500 m distance. The microphone was set at a height of 1.5 m above local ground level, in a free-field position. The survey was undertaken from 13:33 hours 20th July to 13:41 hours on 27th July 2007. Figure 1 shows the location of the noise monitoring.
- 4.6 The instrumentation used consisted of a Rion NL-31 Sound Level Meters and a Brüel & Kjær 4231 Calibrator. The SLMs were set-up to record the 1-second L_{Aeq} noise metric. All instrumentation was calibrated both prior to and immediately following the survey, to ensure that no significant drift had occurred over the survey period. All instrumentation was within the manufacturer's periods of calibration, as specified in BS 7445-1:2003.
- 4.7 Background noise at the location was dominated by noise from road traffic on the A1, with noise from the cement works possibly contributing during the quietest periods on the road. The results from the long-term survey are provided in Table 4.1 below.

Long-term – Broxmouth Cottage

- 4.8 The second survey was undertaken in the garden of Broxmouth Cottage, approximately 1600 m from the proposed site. The proposed development site and surrounding was obscured from site.
- 4.9 The microphone was set at a height of 1.5 m above local ground level, in a free-field position. The survey was undertaken from 12:37 hours 20th July to 13:27 hours on 27th July 2007. Figure 1 shows the location of the noise monitoring surveys.
- 4.10 The instrumentation used consisted of a Rion NL-32 Sound Level Meters and a Brüel & Kjær 4231. The SLMs were set-up to record the 1-second L_{Aeq} noise metrics over the measurement period. Additionally, the Rion sound recording module recorded events over 78 dB(A) and audio snap-shots at 15-minute intervals. These indicated that the sources of maximum noise levels tended to be a mix of events local to the meter (dogs barking and birdsong) and more distant aircraft activity, specifically military jet aircraft.

- 4.11 Ambient noise at this location was characterised by vehicle noise on the A1087 and A1 beyond, and by environmental noise. All instrumentation was calibrated both prior to and immediately following the survey, to ensure that no significant drift had occurred over the survey period. All instrumentation was within the manufacturer's periods of calibration, as specified in BS 7445-1:2003.
- 4.12 While on site, further observations of the noise character of the site were made: Background noise at the location was dominated by noise from road traffic on the A1 and A1087, with noise from the quarry and cement works contributing during the quietest periods on the roads. Reversing beepers were occasionally audible, presumed to be from the quarry or landfill sites. The results from the long-term survey are provided in Table 4.1 below.

Table 4.1: Long-term Noise Survey Results

Table 4.1: Long-term Noise Survey Results									
		4 Easter Meikle Pinkerton				Broxmouth Cottage			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Day 07:00 – 23:00	Max	70	91	62	49	59	88	61	53
	Min	36	50	38	33	43	59	45	33
	Avg	51	73	48	41	50	64	53	42
Workday 07:00 – 19:00 ¹	Max	59	83	62	48	58	87	61	53
	Min	44	72	40	35	47	59	50	35
	Avg	47	75	48	41	48	64	54	42
Night 23:00 – 07:00	Max	54	66	57	50	54	69	56	52
	Min	34	43	35	31	37	56	36	27
	Avg	41	54	45	38	43	61	48	39

Note ¹: 07:00 – 19:00 Monday to Friday, 07:00 – 13:00 Saturday, not Sunday

5 Predicted Effects

Noise During Commissioning of the Facility

- 5.1 Some activities associated with the commissioning of the plant are likely to give rise to high noise levels. Steam blowing of pipework is noisy and generally lasts approximately one minute per blow. There would be approximately two blows per day for approximately two weeks.
- 5.2 It has not been possible to undertake a quantitative assessment of noise emissions during commissioning of the facility due to the difficulty in obtaining appropriate source terms. However, these activities are temporary, of a very limited duration and would not be undertaken during the night-time. It is considered that appropriate community liaison that would inform local residents of the proposed testing schedule is the only effective additional measure that would be practicable for these sources during this phase of the commissioning.

Operational Noise Sources

- 5.3 A list of the significant operational noise sources with descriptions of their acoustic characteristics is provided below.
- 5.4 The noises within the facility typically comprise low frequency rumbles from machinery, broadband noise from rushing air and intermittent high frequency squeaks, impulses and hisses from machinery and air vents. However, the internal noise field is diffuse and reverberant, which will reduce the tonality and impulsive characteristics of the overall noise within the facility and, consequently, emissions from the facility in the far field, which is where the NSRs are, will be continuous, broadband industrial type in character.

Control Valves

- 5.5 There would be a number of control valves within the boiler hall. Noise emissions would be continuous, steady and tonal in the high frequencies when close to the source. Emissions would not be tonal in the diffuse, reverberant noise field within the boiler hall and the contribution to the noise within the hall would be broadband but greater in the high frequencies than the low frequencies.

Combustion Chamber

- 5.6 The combustion chamber will be housed within the boiler room. Noise emissions are continuous, variable and comprise intermittent hissing from air leakage, continuous low frequency rumble and intermittent impulsive noises. The impulsiveness of the emissions from

this source will be significantly reduced within the diffuse, reverberant noise field within the boiler hall and the contribution to the noise within the hall would be broadband.

Combustion Air Fans

- 5.7 There would be four primary combustion air fans, 22 kW each and one fan of 7.5 kW, each with an associated electric motor, located within the boiler house. Noise emissions would be continuous, steady and broadband in character. There will be two secondary air combustion fans of 90 kW.

Exhaust Fan

- 5.8 The exhaust fan will be located within the boiler room. Noise emissions would be continuous, steady and broadband in character, arising from the motor and air movement.

Boiler Water Feed Pump and Motor

- 5.9 This source comprises a 250 kW electric motor and a multi-stage high-pressure pump and is located within the boiler room. Noise emissions would be continuous, steady and comprise a broadband noise and a high-frequency tone. The tonality of the emissions from this source will be significantly reduced within the diffuse, reverberant noise field within the boiler hall and the contribution to the overall noise within the hall would be broadband.

Waste Reception Hall

- 5.10 The waste reception hall comprises a reception area for deliveries from RCVs, cranes to transfer waste to the process equipment via a hopper and the inlet to the primary air fan. Noise emissions would be intermittent and variable, depending upon crane activity and whether or not an RCV was unloading in the hall. The noises within the tipping hall would comprise a hum from the fan inlet, intermittent vehicle and reversing signal noise from the RCVs and intermittent clattering noise from delivery and loading of waste.

Air-Cooled Condenser

- 5.11 The air-cooled condenser will be located externally to the Facility, to the south of boiler room. Noise emissions would be continuous and broadband, arising from the electric motors and the movement of air through the equipment.

Operational Noise Source Data

- 5.12 Only limited acoustic data is available for the above sources. Keppel Seghers indicate that sound attenuation measures would be incorporated into the design of the project to ensure that noise levels in the external and internal general plant areas do not exceed 85 dB(A) at 1 m distance in places where staying due to maintenance or operation is necessary (measured at free field conditions). Exceptions are listed below.
- Safety valves – 120 dB(A) at 1 m distance
 - Start up vent valves – 100 dB(A) at 1 m distance
 - Hydraulic Group (in specific enclosure)
 - Impulse noise sources (such as mechanical rapping system, air shocks and pneumatic hammers)
- 5.13 Keppel Seghers have also indicated that: the total sound pressure level from all apparatuses combined will not exceed 100 dB(A) at 1 m distance; the sound pressure level outside buildings will not exceed 65 dB(A) at 5 m distance, except for the air-cooled condenser; and the sound pressure level at 200 m from the site enclosure will not exceed 43 dB(A).
- 5.14 Included in the list above, there would be occasional sources that would occur during an emergency situation, for example, during a power cut or during the plant start-up. Whilst it is difficult to predict the actual usage / occurrence of these sources, the following table provides an indication of what may occur.

Table 5.1: Indicative Occurrence of Noise from Emergency and Start-up Equipment

Noise Source	Duration	Occurrence
<i>Emergency Equipment</i>		
Emergency pressure release valves	1-min	2 – 3 per year
Testing emergency pressure release valves (required by legislation)	1-min	1 per 18-months
MP steam pressure relief blow	1-min	5 – 15 per year
ACC steam pressure relief blow	1-hour	1 per year
<i>Start-up Equipment</i>		
Hogging ejector	2 – 3 hours	10 – 20 per year
Start-up vent	12-hours	10 per year
Start-up burner (internal noise source)	4-hours	10 per year
Booster burner (internal noise source)	18-hours	10 per year

- 5.15 The most significant of the sources listed in Table 5.1 are the emergency pressure release valves. It is considered that the noise effect of the operation of these is not significant due to the very limited operational duration and infrequent occurrence.

Prediction of Noise Emissions from the Facility

- 5.16 Noise emissions from the facility have been predicted using a WS Atkins NoiseMap noise model. Limited source terms are provided by Keppel Seghers, the technology advisor, from near-field measurements of specific items of plant.
- 5.17 As quoted previously, Keppel Seghers state that sound attenuation measures would be incorporated into the design of the project to ensure that noise levels in the external and internal general plant areas do not exceed 85 dB(A) at 1 m distance in places where staying due to maintenance or operation is necessary (measured at free field conditions). Exceptions are listed below.
- Safety valves – 120 dB(A) at 1 m distance
 - Start up vent valves – 100 dB(A) at 1 m distance
 - Hydraulic Group (in specific enclosure)
 - Impulse noise sources (such as mechanical rapping system, air shocks and pneumatic hammers)
- 5.18 Keppel Seghers have also indicated that: the total sound pressure level from all apparatuses combined will not exceed 100 dB(A) at 1 m distance; the sound pressure level outside buildings will not exceed 65 dB(A) at 5 m distance, except for the air-cooled condenser; and the sound pressure level at 200 m from the site enclosure will not exceed 43 dB(A).
- 5.19 The primary assessment has been based upon the 'normal' operational situation and, therefore, does not include the emergency and start-up equipment identified above. Secondary assessments of emergency and start-up conditions have also been modelled. The results of the BS 4142 assessment are provided in Appendix A. A contour map of the noise emissions under normal operation predicted by the model is provided in Figure 2.

BS 4142 Assessment

- 5.20 BS 7445 Part 2 suggests that tonality may be assessed as follows:

'... 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 5 dB or more.'

- 5.21 No spectral data has been provided for any of the noise sources identified above. It is considered that some tonal character would not be unexpected from the operations of the site. Whilst it is unlikely that this tonal character would carry to the nearest sensitive receptors, a worst case assessment has been made on the basis that the tonal content remains. Thus a +5 dB rating correction has been added to the specific noise level.
- 5.22 In practice, based upon the criterion for tonality suggested by BS 7445, is it considered likely that the specific noise level from the facility would not be tonal at the NNSRs.
- 5.23 The greatest effect has been predicted to occur at Easter Meikle Pinkerton Farm. The results of the BS 4142 assessment indicate that during normal operation, the RL would not exceed 35 dB during either the daytime or the night-time or the background noise level during the daytime or night-time at the majority of NSRs.
- 5.24 This is less than 5 dB above the minimum measured background level of 31 dB L_{A90} at Easter Meikle Pinkerton, and 3 dB below the average night-time background noise level. An assessment under BS 4142 reports that this level of noise would be of less than marginal significance, and is an indication that complaints are unlikely.
- 5.25 Noise levels during start-up are likely to be approximately 11 dB greater than during normal operation. During an emergency steam vent, levels are likely to be approximately 31 dB greater than from normal operation. Whilst these unusual conditions may be audible at some NNSRs, the infrequency of events will ensure that no significant impact occurs in the surrounding area.

Effects Upon Avian Species

- 5.26 With reference to Figure 2, noise emissions from the facility have been predicted to be approximately 20 dB $L_{Aeq,12hr}$ at Barns Ness, the closest area important for wildfowl. A study for the Environment Agency by WS Atkins on the effects of noise on the activities of avian species concluded that *'a level of 40-45 dB L_{eq} provides a useful benchmark'*. Only within approximately 200 m of the facility would levels reach this magnitude. Furthermore, existing ambient noise levels are significantly in excess of the predicted noise level from the facility and, therefore, a significant effect upon avian species is unlikely to occur as a result of the operation of the EfW.

6 Summary and Conclusions

- 6.1 The noise and vibration effects arising from the operation of the proposed EfW have been assessed and satisfy the criteria contained within the IPPC Technical Guidance Note S5.01 at residential receptors.
- 6.2 The results of the noise assessment indicate that complaints would be unlikely at the nearest residential areas to the site and that adverse effects on wildfowl would be unlikely to occur at the Barns Ness area of ecological importance or beyond.
- 6.3 It is considered that the design constitutes 'Best Available Technology' (BAT).

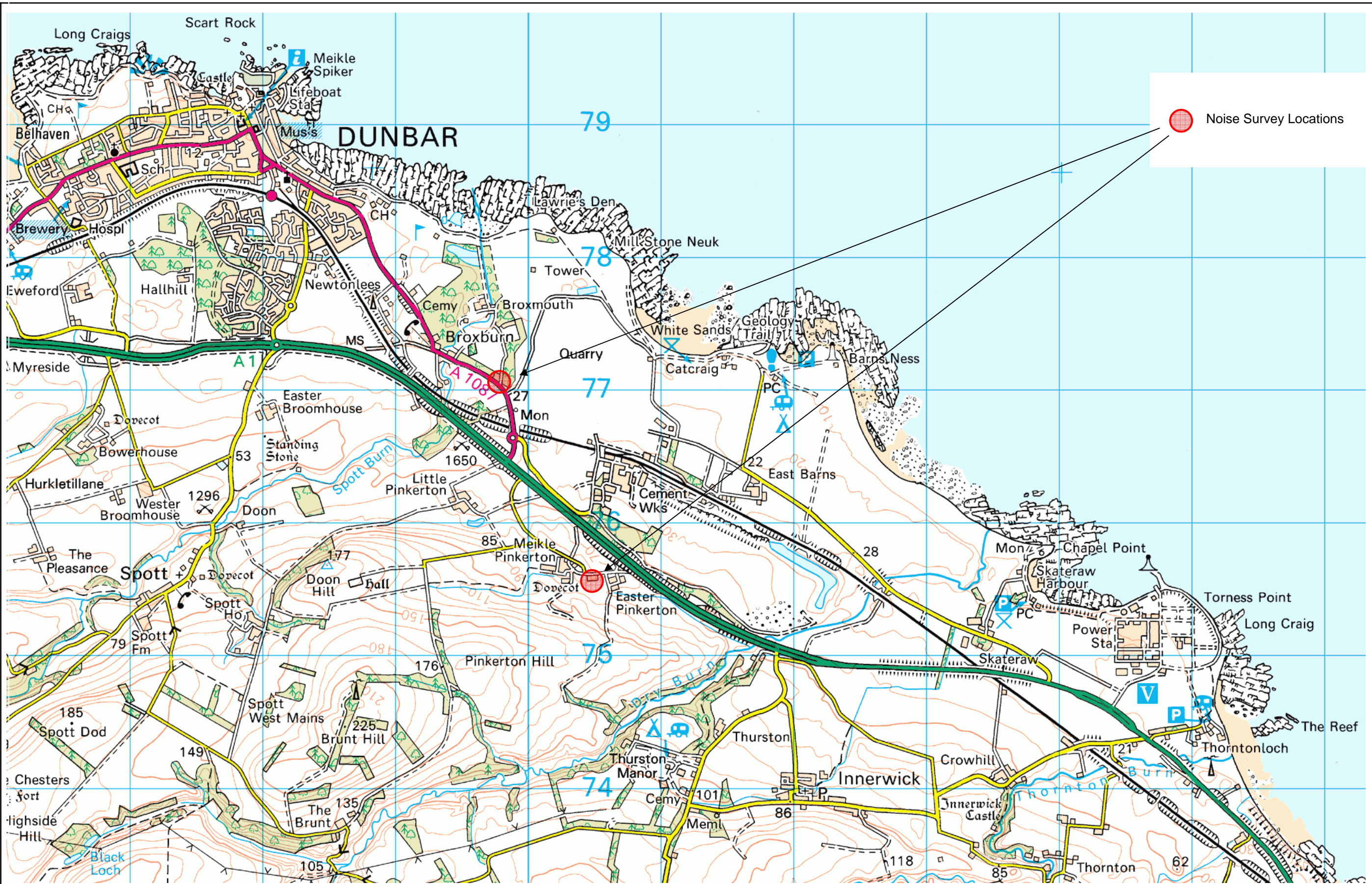
References

1. British Standards Institution. British Standard 7445: Description and Measurement of Environmental Noise, Part 1. Guide to Quantities and Procedures, 2003.
2. Environment Agency. IPPC S5.01 Guidance for the Incineration of Waste and Fuel Manufactured from or Including Waste, 29 July 2004.
3. Environment Agency. IPPC Horizontal Guidance for Noise H3. Part 1 – Regulation and Permitting, Part 2 – Noise Assessment and Control, June 2004.
4. British Standards Institution. British Standard 4142: Method for rating Industrial Noise Affecting Mixed Residential and Industrial Areas, 1997.
5. Concawe. ATL Report No 4/81: The Propagation on Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities, 1981.
6. Environment Agency. Assessment of noise disturbance upon birds and dust on vegetation and invertebrate species. Final Report. July 2003.
7. British Standards Institution. British Standard 7445: Description and Measurement of Environmental Noise, Part 2. Guide to the acquisition of data pertinent to land use, 1991. ISO 1996-2: 1987.

Figures

Figure 1

Site Location and Survey Locations



Noise Survey Locations

Figure: Noise Assessment – 1

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Figure 2

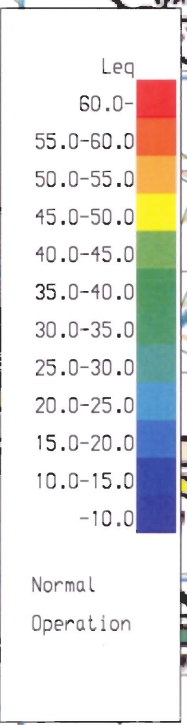
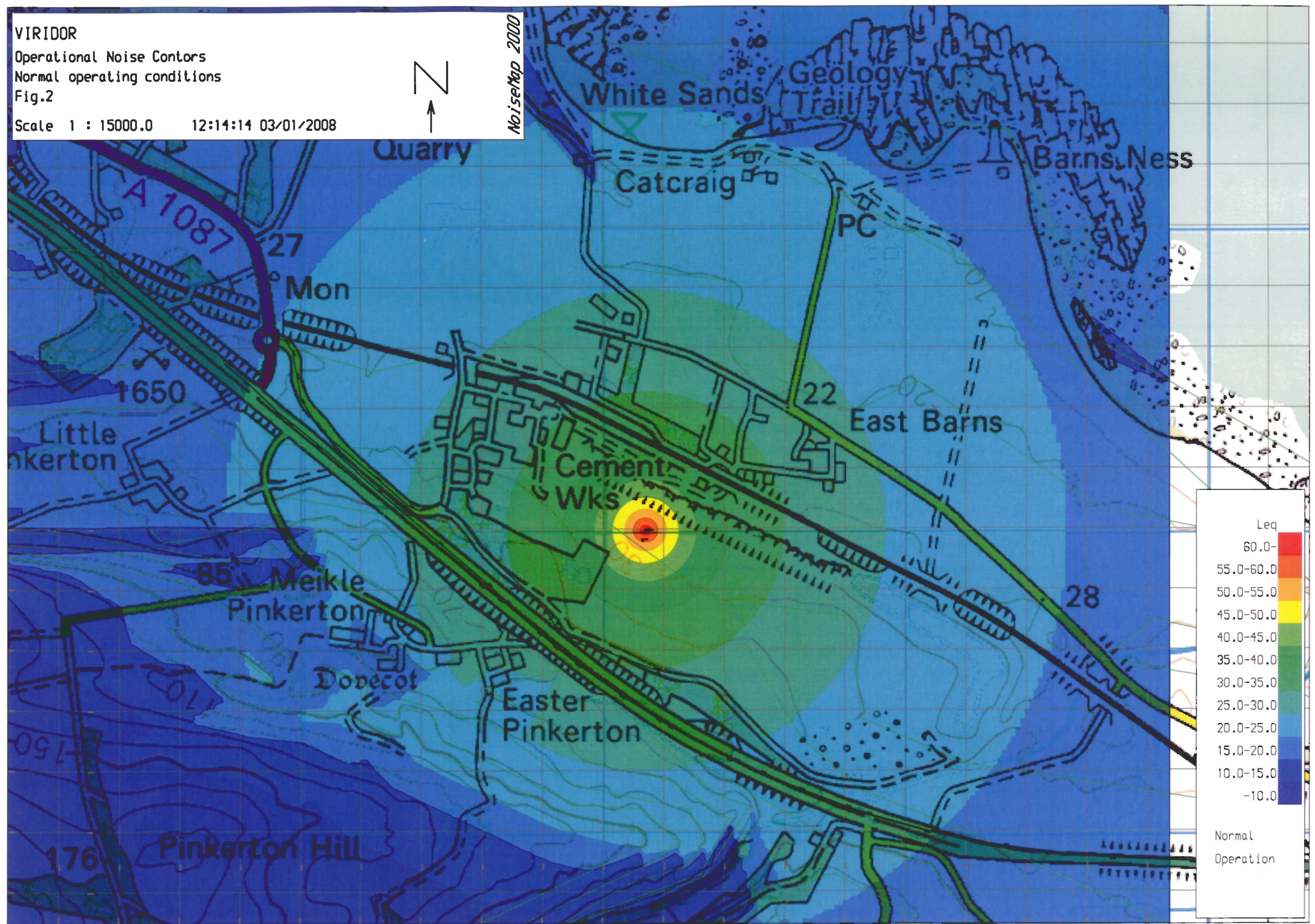
Operational Noise Contours

VIRIDOR
Operational Noise Contors
Normal operating conditions
Fig.2

Scale 1 : 15000.0 12:14:14 03/01/2008



NoiseMap 2000



Appendices

Appendix A

Operational Noise Assessment Results

**Appendix A
Operation Noise Assessment Results**

		Normal Operation	Emergency operation / test	Startup steam vent	Opening site, commencement of the works	Substructure works, foundations, floors	Superstructure / Walls Roof	Night-time concrete pour
1	Eastern Meikle Pinkerton Far	30	61	41	44	47	39	37
2	Eastern Meikle Pinkerton Far	30	61	41	44	47	39	38
3	1 Eastern Meikle Pinkerton	29	60	40	42	45	37	36
4	3 Eastern Meikle Pinkerton	28	59	40	42	45	37	36
5	6 Eastern Meikle Pinkerton	28	59	39	42	45	37	35
6	7 Eastern Meikle Pinkerton	28	59	39	40	43	35	33
7	West Meikle Pinkerton Farm	27	58	38	37	40	32	31
8	Meikle Pinkerton	27	58	38	38	42	34	32
9	3 West Meikle Pinkerton Cot	24	57	38	33	37	29	26
10	North Lodge Cottage	25	56	36	38	41	33	32
11	Broxmouth Gatehouse	21	52	32	33	37	28	26
12	Broxmouth	20	51	31	31	35	27	25
13	PC	24	55	35	37	40	32	31
14	Skateraw	19	50	30	32	35	27	26
15	Little Pinkerton	22	53	33	31	37	27	25
16	Thursdon Manor	7	42	22	18	22	14	12