Jersey Waste Facilities

Energy from Waste Facility

Noise Assessment

November 2006

JACOBS

Document control sheet

Client: States of Jersey
Project: Jersey Waste Facility
Title: Noise Assessment

Job No: B2091100

	Prepared by	Reviewed by	Approved by
ORIGINAL	NAME **R Mansfield**	NAME **J Rowland**	NAME **J Rowland**
DATE **August 2006**	SIGNATURE	SIGNATURE	SIGNATURE

REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

JACOBS

Contents

		Page
1	Introduction	1
2	Consultation	2
3	Assessment Methodology	2
4	Baseline Conditions	5
5	Proposed Development Description	7
6	Prediction of Impact Assessment	7
7	Mitigation	10
8	Summary	12

Appendix A – Noise Terminology

Appendix B – Long Term Unattended Noise Measurements

Appendix C – Calculations

1 Introduction

1.1 A new Energy from Waste (EfW) facility is proposed to be sited at La Collette, St. Helier, Jersey. Currently there is an Energy from Waste facility located at Bellozanne. The current facility at Bellozanne is to be demolished once the La Collette facility is operating. The Jersey Electricity Company (JEC) power station is currently located at La Collette and the proposed Energy from Waste facility would be sited alongside this.

1.2 The construction and operation of the Energy from Waste facility at La Collette could potentially result in additional noise emissions affecting nearby sensitive receptors. The potential noise generating activities include:

- noise emanating from the construction of the site;
- noise from road traffic during the construction and operational phase; and
- operational noise from plant.

1.3 The Energy from Waste facility is proposed to be operating in 2010.

1.4 This section of the Environmental Impact Statement assesses the impact of the proposed facility with regard to noise. It describes the methods used to:

- quantify the baseline noise conditions currently existing at and around the site;
- identify potentially affected noise sensitive receptors;
- assess the potential direct and indirect impacts arising from the proposed development; and
- the identification and assessment of mitigation measures.

1.5 New plant associated with the Energy from Waste facility, relevant to the planning application, having the potential to generate noise, consist of:

- receiving hall;
- refuse bunker;
- boiler house including energy from waste units and boilers;
- bottom ash area;
- flue gas treatment plant including scrubber reactor and fabric filter house;
- scrubber reactor;
- bag filter house;
- induced draught fans and external ducts to existing Jersey Electricity Company power station chimney ;
- compressor house;
- flue gas treatment residue silo;
- flue gas ducts;
- weighbridges;
- steam turbine (housed within existing turbine building);
- waste incinerator;
- bulky waste facility;
- waste shredders (daytime use only); and
- traffic.

1.6 The steam turbine is to be housed in the existing Jersey Electricity Company power station alongside existing steam turbines, and has therefore been excluded from this assessment.

1.7 The Energy from Waste facility area of the site applicable to this assessment is proposed to operate 24 hours a day and 7 days a week. The hours proposed for delivery of waste would relate to daytime periods from 07:00 hours to 18:00 hours Monday to Friday. Saturday deliveries would be between the hours of 07:00 hours to 13:00 hours.

1.8 The prediction of noise emanating from the operational aspects of the proposed facility has been carried out by Dean Kettlewell of Noise & Vibration Consultants Ltd. Jacobs has been unable to verify these noise calculations provided by Noise & Vibration Consultant Ltd. It is assumed, however, that all work undertaken by Noise & Vibration Consultants Ltd has been undertaken with due skill, care and diligence to ensure all information is accurate.

2 Consultations

2.1 The relevant Authority for the proposed development is the States of Jersey. Consultation was undertaken with the Environmental Health Officer (EHO) to agree an appropriate approach for the noise assessment. It was agreed that the assessment shall be undertaken in accordance with the methods and criteria provided in British Standard 4142:1997 (BS 4142)[1] for day-time periods. The Environmental Health Officer requires noise from plant to not exceed the representative background noise level (L_{A90}) by more than 5 dB.

2.2 In addition, noise emanating from plant associated with the facility shall not exceed the octave noise levels provided in the Noise Rating (NR) 30 curve, during night-time periods, one metre from the window of nearby residential properties.

The Noise Rating curves are developed by the International Organisation for Standardisation (ISO) to determine the acceptable indoor environment for hearing preservation, speech communication and annoyance. A Noise Rating curve of 30 is applied to private dwellings, hospitals, theatres, cinemas and conference rooms.

2.3 Potential noise impacts associated with changes in traffic flows on the local road network as a result of the proposed Energy from Waste facility are to be assessed using noise change methodology. Road traffic noise level predictions have been undertaken following the methodology contained in the Calculation of Road Traffic Noise: 1988 (CRTN)[2]. It was agreed with the Environmental Health Officer that the potential noise impact due to traffic changes would be assessed during the complete daytime period (06:00 hours to 24:00 hours) and also at peak hour periods where traffic associated with the EfW facility is considered to be at its greatest.

2.4 The locations and methodology for baseline and plant source term noise surveys were also agreed with the Environmental Health Officer.

1 British Standards Institution, British Standard BS 4142 - Method for rating industrial noise affecting mixed residential and industrial areas, 1997

2 HMSO, Department of Transport/Welsh Office, Calculation of Road Traffic Noise, 1988

3 Assessment Methodology

3.1 Noise Terminology is provided in Appendix A.

3.2 Whilst UK and EU guidelines are not mandatory in Jersey, any unacceptable noise increases are likely to be a major concern for local residents. To ensure noise is considered, UK planning guidelines have been adopted in this assessment. Within the introduction of Planning Policy Guidance 24[3] (PPG24), 'Planning and Noise': 1994, it states:

"*The aim of this guidance is to provide advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business*."

3.3 PPG 24 provides the following information:

- indicates how noise issues should be handled in development plans and development control;
- outlines ways of mitigating the adverse impact of noise;
- provides specific guidance on noisy and noise-sensitive development;
- introduces the use of noise exposure categories; and
- gives guidance on the use of planning conditions relating to noise.

Operational Noise

BS 4142:1997

3.4 PPG 24 recommends that the guidance contained within BS 4142 is used to assess noise from industrial and commercial developments. BS 4142 provides a method for rating industrial noise affecting mixed residential and industrial areas. The standard advocates the use of L_{Aeq}, a level which is directly measurable and termed the Specific Noise Level.

3.5 BS 4142 requires the addition of a 5 dB correction, to be applied to the Specific Noise Level, if the noise contains:

- a distinguishable, discrete, continuous note (whine, hiss, screech, hum etc);
- impulsive characteristics (bangs, clicks, clatters, or thumps); and/or
- the noise is irregular enough in character to attract attention.

The Specific Noise Level then becomes the Rating Level.

3.6 When used to assess industrial noise, the Rating Level is determined and the L_{A90} background level is subtracted from it. A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance and a difference of -10 dB is a positive indication that complaints are unlikely.

3 Department of the Environment, HMSO. Planning Policy Guidance Note 24: Planning and Noise (PPG24), September 1994

3.7 The Environmental Health Officer requires noise from the plant of the Energy from Waste facility to not exceed the representative background noise level (L_{A90}) by 5 dB or more. Therefore, should plant noise emanating from the facility exceed this criteria, the noise impact will be considered significant.

Noise Rating Curves

3.8 Noise rating (NR) curves relate levels of sound in octave bands to acceptability, for particular applications i.e. from industrial applications. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application.

3.9 Noise Rating curves are provided in British Standard 8233[4] (BS 8233). To achieve the required NR 30 curve, as agreed with the Environmental Health Officer, the sound level at each of the octave band centre frequencies shall be below each of the values provided in Table 1 as taken form BS 8233, during night-time periods, one metre from the window of nearby residential properties.

Table 1: NR 30 Octave Band Centre Frequencies

Octave Band centre frequency, Hz								
31.5	63	125	250	500	1000	2000	4000	8000
76	59	48	40	34	30	27	25	23

3.10 The Environmental Health Officer requires that night-time noise emanating from plant associated with the facility shall not exceed the octave noise levels provided in the Noise Rating (NR) 30 curve at nearby properties. Therefore, should plant noise emanating from the facility exceed this criteria, the noise impact will be considered significant.

Traffic Noise

3.11 In order to determine the effects of increased road traffic noise as a consequence of the development, predictions have been undertaken to the methodology contained in the Calculation of Road Traffic Noise.

3.12 An approach for determining the magnitude of noise impacts that has been used in the UK over a number of years is based on the premise that subjective response to noise from a new source is proportional to the change in overall noise level as a result of the development. The L_{Aeq} metric is the commonly adopted noise metric for general environmental noise measurement, whereas the L_{A10} noise metric is commonly used to describe and measure road traffic noise.

3.13 When considering two sounds of a similar acoustical nature, i.e. similar spectral and temporal characteristics, a change of more than 3dB(A) is regarded as being perceptible to the human ear. The magnitude of impact can be based on this acoustical 'rule of thumb', supplemented with the evidence contained within the Design Manual for Roads and Bridges[5] (DMRB) Vol 11, Section 3, Part 7, Chapter 3, Paragraph 3.5. The latter highlights that *"people are more sensitive to abrupt changes in traffic noise associated with new road schemes than would be predicted from the steady state evidence. In the period following a change in traffic flow, people may find benefits or disbenefits* when the noise changes are as small as 1dB(A)".

4 British Standards Institution. British Standard BS 8233 - Sound Insulation and Noise Reduction for Buildings - Code of Practice, 1999

5 Department of Transport, HMSO, 1993, Design Manual for Roads and Bridges Volume 11

3.14 Considering these levels, the classification system shown in Table 2 has been used in this assessment to define the magnitude of noise impacts due to changes in road traffic noise as a result of the proposed scheme.

Table 2: Criteria for the Classification of Noise Changes Associated with Road Traffic Noise

Change in Noise Level	Magnitude of Impact	Significance
10 dB(A) and greater	High	**Significant**
5 to < 10 dB(A)	Medium	
3 to < 5 dB(A)	Low	
1 to < 3 dB(A)	Slight	**Insignificant**
0 to < 1 dB(A)	No impact	

Significance boundary

Construction Noise

BS 5228:1997

3.15 In order to determine the likely noise impact from construction activities, reference has been made to British Standard 5228: 1997 - Noise and Vibration Control on Construction and Open Sites, Part 1[6], and the DEFRA publication "Update of Noise Database for Prediction of Noise on Construction and Open Sites". BS 5228 provides information on the factors, which affect the acceptability of site noise and, the degree of control necessary. It also provides a methodology for the prediction of site noise at sensitive receptors and provides guidance on possible mitigation measures.

3.16 Further guidance relating to acceptable noise criteria is provided in Department of the Environment's Advisory Leaflet 72[7]. This document is now out of print but it remains a useful guide as to likely acceptable noise levels. It provides recommended construction site noise at residential locations during daytime hours (07:00 hours – 19:00 hours). It states that noise levels outside the nearest occupied room should not exceed:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or
- 70 dB(A) in rural, suburban urban areas away from main roads and industrial areas.

3.17 These noise limits are often used by Local Authorities to control noise emanating from construction works.

4 Baseline Conditions

4.1 Environmental noise surveys have been carried out at properties considered to be representative of those which have the potential to experience the greatest noise impact as a result of the introduction of proposed facility. The detailed environmental noise surveys were carried out by Babtie Fichtner between 18th July to 20th July 2006.

6 British Standard 5228 Noise and Vibration Control on Construction and Open Sites (BS 5228), Part 1:1997'Code of Practice' for basic information and procedures for noise and vibration control. British Standards Institution

7 Department of the Environment's Advisory Leaflet 72

4.2 Through consultation with Environmental Health Officer of the States of Jersey it was agreed that a long term noise survey would be undertaken at the following locations:

De La Plage, Havre des Pas

4.3 The apartments at De La Plage are fronted by Havre des Pas to the north. Road traffic dominates the noise environment at the northern facades of these apartments. To the south, the apartments overlook the beach. The noise environment for the south facing facades consist of people using the beach and footways, waves dispersing on the beach, activities from the existing composting plant at La Collette, and distant road traffic.

4.4 The southern facades of the De La Plage apartments have the potential to be subject to noise impacts from the operation of the Energy from Waste facility whereas the northern facades have the potential to experience noise impacts due to changes in traffic flow on Havre des Pas.

4.5 Continuous façade noise levels were measured at first floor level on the northern façade of the apartments between 18 July 2006 and 20 July 2006. A RION NL-32 (serial number 00240639), Class 1 sound level meter was used for the noise survey and the microphone was established at a height of 4m.

4.6 Continuous free-field noise levels were measured at first floor level on the southern façade of the apartments between 18 July 2006 and 20 July 2006. A RION NL-32 (serial number 00151045), Class 1 sound level meter was used for the noise survey and the microphone was established at a height of 4m.

Commercial Premises above Norman Ltd. Commercial Buildings

4.7 A number of residential and commercial properties are located on Commercial Buildings. The commercial premises above Normans Ltd. are considered representative of other properties on Commercial Buildings. Road traffic dominates the noise environment at properties on Commercial Buildings.

4.8 With the introduction of the Energy from Waste facility, properties located on Commercial Buildings have the potential to experience noise impacts due to changes in traffic flow on Commercial Buildings.

4.9 Continuous façade noise levels were measured at first floor level at Normans Ltd between 18 July 2006 and 20 July 2006. A RION NL-32 (serial number 001030567), Class 1 sound level meter was used for the noise survey and the microphone was established at a height of 4m.

Caretakers apartment, Territorial Army Barracks

4.10 The Caretakers apartment at the Territorial Army Barracks is the closest noise sensitive property to the proposed facility. Road traffic using the access road to La Collette and noise from trickling water from the Caretaker's pond was noted to dominate the noise environment at this property. The existing power station located in La Collette has the potential to increase existing noise levels in this area. However, the power station was not operating and therefore baseline conditions do not take its potential noise emissions into account.

4.11 This property has the potential to be subject to noise impacts from the operation of the facility.

4.12 Continuous free-field noise levels were measured at first floor level on the balcony at the Caretakers apartment between 18 July 2006 and 20 July 2006. A RION NL-32 (serial number 00840859), Class 1 sound level meter was used for the noise survey and the microphone was established at a height of 4m.

4.13 For each noise survey location the noise metrics L_{Aeq}, L_{A90}, L_{A10}, L_{Amax} were logged at 5 minute periods at throughout the survey periods.

4.14 All sound level meters were calibrated before and after use using a RION NC-74 (serial number 00830792), showing no significant change. The measurements are therefore considered valid for the purposes of this assessment.

4.15 Weather conditions throughout the survey were generally fine and clear with light winds. A summary of the noise surveys are detailed in Table 3, with the full set of noise readings provided in tabular format in Appendix B.

Table 3: Summary of Long-term Unattended Noise Surveys

Site	Average Daytime Noise Level (07:00 – 23:00), dB				Average Night-time Noise Level (23:00 – 07:00), dB			
	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
1. De La Plage, Havre des Pas (North Façade)	68.6	81.2	71.7	53.7	58.7	70.1	52.4	41.2
2. De La Plage, Havre des Pas (South Façade)	54.4	63.7	54.5	46.3	51.5	61.5	53.4	43.0
3. Norman Ltd, Commercial Buildings	69.0	82.1	70.9	58.6	59.0	68.1	54.4	45.8
4. Caretakers apartment, Territorial Army Barracks	52.5	62.8	52.4	46.4	44.8	53.8	44.9	41.6

5 Proposed Development Description

5.1 The Energy from Waste facility will process up to 126,000 tonnes of municipal solid waste. Road vehicles including Refuse Collection Vehicles will deliver the waste to La Collette via principally Commercial Buildings.

5.2 Bulky waste will be delivered by road to the Bulky Waste Facility. The bulky waste will be separated, and combustible waste shredded. Shredding will take place in an enclosed building. The shredded waste will then be fed to the main storage bunker.

5.3 From the storage bunker, the waste is automatically fed by crane to the two grates, where the waste is burnt under oxidising conditions. The steam produced in the boiler is passed to a steam turbine and produces electricity.

5.4 The Energy from Waste facility is proposed to operate 24 hours a day, 7 days a week.

6 Prediction of Impact Assessment

Operational Noise

6.1 The following features have been identified as key sources of potential noise impact following the introduction of the proposed Energy from Waste facility:

- noise associated with the operation of the proposed facility; and
- increases in traffic noise on the local road network.

6.2 The proposed facility would be located at approximately 190m from the nearest noise sensitive property, the Caretaker's apartment at the Territorial Army Barracks. Other noise sensitive premises, such as De La Plage apartments, are located over 500m from the proposed facility.

6.3 Noise emanating from the facility would be generated from a variety of activities as outlined in Paragraph 1.51.

6.4 It is proposed to operate the facility 24 hours a day and, as discussed earlier, the potential noise impact during daytime periods will be assessed using BS4142. The potential night-time noise impacts are assessed against NR 30 curve.

6.5 Noise levels emanating from all potential activities operating during day and night-time hours, predicted at the boundary of nearest residential properties to the proposed facility, are provided in Table 4. Detailed calculations provided in Appendix C. The noise criteria agreed with the Environmental Health Officer are also provided in Table 4. The calculation method used for site operation in this study is based upon ISO9613[8], which takes into account source distance, air absorption, frequency content, screening effects and direction in relation to the nearest sensitive receptor. The predicted noise levels assume that the noise amelioration measures are implemented as detailed in Table 8.

6.6 This assessment has adopted the empirical near field data taken at similar sites in the UK. The noise predictions assume that all the plant is operating at one time so that the highest noise levels likely are assessed against the proposed noise criteria. In addition the assessment has not included for any air absorption attenuation. In light of the above it is considered that this assessment considers worst case noise levels emanating from the proposed facility.

6.7 As previously discussed the prediction of noise emanating from the operational aspects of the proposed facility has been carried out by Dean Kettlewell of Noise & Vibration Consultants Ltd. Jacobs has been unable to verify these noise calculations provided by Noise & Vibration Consultant Ltd. It is assumed, however, that all work undertaken by Noise & Vibration Consultants Ltd. has been undertaken with due skill, care and diligence to ensure all information is accurate.

Table 4 - Predicted Noise Contribution from operation of EfW Facility

8 ISO 9613 – Attenuation of sound during propagation outdoors (1996)

Receptor Position	Noise contribution from EfW Site Plant $L_{Aeq,T}$ dB	Proposed Noise Criteria $L_{Aeq,T}$ dB (day/night)
1. De La Plage, Havre des Pas (North Façade)	Daytime: 30 Night-time: 29 (NR23)	Daytime: 59 Night-time: NR30
2. De La Plage, Havre des Pas (South Façade)	Daytime: 30 Night-time: 29 (NR23)	Daytime: 51 Night-time: NR30
3. Norman Ltd, Commercial Buildings	Daytime: 30 Night-time: 28 (NR23)	Daytime: 64 Night-time: NR30
4. Caretakers apartment, Territorial Army Barracks	Daytime: 38 Night-time: 34 (NR27)	Daytime: 51 Night-time: NR30

N.B. Noise levels in brackets represent the associated NR curve derived from the predicted night-time noise level

6.8 Table 4 indicates that there are no areas where the noise levels exceed the proposed noise criteria for day or night-time operations.

6.9 The assessment of impact concludes that a neutral effect is likely at the nearest dwellings in the vicinity of the new potential noise sources

Noise on Local Road Network

6.10 From the results of the background noise survey and aural observations made on site by Babtie Fichtner, it is considered that the noise climate at De La Plage and Commercial Buildings is dominated by road traffic. The introduction of the proposed development will increase traffic flows on the local road network. Details of the traffic changes due to the proposed Energy from Waste facility are provided in the Traffic and Transportation section.

6.11 Traffic data was provided by States of Jersey's Transport and Technical Services Department. Traffic on the Jersey road network is predicted to increase annually by 0.5%.

6.12 Traffic counts were undertaken at Havre Des Pas between 13/06/06 - 13/07/06 and at Commercial Buildings between 18/07/06 - 11/08/06.

6.13 Traffic using the proposed facility will travel via Havre des Pas and Commercial Buildings. Using existing and modelled future traffic flow data, road traffic noise changes on these roads can be predicted as a result of the proposed facility.

6.14 The percentage change in traffic flow on Havre des Pas and Commercial Buildings, for the proposed year of opening of the proposed facility (2010), and the associated noise level change for the daytime 18-hour period are shown in Table 6. The resultant change in noise levels associated with the vehicle movements has been calculated using CRTN.

6.15 Predicted road traffic noise levels are based upon the Annual Average Daily Traffic (AADT) traffic flows.. When predicting road traffic noise levels CRTN requires the use of Annual Average Weekly Traffic (AAWT) 18-hour traffic flow data. However, this assessment provides noise level changes due to alterations in traffic flow and not absolute noise levels, and therefore, predicted road traffic noise levels changes are the same using either AADT or AAWT 18hr flows.

Table 6: Daily Road Traffic Noise Change as a result of the introduction of the EfW Facility (2010)

Road	% Increase in	Associated increase in

	Traffic flow	Noise Level ($L_{A10,18hr}$)
Commercial Buildings	7.5%	0.8 dB
Havre des Pas	1.0%	0.1 dB

6.16 The greatest predicted increase in noise levels associated with the change in traffic flows is shown to be 0.8 dB on Commercial Buildings with the introduction of the facility. In accordance with the criteria provided in Table 2 a noise level increase of less than 1 dB is unlikely to perceptible to residents of noise sensitive premises. This noise change is therefore not considered to be significant.

6.17 The greatest vehicle movement associated with the facility has the potential to occur in the morning peak periods. The percentage change in traffic flow on Havre des Pas and Commercial Buildings in the morning peak period, for the proposed year of opening of the facility (2010), and the associated noise level change for the 1-hour period are shown in Table 7.

Table 7: Morning Peak Hour Road Traffic Noise Change as a result of the introduction of the EfW Facility (2010)

Road	% Increase in Traffic flow	Associated increase in Noise Level ($L_{A10,1hr}$)
Commercial Buildings	4.2 %	0.7 dB
Havre des Pas	0.6 %	0.1 dB

6.18 The greatest predicted increase in noise levels associated with the change in traffic flow in the morning peak period is shown to be 0.7 dB on Commercial Buildings. In accordance with the criteria provided in Table 2 a noise level increase of less than 1 dB is unlikely to perceptible to residents of noise sensitive premises. This noise change is therefore not considered to be significant.

Construction Noise

6.19 Initial site preparation works is likely to involve the movement of soils and the construction of new buildings and infrastructure. It is considered that piling, excavators, haulage lorries, cranes, dumpers, concrete mixers, diggers and paving machines will all, at some time during the construction programme, be operating on the site. In addition, ancillary equipment such as small generators and compressors may also be operating on occasions during the construction of the Energy from Waste facility.

6.20 The above noise sources and their associated activities will vary from day to day and may be in use at different stages of the proposed development for relatively short durations. The noisiest activities are expected to be generated during soil movement work during the initial stages of the development when piling rigs, excavators or similar may be in use.

6.21 A detailed construction schedule is yet to be established and without detailed knowledge of individual construction activities and timings an assessment is not possible at this time. However, with the large separation distances between the proposed construction site and noise sensitive receptors, exposure levels during this period are anticipated to generally be below 75 dB $L_{Aeq,12hr}$.

7 Mitigation

Operational Noise

7.1 The States of Jersey are able to set out planning consent conditions to ensure that the proposed noise criteria for daytime and night-time operations are achieved.

7.2 Whilst this can be achieved by mitigation it must be noted that this assessment considers one method of treatment. There are a number of different ways in which the criteria can be achieved, for example, the use of noise control at source and/or the selection of different plant equipment which may be quieter can be investigated.

7.3 The predicted noise levels from the proposed Energy from Waste facility have been calculated with the mitigation measures in place, as detailed in Table 8, to ensure that the resultant noise levels are within appropriate guidance and standards.

Table 8: Proposed Mitigation in Design and Operation of proposed EfW Facility

Building Element	Comments
Building cladding	The walls and roof of the building would be fitted with insulated cladding (i.e. with double skin and mineral wool insulation or similar) as necessary, to a suitable standard to mitigate noise emitted.
Induced draught fan to chimney stack, including flue gas duct	The noise contribution from the induced draught fan system via the chimney stack would not exceed 75dB(A) at 1 metre from the end of the stack. This is likely to involve the installation of in-duct attenuators mounted in the extract side of the fan, in the flue gas duct, just prior to it exiting from the building.
Shredders in Bulky Waste Facility	The shredders are relatively noisy pieces of equipment, and to mitigate noise during the night time, the shredders will not be operated.
Ventilation Louvres	The air inlet weather louvres and roof mounted air outlet ventilation cowls should be designed so that the noise level does not exceed 70dB(A) at 1 metre. One method of ensuring that this is achieved would be to fit suitable attenuators to the rear of the weather louvres or acoustic louvres. The need for further attenuation will be dependent upon a number of factors including the plant noise levels, location of plant, size of louvres and their location
Reverse Alarms	Where possible the heavy goods vehicle route on and off site would be designed such that reverse alarm use is minimised. For mobile plant used on site at night-time, where practicable the plant would be fitted with attenuated alarms (e.g. Brigade Electronics 'smart alarms') or visual alarms used instead (subject to health and safety risk assessment).
Door Openings	Where practicable, door openings would be kept closed particularly during night-time periods.
Site Management	Minimise heavy goods vehicle and mobile plant movements at late evening periods (where practicable) including speed restriction.

Construction Noise

7.4 In accordance with BS5228, best practical means would be employed to control the noise generation. Typical examples of the type of measures adopted for the construction stage of the development could include:

- restriction of construction hours to non-sensitive times of day would normally form part of the planning consent conditions;
- restriction on the types of plant being used relating to noise limits for specific operations;
- switching off plant and equipment when it is not in use for longer periods of time;
- sensible routing of the construction plant to avoid the nearest residential properties;
- use of auger type piling rigs where practicable rather than drop-hammer;
- monitoring of noise levels during stages of the construction to ensure the impact is minimised.

8 Summary

Operational Noise

8.1 Noise levels have been considered and assessed to both the construction and operational phases of the proposed development. Relevant and appropriate noise guidance and standards have been used to determine the noise impact. Where appropriate, amelioration measures are proposed to mitigate noise sources to acceptable and reasonable levels.

8.2 To establish any likely impact from noise it was necessary to establish the existing noise climate at the site. This information has helped determine any likely noise impact on nearest receptors to the site during the operation of the proposed development.

8.3 The States of Jersey has been consulted throughout the assessment process to seek approval for the assessment methodology and confirmation of appropriate noise criteria.

Energy from Waste Facility

8.4 During the operation of the site it is concluded that with the installation of the proposed mitigation measures, it is unlikely adverse noise impacts would occur at nearby residential properties.

Traffic Noise on Local Road Network

8.5 Noise changes due to increased traffic flows, as a result of the proposed Energy from Waste and Bulky Waste facilities, are unlikely to be perceptible to residents of noise sensitive premises on Commercial Buildings and Havre des Pas. The predicted noise changes are considered to be insignificant.

Construction Noise

8.6 The extent of noise impacts will vary throughout the construction period and will depend on the contractor's chosen method of working, as well as the timing and phasing of certain operations. With the large separation distances between the proposed construction site and noise sensitive receptors, exposure levels during this period are anticipated to generally be below 75 dB $L_{Aeq,12hr.}$

Appendix A - Noise Terminology

The sound wave travelling through the air is a regular disturbance in atmospheric pressure. These pressure fluctuations, when within the audible range, are detected by the human ear, producing the sensation of hearing. Noise is often defined as sound which is undesired by the recipient.

It is impossible to measure nuisance caused by noise directly but it is possible to measure the "loudness" of that noise. "Loudness" is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitude of the numbers involved, a logarithmic scale of decibels (dB) based on a reference level of the lowest audible sound is normally used.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequency to approximate the human response. This is achieved by using a "A"-weighted decibel reading dB(A) and has been shown to correlate closely to the non-linear and subjective human response.

Equivalent Continuous Sound Level (L_{Aeq}) is the level of a Notional Steady Sound which at the same position and over a defined period of time, would have the same "A" Weighted acoustic energy as the fluctuating noise.

L_{A90} is the level that is exceeded for 90% of the time, often referred to as the background noise level.

L_{A10} is the level that is exceeded for 10% of the time and is used to evaluate road traffic noise.

L_{A1} is the level that is exceeded for 1% of the time and gives an indication of the higher noise levels recorded.

Free Field is where the sound is measured or calculated in the open, without any reflection from nearby surfaces.

Facade level is where there is reflection from a building or other structure, which produces a higher level. In the case of a building, the sound level close to it, say one metre from the walls, is slightly higher (2.5dB(A)) than it would be if the building were not there.

Appendix B - Long Term Unattended Noise Measurements

Appendix C - Calculations