

## **RWE Npower plc**

### **Pembroke Power Station Project**

### **Operational Noise and Vibration Management Plan**

#### **1. Introduction**

1.1. This Plan is submitted to Pembrokeshire County Council for approval pursuant to Condition 23 of the deemed planning permission for the Pembroke Power Station project granted by the Secretary of State on 5 February 2009.

1.2. In this document, unless the context otherwise requires:

- reference to a numbered condition is to that condition of the above deemed planning permission;
- “the CES” means the Consolidated Environmental Statement issued by RWE Npower plc in July 2007;
- “the Company” means RWE Npower plc and any successor as operator of Pembroke Power Station;
- “the Council” means Pembrokeshire County Council;
- “the LLC” means the Local Liaison Committee established pursuant to condition 25;
- “operation” refers to the phase of the Pembroke Power Station project following the handover of the whole Station from the Main Contractor to the Company, when the plant is being operated commercially by the Company;
- “the Permit” means Environmental Permit reference EPR/DP3333TA, granted by the Environment Agency on 10 November 2011, which authorises the combustion and associated activities carried on at the Station, and where the context so admits shall include any variation, consolidation or re-issue of the Permit for the time being in force;
- “Station” means Pembroke Power Station.

#### **2. Scope**

2.1. Condition 23 requires a noise and vibration management plan which includes provision for the monitoring of noise generated during the normal commercial operation of the Station.

2.2. Commissioning activities including commissioning operation and tests form part of the construction of the Station for noise and vibration management purposes and noise and vibration from these activities will continue to be managed under the scheme previously approved under Condition 21 until the whole of the Station has been handed over for commercial operation.

2.3. Any residual construction activity which may be taking place around the Pembroke site (e.g. the restoration of areas occupied by temporary construction facilities) is outside the scope of this scheme and will continue to be managed in accordance with the scheme previously approved under Condition 21.

2.4. The specific requirements for the plan to which this document relates, as set out in condition 23, are that it shall:

- specify the locations from which noise and vibration will be monitored;

- specify the method of noise measurement;
- specify the maximum permissible levels at each such monitoring location;
- detail the procedures for dealing with any complaints received regarding noise;
- detail the arrangements for making the noise monitoring results available to the Council;
- make provision for noise and vibration measurements to be made by the Company as soon as possible following requests by the Council and for such measurements to be given to the Council as soon as they are available.

### **3. Responsibilities**

3.1. The RWE Technology Project Director is responsible for appointing a competent noise specialist, external to RWE, to carry out noise monitoring surveys according to this plan at the specified intervals described in Section 6, until 31 December 2012.

3.2. The Company's Station Manager is responsible for the appointment of a competent external noise specialist for this purpose with effect from 1 January 2013. This specialist may be the same person as appointed under paragraph 3.1. (N.B.: The dates in this paragraph and in 3.1 shall apply irrespective of the actual date when the whole or any part of the Station enters commercial operation.)

3.3. The Company's Station Manager shall appoint one or more members of the Station staff to carry out noise measurements as required in response to observations, complaints or requests from the Council. The nominated staff members shall have the authority to take appropriate prompt remedial action to prevent or mitigate noise which is causing, or has the potential to cause, nuisance to local residents.

3.4. The Regulation Section Head at the Station is responsible for ensuring that the Station staff members appointed to carry out noise measurements are suitably trained and competent in noise measurement and assessment.

3.5. The Regulation Section Head at the Station is responsible for ensuring that suitable noise measuring equipment is kept available at the Station, in proper working order, and that the calibration of the noise meter(s) used is valid and up to date.

3.6. The external noise specialists appointed under 3.1 and 3.2 above shall be responsible for providing their own noise measuring equipment in proper working order for the purposes of scheduled noise monitoring surveys, and ensuring that the noise meter(s) used are properly calibrated.

### **4. Operational Noise Monitoring Locations**

4.1. The community reference locations for assessing the impact of operational noise from the Station were previously agreed with the Council as detailed in the CES. These are shown in Table 1 and on drawing UKP/PMB/0281/B (attached) as reference locations RP1, RP2 and RP4.

4.2. As there are currently no permanent residents in the vicinity of location RP1, the location is screened from the power station site by intervening higher ground, and background noise levels there are increased due to noise from the Valero refinery, it is not proposed to use position RP1 for operational noise monitoring. This does not

preclude noise monitoring at position RP1 being undertaken in the future should this be justified by changed circumstances.

4.3. A reference location was also originally identified in Hundleton village (RP3) but this is some 3.3 km south-east of the power station site. It was not considered further for the purposes of noise monitoring during construction and it is most unlikely to be possible to monitor compliance with operational noise limits directly at this location given the measured background noise levels in the area. It is therefore not proposed to attempt operational noise monitoring at this location.

4.4. In the case of Greenhill Farm (RP2), since the Company acquired the farm it has been the practice to measure noise at the farmhouse (shown in Table 1 and on drawing UKP/PMB/0281/B as RP2A) rather than at the original location at the junction of the farm access road with the public road to the power station site and Pwllcrochan. This reduces the impact of passing traffic on noise measurements and offers greater security when an automatic noise logger is used. It is proposed to use this revised location as the community reference position for Greenhill Farm, in preference to the original location.

4.5. In the case of Pennar Point (RP4) an alternative location in the housing development area at Pennar Point (shown in Table 1 and on drawing UKP/PMB/0281/B as RP4A) has been identified and used for noise monitoring during construction work. An automatic noise logger is currently deployed at this location which has been selected to comply with the requirements of BS 4142 while being representative of noise experienced by residents of the housing estate at Pennar Point. The automatic logger will continue to be used for noise monitoring during commissioning of the Station. For reasons of consistency it is proposed to use this location as the community reference position for Pennar Point, in preference to the original location RP4 on the access road to the Pennar Point housing estate.

4.6. There are potential difficulties in measuring compliance with noise limits where, as in this case, certain of the community receptor locations are at a significant distance from the noise sources and noise limits are close to existing background levels. Therefore alternative reference locations closer to the power station site (RP2\* and RP4\*), have been identified. These are as nearly as reasonably practicable in the same direction from the power station as the corresponding community reference positions RP2A and RP4A.

4.7. No practical alternative location close to a direct line between the power station and community reference position RP2A at Greenhill Farm has been identified. All potential locations at a suitable distance from the main power plant in this direction are either surrounded by trees or do not have an unobstructed line of sight towards the power plant. However, it is likely to be possible to assess compliance with operational noise limits directly at location RP2A under most conditions, given that this location is less than 750m from the power plant. If not, position RP2\* at the edge of a hardstanding in the former sports field west of the power station main buildings will be used. This location has direct vehicle access and will be safely accessible for measurement purposes at all times.

4.8. As much of the area between the power station (and in particular the cooling water pumps) and position RP4A is part of the Pembroke River estuary, location RP4\* can not be on a direct line between the cooling water pumps (in particular) and community receptor location RP4A. Although it is to the north of the direct line from

the cooling water pumps to RP4A, location RP4\* has been chosen as the most suitable alternative location to RP4A, because:

- (1) it is on dry land;
- (2) it has a direct line of sight to the main power plant and the cooling water pumps; and
- (3) it is accessible for monitoring purposes.

4.9. Location RP4\* is however not ideal as it is at the edge of an arable field, access is only possible on foot and would present difficulties at night. To overcome the night-time access issue, during planned overnight noise surveys, an automatic noise meter would be deployed the previous evening, and recovered the following morning. For unplanned noise surveys (e.g. in response to a complaint) a measurement would be taken the following day at RP4\* if the noise level recorded at receptor position RP4A was insufficiently in excess of the residual background noise levels to allow compliance with the applicable noise limit to be verified (see para. 6.18 et seq. below)

**Table 1: Receptor locations: operational noise**

| Ref  | Receptor Location             | OS Grid ref | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|------|-------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RP1  | Pwllcrochan                   | SM921027    | At the centre of Pwllcrochan village. This location is representative of the nearest potential sensitive community position to the north west of the development site. The position is dominated by the large Valero (formerly Chevron) refinery to the north west. This location is 850m west of the power station site and has no line of sight to the development.                          |
| RP2  | Greenhill Farm                | SM924021    | At the junction of the minor road leading to the power station site/Pwllcrochan and the farm access road and is representative of this farmhouse which is the nearest residential location to the south west of the power station site. This location is situated some 720 m south west of the development site, and at 35 m above sea level has a partial line of sight to the power station. |
| RP2A | Greenhill Farm                | SM925021    | Adjacent to the farmhouse at Greenhill Farm, with partial line of sight to the power station.                                                                                                                                                                                                                                                                                                  |
| RP2* | Former sports field           | SM925025    | On the north side of a hardstanding in the former sports field to the west of the power station site, approximately 20 metres above sea level and has a line of sight to most of the power station development.                                                                                                                                                                                |
| RP4  | Pennar Point                  | SM945028    | To the side of the road leading to the north-west sector of Pennar Point, overlooking the power station to the west, and is representative of the new residential development at Pennar Point. This location is situated around 1.6 km east of the main power station buildings and has a clear line of sight to the power station.                                                            |
| RP4A | Pennar Pont (logger location) | SM944029    | On party wall between gardens of 2 of the closest houses to the power station on the Pennar Point housing estate, with direct line of sight to power station and cooling water pumps.                                                                                                                                                                                                          |
| RP4* | Pennar Mouth West             | SM938029    | At south edge of easternmost arable field on Pennar Cants peninsula north-east of cooling water intake, 15 metres east of the western end of post and wire fence enclosing new plantation.                                                                                                                                                                                                     |

## 5. Operational Noise Limits

5.1. Operational noise is regulated by the Environment Agency under the conditions of the Permit, which does not impose any quantitative noise limits, but requires that:

*"Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.*

*The operator shall:*

*(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Environment Agency for approval within the period specified, a noise and vibration management plan;*

*(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency."*

5.2. As noted at 2.4 above, condition 23 requires maximum permissible levels of operational noise and vibration to be specified at each of the specified monitoring locations.

5.3. With noise monitoring locations RP2A and RP4A being at different distances from the Station and experiencing different levels of background ambient noise, specific operational noise limits have been set for each location taking these circumstances into account.

**Table 2: Operational noise limits**

| Ref. | Monitoring Location | Distance to Station main buildings (m) | Operational noise limit (dB(A)Leq) <sup>#</sup> |
|------|---------------------|----------------------------------------|-------------------------------------------------|
| RP2A | Greenhill Farm      | 750                                    | 42                                              |
| RP4A | Pennar Point        | 1600                                   | 40                                              |

<sup>#</sup> LAeq (5 min) between 2300 and 0700hrs, LAeq (1 hour) between 0700 and 2300hrs

5.4. During operation of the Station there will be planned and unplanned activities which may temporarily generate noise above the limits set out in Table 2. Planned activities which have the potential to generate noise above the proposed limits will be scheduled to take place during daytime hours (0700 to 1900 hours) only and advance notification of these will be provided to both the Environment Agency and the Council. The advance notification will include details of the expected duration of the activities and mitigation measures to be put in place. Abnormal activities with the potential to generate noise levels above the limits in Table 2 typically occur infrequently for safety reasons and are of short duration only. In order to minimise the noise generated, mitigation measures have been implemented e.g. HRSG safety valves are fitted with silencers. The need for and practicality of undertaking noise measurements to assess compliance against the above limits will be assessed for each circumstance in which planned operational activity has the potential to exceed the limits in Table 2.

5.5. The main generating equipment items associated with the operation of the Station are designed to be well-balanced and are well isolated from the ground by anti-vibration mounts and concrete inertia bases. There is no perceptible ground vibration produced by operation of the Station at either on-plant or off-plant positions and it is therefore not necessary to set, or check, specific vibration limits.

## **6. Operational Noise Surveys**

### **Environmental Permit Requirements**

6.1. The Permit contains an Improvement Programme condition (IC2) which requires that:

*"The Operator shall:*

- (a) Submit to the Environment Agency at the Reporting Address for approval written proposals for carrying out a noise survey to assess the impact of the Installation when fully operational and covering the full range of potential operating techniques. The proposals shall include the comparison of measured data against the information supplied in Chapter 2 of Part 2 of Volume 2 of the Application. The proposals shall also contain details of the methods to be used for the assessment of tonal noise at sensitive receptors and proposed (sic) a timeframe within which the survey will be undertaken;*
- (b) Carry out the noise survey in accordance with the Environment Agency's written approval;*
- (c) Submit a report of the findings of the noise survey to the Environment Agency at the Reporting Address for approval; and*
- (d) Submit to the to the Environment Agency at the Reporting Address for approval a written report which assesses whether any minor improvements and modifications are required to noise mitigation measures. Where such measures are required, the Operator shall provide a time-bound programme for their implementation."*

6.2. The Permit requires (a) above to be done within 6 months of the completion of commissioning of the first gas turbine, with the survey itself following in accordance with the Agency's approval. The report on the findings of the survey is required to be submitted for approval within a month after completion of the survey, and the report required by (d) within 2 months of the completion of the survey.

6.3. The operational noise survey programme under Condition 23 must as a minimum meet the requirements of the above conditions of the Permit.

### **Programme**

6.4. Operational noise surveys will be completed in accordance with the following programme:

- The initial noise survey required by condition IC2 (a) and (b) of the Permit shall be undertaken as soon as possible following introduction of the complete Station into normal commercial operation.

- Thereafter, a routine noise survey shall be undertaken annually, again with the Station in normal commercial operation.

6.5. Additional surveys may be included at the discretion of the Company and when requested in writing by the Council, in response to any specific circumstances such as a complaint.

6.6. The operational noise surveys will be used to verify that noise levels from the operating power station comply and continue to comply with the noise limits set out in Table 2 above, in accordance with condition 23 of the deemed planning permission.

#### Initial Operational Noise Survey

##### *Purpose and procedure*

6.7. In addition to meeting the requirements of the Environment Agency under the Permit, the initial noise monitoring survey will provide sufficient noise measurements and the associated survey report shall if necessary include predictive calculations, for the purpose of demonstrating compliance with the noise limits set out in Table 2 above.

6.8. The noise survey shall include noise measurements recorded at reference positions RP2A and RP4A identified in Table 1 above.

6.9. To limit extraneous noise from intermittent sources such as road traffic, measurements shall be recorded during the late evening and early night time period of 2300-0200 hrs, when noise from the power station is most likely to provide a measurable contribution to ambient noise at the receptor positions.

6.10. This survey will be completed as soon as is practicable following the complete Station being brought into normal commercial operation, consistent with compliance with the Environment Agency's requirements under the Permit. During the measurements outlined in 6.8 and 6.9 above, the Station shall be operated under normal full load conditions. Other measurements may be carried out under other operating conditions to meet the requirements of the Permit, but the limits in Table 2 above shall not apply to noise generated by operation other than in normal steady state conditions.

6.11. The survey will be undertaken in dry weather conditions and with a temperature above 3° C. Downwind propagation conditions, as detailed in ISO 9613-2: 1996, will be selected for the noise measurements outlined above. As by definition downwind propagation conditions can not exist concurrently at all the receptor locations, surveys will be undertaken when downwind propagation conditions exist in relation to location RP4A at Pennar Point as this is the most significant location in terms of the number of residents who might be affected.

6.12. Two sets of noise measurements will be undertaken during different hourly periods. The following noise measurements will be recorded:

- A continuous noise measurement sample of 10 minute duration
- A short period (30 second) 'snapshot' noise sample, taken when no extraneous noise is evident
- Each measurement will include for recording the noise sample in terms of LAeq, LAmix and LA90.

6.13. Where noise measurements taken at locations RP2A and RP4A are shown to be above the applicable noise limit identified in Table 2 above, and compliance with that limit cannot be effectively verified owing to the influence of background noise, the same set of noise measurements will be repeated at position RP2\* or RP4\* (as the case may be) which, owing to the closer proximity of these positions to the power station, will reduce the influence of background noise, thereby allowing specific Station operating noise to be measured directly.

#### *Instrumentation*

6.14. Instrumentation used for the operational noise surveys shall be type 1 or better and shall have the relevant calibration certificates.

#### *Demonstration of Compliance with Noise Limits as required by Deemed Planning Permission*

6.15. At the community reference positions RP2A and RP4A the permitted noise limit for the Station has been set at a level which is close to background noise levels and in some environmental conditions below background noise level. Details of background noise levels taken from surveys undertaken since August 2009 (in connection with this development) are set out in report reference PJ2890/29182, entitled "*Pembroke CCGT Power Station: Construction Noise Monitoring Programme*" issued by Spectrum Acoustic Consultants. Further night-time background noise surveys were carried out at Pennar Point on 16-17 March and 3-4 April 2011, which are reported in Appendix 2.4 to the revised Part 2 Chapter 2 of the Pembroke Power Station EP Application Appropriate Assessment Supporting Document, submitted to the Environment Agency on 13 April 2011;

6.16. It may not be possible to directly measure the specific Station operational noise, within the background noise climate. Compliance with the applicable noise limit will therefore be demonstrated in accordance with the following two procedures.

#### *Direct measurement of specific Station noise*

6.17. In accordance with sections 6.3.2 and 6.3.3 of BS4142: 1997, the specific noise contribution from the Station can be determined by using the direct measurement of total noise (residual noise plus development noise) and then correcting for the effect of the residual noise by subtracting this component from the total measured noise.

6.18. The corrections to the noise level readings, as taken from section 6.3.3 of BS 4142 are detailed in Table 3

**Table 3: Correction to noise level readings**

| Noise level reading, minus residual noise | Correction, subtract from noise level reading |
|-------------------------------------------|-----------------------------------------------|
| dB                                        | dB                                            |
| >10                                       | 0                                             |
| 6 to 9                                    | 1                                             |
| 4 to 5                                    | 2                                             |
| 3                                         | 3                                             |
| <3                                        | See next procedure                            |

6.19. BS4142 uses LAeq as the measurement of both total ambient noise and residual noise. For the purpose of establishing the corrections to be applied, residual noise levels from the following surveys shall be used:

- For RP2A, the night-time data from an automatic logger survey carried out in January-March 2010, reported in Appendix 2.4 to the revised Part 2 Chapter 2 of the Pembroke Power Station EP Application Appropriate Assessment Supporting Document, submitted to the Environment Agency on 13 April 2011; and
- For RP4A, from the night-time automatic logger surveys carried out in March-April 2011 and reported in Appendix 2.4 to the revised Part 2 Chapter 2 of the Station EP Appropriate Assessment document, submitted to the Environment Agency on 13 April 2011.

Appendix 2.4 to the revised Part 2 Chapter 2 of the Station EP Appropriate Assessment document is attached to this document as Appendix B.

6.20. Where the difference between the total measured noise level and the residual noise (Table 3) is 3 dB(A) or greater, the appropriate correction from Table 3 shall be applied to the measured noise level and this level shall then be compared with the stated noise limit.

6.21. Where the difference between the total measured noise level and the residual noise (Table 3) is less than 3 dB(A), the specific noise contribution from the development cannot be accurately determined by direct measurement at that location and the following procedure shall then apply.

*Prediction of specific Station noise at RP2A or RP4A*

6.22. The additional noise measurements recorded at alternative reference locations RP2\* (in relation to RP2A) and RP4\* (in relation to RP4A) shall be corrected in accordance with the following formula:

$$L_p(RP_x) = L_p(RP_x^*) + 20 \log (R_x^*/R_x)$$

Where:

- RP<sub>x</sub> is the community reference location concerned (RP1, RP2A or RP4A, as the case may be);
- RP<sub>x</sub>\* is the alternative reference location (RP1\* or RP4\* as appropriate); and
- R<sub>x</sub> and R<sub>x</sub>\* are distances between the power station and the community reference location and the relevant alternative reference location respectively.

6.23. Following application of the correction the predicted noise at the community reference location in question shall then be compared with the noise limit.

6.24. Where the predicted noise level is above the stated noise limit, corrections to take account of additional atmospheric absorption and ground effects between the community reference location concerned and the relevant alternative reference location will be applied using corrections detailed in ISO 9613-2:1996. Following application of these additional corrections the predicted noise at the community reference location concerned shall again be compared with the noise limit

*Reporting*

6.25. The appointed noise specialist shall issue a report to the Company as soon as possible after the completion of the initial operational noise survey. The Company shall retain the report as a reference document and forward copies forthwith to the Council and the Environment Agency, as soon as possible and in any case within 1 month of the completion of the survey. (N.B.: The survey as a whole may be

completed after the measurements outlined at 6.7 to 6.13 above, depending on the Environment Agency's final requirements.)

6.26. The report shall detail all measurement data, including, where necessary, calculations to show how final values have been analysed and how compliance has been determined.

### Annual Operational Noise Survey

#### *Purpose and procedure*

6.27. The routine annual operational noise survey will be used to demonstrate that noise emission levels from the operating power station continue to comply with the noise limits set out in Table 2. The annual survey will also provide information to the Environment Agency on noise currently produced by the Station, in connection with the regulation of the Station under the Permit.

6.28. The routine annual survey shall as a minimum follow the procedure for the initial operational noise survey described at 6.7 *et seq.* above, except that only one noise survey visit to each site will be made during each annual noise survey.

#### *Reporting*

6.29. The appointed noise specialist shall issue a report to the Company within 1 month of the completion of each annual operational noise survey. The Company shall retain all such reports as reference documents and forward copies forthwith to the Council and to the Environment Agency. Each such report shall detail all measurement data and include a comparison with previous noise survey data.

## **7. Complaints Procedure**

7.1. Complaints about noise control on and around the Station will be dealt with in accordance with the complaints procedure which is for the time being approved by the LLC under Condition 27. The current procedure (as at February 2012) was written in the context of the construction phase of the Pembroke Power Station project and will need to be revised and re-approved to take account of the changed management structure and responsibilities following the handover of the completed Station from the main Contractor to the Company. As a minimum this procedure shall provide for:

- local publicity to be given to the contact postal and e-mail addresses and telephone numbers which may be used to make complaints about the Station;
- all complaints received about the Station to be investigated promptly and corrective action to be taken where appropriate;
- a response to be made to the complainant in every case;
- a register of complaints to be kept;
- all complaints received and the responses to them to be reviewed regularly by the LLC.

7.2. Where a complaint relates to an on-going or predictably recurring noise from an identifiable source at the Station, the investigation of the complaint shall where reasonably practicable include measurement of the noise complained of. Such measurements shall be made at location(s) determined by the trained member of Station staff undertaking the measurements (see 3.4.above).

## **8. Requests from the Council for noise measurements**

8.1. The Council may request noise measurements to be made by the Company (e.g. in response to a complaint). Such measurements shall be made as soon as reasonably practicable by a suitably trained member of Station staff (see 3.4 above), or, if so agreed between the Company and the Council, the external noise specialist appointed pursuant to 3.1 or 3.2 above (as the case may be). The results of such measurements shall be provided to the Council as soon as they are available.

## **9. Procedure in case of Breach of Noise Limits**

9.1. Except in the case where the Council has given prior written approval, the following procedure will be adopted where noise measurements taken by the Company indicate that any of the specified limits set out in Table 2 have been breached:

- The source of the noise causing the breach shall be determined;
- The Company shall notify the Council as soon as possible and follow up the notification within 2 working days with a written statement detailing the circumstances of the breach, why the agreed noise limit was exceeded, any immediate remedial measures been put in place, and initial proposals for any appropriate longer term actions to prevent a recurrence.

9.2. The above procedure shall not apply where observations made at the time of the measurement indicate that the noise excess was due to sources unrelated to the Station, or to transient or abnormal non-routine operating conditions.

## **10. Review and Revision**

10.1. This Plan shall be reviewed if the Council or the Company consider that the requirements of the Environment Agency or relevant local circumstances, in particular prevailing background noise levels, developments in the vicinity of the Station or the existing community reference locations, may have changed sufficiently to invalidate the provisions of this Plan or to make the monitoring of operational noise, as provided for in this Plan, impracticable.

10.2. In the circumstances described in paragraph 10.1, the Company shall review the Plan, in consultation with Council officers. The Company shall submit the revised plan to the Council for approval and the revised Plan shall come into force from the date of such approval or the date specified for this purpose in the revised Plan if later.

## **11. Validity**

11.1. Subject to the exclusions in section 2 (Scope) above, this Plan shall come into force when it is approved by the Council and remain in force for so long as the Station remains operational, or until a revised Plan comes into force as provided in paragraph 10.2, whichever is the earlier.

**Appendix A**  
**Community Noise Monitoring Locations**  
**Drawing UKP/PMB/0281/B**



- COMMUNITY REFERENCE LOCATIONS IDENTIFIED IN THE CES
- REVISED REFERENCE LOCATIONS FOR OPERATIONAL NOISE SURVEYS
- ALTERNATIVE REFERENCE LOCATIONS

| UPDATED                                                                                                                                              |          |      |          | B   |          |      |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|----------|-----|----------|------|----------|
| MHP                                                                                                                                                  | Checked  | Date | Approved | MHP | Checked  | Date | Approved |
| MHP                                                                                                                                                  | 12.07.11 |      |          | MHP | 12.07.11 |      |          |
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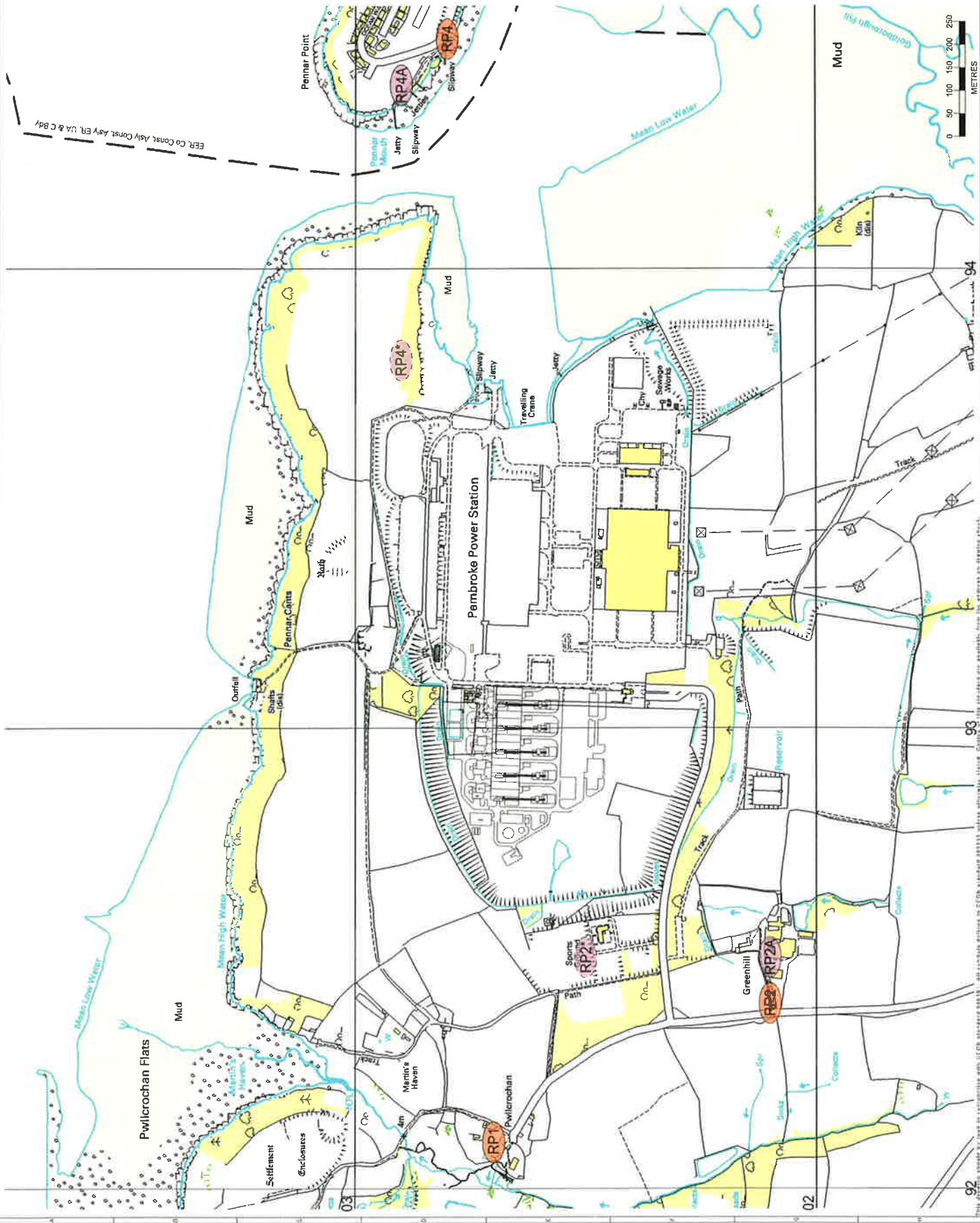
npower  
T +44 (0) 1793 / 89 33 91  
Swinford Drawing Office  
Windmill Hill Business Park  
Whitehill Way  
Swinford  
WB5 5S 8PB

Size of original  
Scale of original  
A3  
1:7500

Site  
PEMBROKE POWER STATION

Title  
OPERATIONAL NOISE  
MONITORING POINTS

Status  
Drawing number  
UKP/PMB/0281/B



**Appendix B**

**Appendix 2.4 Recent Noise Survey Results  
to**

**Part 2 Chapter 2 of Pembroke Environmental Permit Appropriate Assessment  
Supporting Document**

**As reissued April 2011**

## **Appendix 2.4 Recent Background Noise Survey Results**

### **Night time background survey 16<sup>th</sup>-17<sup>th</sup> March 2011**

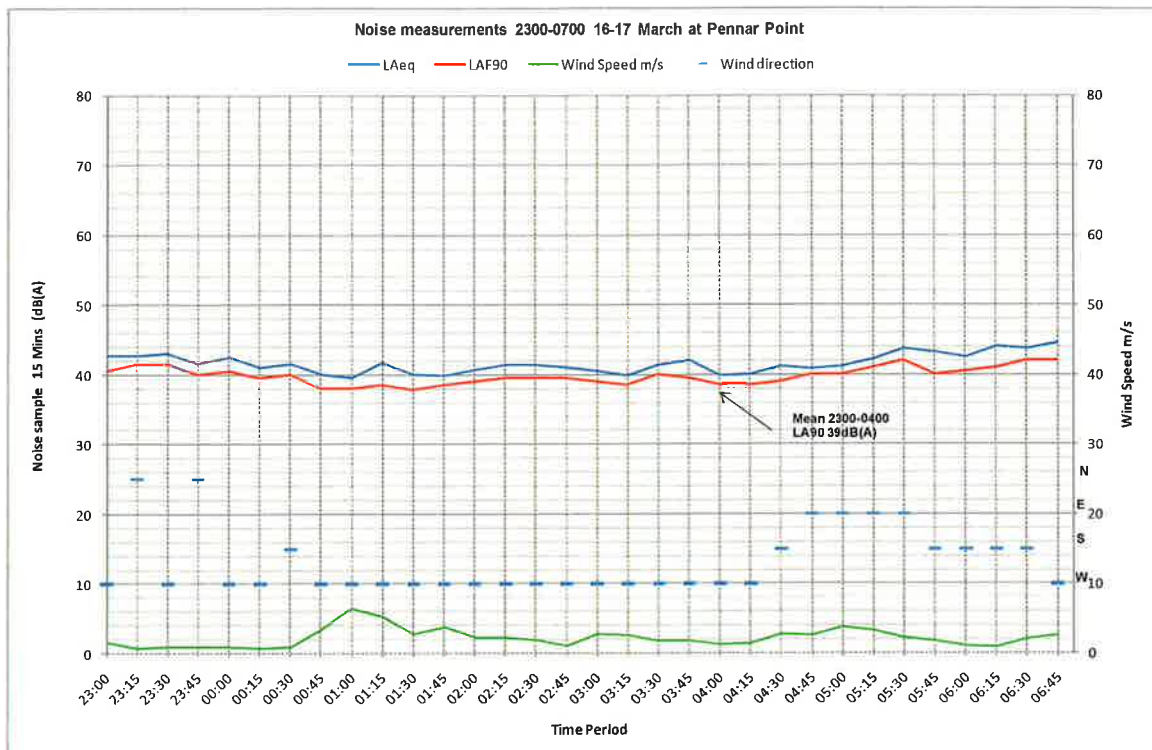
Reported information (as per BS4142 section 10) – background survey sections only

- a) Background survey carried out at Pennar Point
- b) 1) No specific noise source as power station not operational.  
2) Residual noise dominated by steady noise from Chevron oil refinery, other steady noise from 400kv substation and Dragon LNG terminal. Occasional / intermittent noise boat movements on Haven, vehicles and power station construction site (see o) below)
- c) Measurement position at the bottom of the rear garden of nearest house at Pennar Point overlooking Pennar Gut and power station site. Position covered by background noise measurement procedure, issued to and agreed with Environment Agency and compliant with BS 4142.
- d) Bruel & Kjaer Type 2238, serial number 2246383. Formal calibration on 16 June 2010 (valid for 2 years). B & K outdoor microphone kit.
- e) Calibration to 94dB(A) made prior to survey.
- f) 1) Generally light westerly wind (0-4 m/s). One measurement of 6 m/s  
2) No temperature inversion  
3) No precipitation  
4) Light mist
- g) 16<sup>th</sup> March 2300 – 17<sup>th</sup> March 0400
- h) No specific noise level – background survey only. Specific noise to be supplied by prediction
- i) Measurement intervals 15 minutes
- j) Survey period 2300-0400, to establish representative background level for most sensitive night time period.
- k) No rating level – background survey only. Rating level to be supplied by prediction
- l) Background noise levels as reported in results chart 1 / table 1.  
Range 38 – 41.5dB(A). Mean LA<sub>90</sub> 39dB(A) over period 2300-0400. Mean over “quietest time of night “of 0200-0400 as indicated in EA Schedule 5 LA<sub>90</sub> 39.3dB(A)
- m) No rating level or assessment level – background survey only

Other information – There was no MOD firing during the survey.

## n) Summary of noise observations

| <b>Time period</b> | <b>Steady dominant</b>        | <b>Steady secondary</b>                                                 | <b>Occasional/intermittent (will not contribute to LA<sub>90</sub>)</b>                                                               |
|--------------------|-------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 2300-0000          | Continuous 'hum' from Chevron | Pumping at Dragon terminal                                              | Boat engines, birds, 4 clangs metal on metal (power station construction site), one reversing alarm (power station construction site) |
| 0000-0100          | Continuous 'hum' from Chevron | Pumping at Dragon terminal, National Grid 400kV substation 'hum'        | Pembroke Ferry, boat engines, one reversing alarm (power station construction site)                                                   |
| 0100-0200          | Continuous 'hum' from Chevron | Engine noise from Dragon terminal, National Grid 400kV substation 'hum' | Boat engines, vehicle, three reversing alarms (power station construction site)                                                       |
| 0200-0300          | Continuous 'hum' from Chevron | Engine noise from Dragon terminal, National Grid 400kV substation 'hum' | Boat engines, vehicle, Pembroke ferry                                                                                                 |
| 0300-0400          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum'                                    | Boat engines                                                                                                                          |



**Figure 1 Noise measurements 2300-0700 16-17 March at Pennar Point**

|            | Start time | LAeq | LAF90 | Wind Speed m/s | Wind direction |
|------------|------------|------|-------|----------------|----------------|
| 16/03/2011 | 23:00      | 42.7 | 40.5  | 1.7            | 310            |
| 16/03/2011 | 23:15      | 42.8 | 41.5  | 0.8            | 317            |
| 16/03/2011 | 23:30      | 43   | 41.5  | 0.9            | 305            |
| 16/03/2011 | 23:45      | 41.6 | 40    | 0.9            | 319            |
| 17/03/2011 | 0:00       | 42.6 | 40.5  | 0.9            | 307            |
| 17/03/2011 | 0:15       | 41.1 | 39.5  | 0.7            | 249            |
| 17/03/2011 | 0:30       | 41.5 | 40    | 1.0            | 167            |
| 17/03/2011 | 0:45       | 40.1 | 38    | 3.5            | 299            |
| 17/03/2011 | 1:00       | 39.6 | 38    | 6.4            | 285            |
| 17/03/2011 | 1:15       | 41.7 | 38.5  | 5.3            | 289            |
| 17/03/2011 | 1:30       | 40   | 37.8  | 2.8            | 289            |
| 17/03/2011 | 1:45       | 39.8 | 38.5  | 3.7            | 294            |
| 17/03/2011 | 2:00       | 40.7 | 39    | 2.2            | 300            |
| 17/03/2011 | 2:15       | 41.4 | 39.5  | 2.3            | 301            |
| 17/03/2011 | 2:30       | 41.4 | 39.5  | 1.9            | 303            |
| 17/03/2011 | 2:45       | 41   | 39.5  | 1.2            | 301            |
| 17/03/2011 | 3:00       | 40.6 | 39    | 2.8            | 290            |
| 17/03/2011 | 3:15       | 39.9 | 38.5  | 2.6            | 302            |
| 17/03/2011 | 3:30       | 41.4 | 40    | 1.8            | 310            |
| 17/03/2011 | 3:45       | 42   | 39.5  | 1.8            | 299            |

**Table 1 Noise Measurement Data 2300-0400 16-17 March, Pennar Point**

### **Night time background survey 3rd - 4th April 2011**

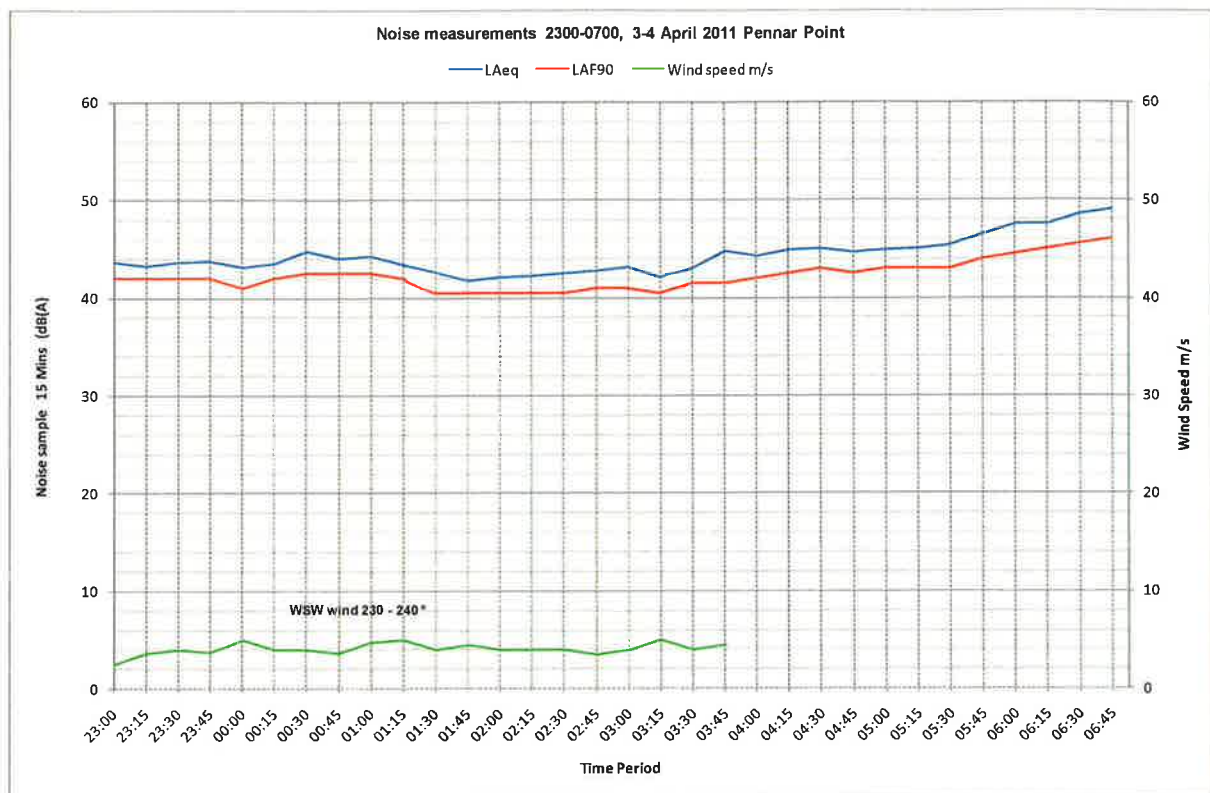
Reported information (as per BS4142 section 10) – background survey sections only

- a) Background survey carried out at Pennar Point
- b)
  - 1) No specific noise source as power station not operational.
  - 2) Residual noise dominated by steady noise from Chevron oil refinery, other steady noise from 400kv substation. Occasional / intermittent noise boat movements on Haven, vehicles and power station construction site (see o) below)
- c) Measurement position at the bottom of the rear garden of nearest house at Pennar Point overlooking Pennar Gut and power station site. Position covered by background noise measurement procedure, issued to and agreed with Environment Agency and compliant with BS 4142.
- d) Bruel & Kjaer Type 2238, serial number 2246383. Formal calibration on 16 June 2010 (valid for 2 years). B & K outdoor microphone kit.
- e) Calibration to 94dB(A) made prior to survey.
- f)
  - 1) Generally light westerly wind (0-4 m/s). One measurement of 5 m/s
  - 2) No temperature inversion
  - 3) No precipitation
  - 4) No mist/fog
- g) 3<sup>rd</sup> April 2300 – 4<sup>th</sup> April 0400
- h) No specific noise level – background survey only. Specific noise to be supplied by prediction
- i) Measurement intervals 15 minutes
- j) Survey period 2300-0400, to establish representative background level for most sensitive night time period.
- k) No rating level – background survey only. Rating level to be supplied by prediction
- l) Background noise levels as reported in results chart 2 / table 2. Range 40.5 to 42.5dB(A), mean LA<sub>90</sub> 41.5 dB(A) over period 2300-0400. Mean over “quietest time of night “of 0200-0400 as indicated in EA Schedule 5 LA<sub>90</sub> 40.8dB(A)
- m) No rating level or assessment level – background survey only

Other information – There was no MOD firing during the survey.

## o) Summary of noise observations

| <b>Time period</b> | <b>Steady dominant</b>        | <b>Steady secondary</b>                                                              | <b>Occasional/intermittent (will not contribute to LA<sub>90</sub>)</b>                                                                   |
|--------------------|-------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 2300-0000          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum'                                                 | Vehicles, boat engines, air driven torque wrench (power station construction site)                                                        |
| 0000-0100          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum'                                                 | Pembroke Ferry, air driven torque wrench (power station construction site), voices/metal clang (power station construction site), vehicle |
| 0100-0200          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum', engine noise (power station construction site) | Vehicle, boat engines                                                                                                                     |
| 0200-0300          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum'                                                 | Boat engines, Pembroke ferry                                                                                                              |
| 0300-0400          | Continuous 'hum' from Chevron | National Grid 400kV substation 'hum'                                                 | Boat engines, plane                                                                                                                       |



**Figure 2 Noise measurements 2300-0700 3-4 April at Pennar Point**

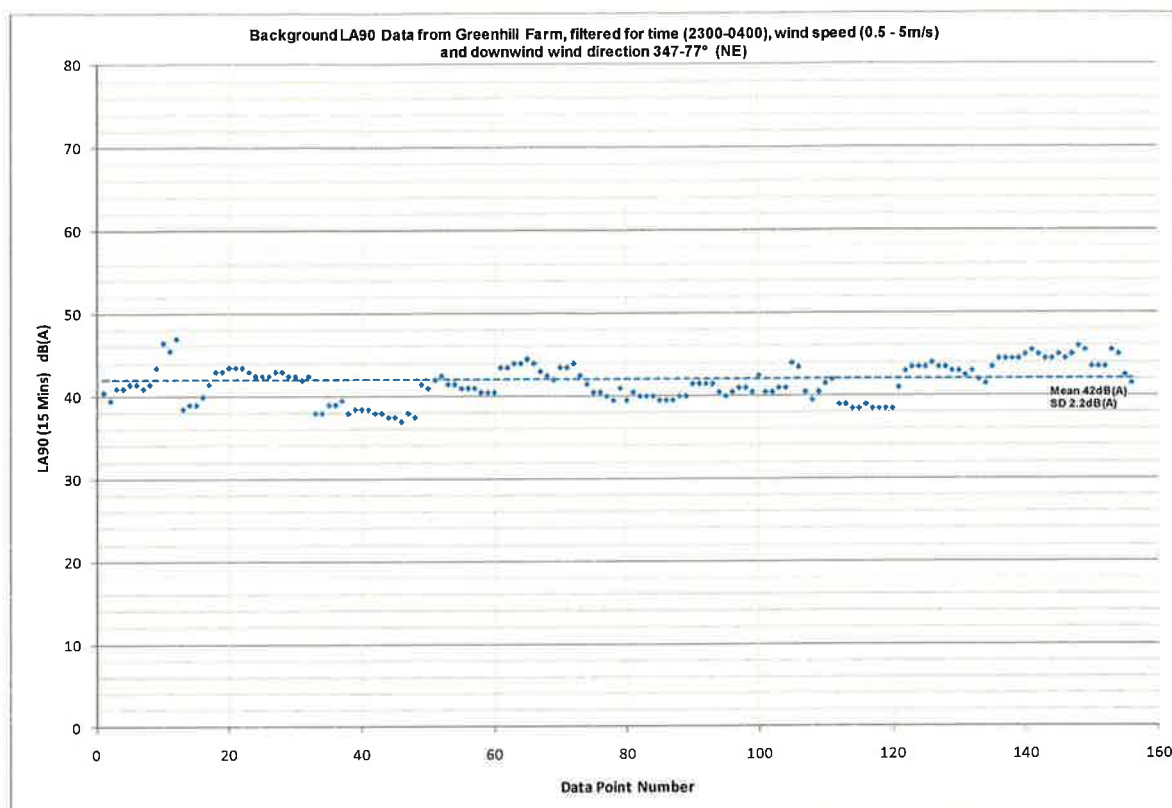
| Start date | Start time | LAeq | LAF90 | Wind speed m/s | Wind Direction |
|------------|------------|------|-------|----------------|----------------|
| 03/04/2011 | 23:00      | 43.6 | 42    | 2.5            | 240            |
| 03/04/2011 | 23:15      | 43.3 | 42    | 3.6            | 240            |
| 03/04/2011 | 23:30      | 43.7 | 42    | 4              | 240            |
| 03/04/2011 | 23:45      | 43.8 | 42    | 3.8            | 240            |
| 03/04/2011 | 0:00       | 43.1 | 41    | 5              | 240            |
| 03/04/2011 | 0:15       | 43.5 | 42    | 4              | 240            |
| 03/04/2011 | 0:30       | 44.8 | 42.5  | 4              | 240            |
| 03/04/2011 | 0:45       | 44.1 | 42.5  | 3.6            | 240            |
| 04/04/2011 | 1:00       | 44.3 | 42.5  | 4.8            | 240            |
| 04/04/2011 | 1:15       | 43.4 | 42    | 5              | 240            |
| 04/04/2011 | 1:30       | 42.6 | 40.5  | 4              | 240            |
| 04/04/2011 | 1:45       | 41.8 | 40.5  | 4.5            | 240            |
| 04/04/2011 | 2:00       | 42.2 | 40.5  | 4              | 230            |
| 04/04/2011 | 2:15       | 42.3 | 40.5  | 4              | 230            |
| 04/04/2011 | 2:30       | 42.5 | 40.5  | 4              | 230            |
| 04/04/2011 | 2:45       | 42.8 | 41    | 3.5            | 230            |
| 04/04/2011 | 3:00       | 43.1 | 41    | 4              | 230            |
| 04/04/2011 | 3:15       | 42.2 | 40.5  | 5              | 230            |
| 04/04/2011 | 3:30       | 43   | 41.5  | 4              | 230            |
| 04/04/2011 | 3:45       | 44.8 | 41.5  | 4.5            | 230            |

**Table 2 Noise Measurement Data 2300-0400 3-4 April, Pennar Point**

### **Night time background data Jan-March 2010**

Reported information (as per BS4142 section 10) – background survey sections only

- a) Background survey carried out at Greenhill Farm
- b) 1) No specific noise source as power station not operational.  
2) Residual noise dominated by steady noise from Chevron oil refinery, other steady noise from 400kv substation. Occasional / intermittent noise from boat movements on Haven
- c) The noise logger was installed in a free-field position at the head of the drive leading to Greenhill Farmhouse, overlooking adjacent open fields and compliant with BS4142 requirements.
- d) Bruel & Kjaer Type 2238, serial number 2246383. Formal calibration on May 2008 and June 2010 (calibration valid for 2 years). B & K outdoor microphone kit.
- e) Calibration to 94dB(A) made prior to survey.
- f) Logger in-situ for variety of weather conditions. Data has been screened for downwind conditions of 0.5-5 m/s
- g) Screened night times (2300-0400) between 1<sup>st</sup> Jan – March 2010
- h) No specific noise level – background survey only. Specific noise to be supplied by prediction
- i) Measurement intervals 15 minutes
- j) Survey period continuous. Reported data filtered for night time 2300-0400, and downwind condition to establish representative background level for most sensitive night time period.
- k) No rating level – background survey only. Rating level to be supplied by prediction
- l) Background noise levels as reported in results chart 3 / table 3. Mean LA<sub>90</sub> 42 dB(A) over period 2300-0400, with standard deviation of 2.2dB(A).
- m) No rating level or assessment level – background survey only



**Figure 3** Night time (2300-0400) background noise (filtered to reflect downwind conditions), taken from long-term survey Jan–March 2010 at Greenhill Farm

| Date       | Start time | LAF90 dB | Direction° | Speed m/s |
|------------|------------|----------|------------|-----------|
| 27/01/2010 | 00:00:00   | 40.5     | 50         | 2.7       |
| 27/01/2010 | 00:15:00   | 39.5     | 50         | 2.7       |
| 27/01/2010 | 00:30:00   | 41       | 50         | 2.7       |
| 27/01/2010 | 00:45:00   | 41       | 50         | 2.7       |
| 27/01/2010 | 01:00:00   | 41.5     | 30         | 2.7       |
| 27/01/2010 | 01:15:00   | 41.5     | 30         | 2.7       |
| 27/01/2010 | 01:30:00   | 41       | 30         | 2.7       |
| 27/01/2010 | 01:45:00   | 41.5     | 30         | 2.7       |
| 27/01/2010 | 02:00:00   | 43.5     | 40         | 2.7       |
| 27/01/2010 | 02:15:00   | 46.5     | 40         | 2.7       |
| 27/01/2010 | 02:30:00   | 45.5     | 40         | 2.7       |
| 27/01/2010 | 02:45:00   | 47       | 40         | 2.7       |
| 03/02/2010 | 00:00:00   | 38.5     | 60         | 2.2       |
| 03/02/2010 | 00:15:00   | 39       | 60         | 2.2       |
| 03/02/2010 | 00:30:00   | 39       | 60         | 2.2       |
| 03/02/2010 | 00:45:00   | 40       | 60         | 2.2       |
| 06/02/2010 | 00:00:00   | 41.5     | 60         | 3.6       |
| 06/02/2010 | 00:15:00   | 43       | 60         | 3.6       |
| 06/02/2010 | 00:30:00   | 43       | 60         | 3.6       |
| 06/02/2010 | 00:45:00   | 43.5     | 60         | 3.6       |
| 06/02/2010 | 01:00:00   | 43.5     | 30         | 4.0       |
| 06/02/2010 | 01:15:00   | 43.5     | 30         | 4.0       |

|            |          |      |     |     |
|------------|----------|------|-----|-----|
| 06/02/2010 | 01:30:00 | 43   | 30  | 4.0 |
| 06/02/2010 | 01:45:00 | 42.5 | 30  | 4.0 |
| 06/02/2010 | 02:00:00 | 42.5 | 30  | 4.0 |
| 06/02/2010 | 02:15:00 | 42.5 | 30  | 4.0 |
| 06/02/2010 | 02:30:00 | 43   | 30  | 4.0 |
| 06/02/2010 | 02:45:00 | 43   | 30  | 4.0 |
| 06/02/2010 | 03:00:00 | 42.5 | 50  | 4.5 |
| 06/02/2010 | 03:15:00 | 42.5 | 50  | 4.5 |
| 06/02/2010 | 03:30:00 | 42   | 50  | 4.5 |
| 06/02/2010 | 03:45:00 | 42.5 | 50  | 4.5 |
| 08/02/2010 | 00:00:00 | 38   | 70  | 3.6 |
| 08/02/2010 | 00:15:00 | 38   | 70  | 3.6 |
| 08/02/2010 | 00:30:00 | 39   | 70  | 3.6 |
| 08/02/2010 | 00:45:00 | 39   | 70  | 3.6 |
| 08/02/2010 | 01:00:00 | 39.5 | 50  | 3.6 |
| 08/02/2010 | 01:15:00 | 38   | 50  | 3.6 |
| 08/02/2010 | 01:30:00 | 38.5 | 50  | 3.6 |
| 08/02/2010 | 01:45:00 | 38.5 | 50  | 3.6 |
| 08/02/2010 | 02:00:00 | 38.5 | 50  | 2.7 |
| 08/02/2010 | 02:15:00 | 38   | 50  | 2.7 |
| 08/02/2010 | 02:30:00 | 38   | 50  | 2.7 |
| 08/02/2010 | 02:45:00 | 37.5 | 50  | 2.7 |
| 08/02/2010 | 03:00:00 | 37.5 | 60  | 2.7 |
| 08/02/2010 | 03:15:00 | 37   | 60  | 2.7 |
| 08/02/2010 | 03:30:00 | 38   | 60  | 2.7 |
| 08/02/2010 | 03:45:00 | 37.5 | 60  | 2.7 |
| 09/02/2010 | 00:00:00 | 41.5 | 10  | 2.2 |
| 09/02/2010 | 00:15:00 | 41   | 10  | 2.2 |
| 09/02/2010 | 00:30:00 | 42   | 10  | 2.2 |
| 09/02/2010 | 00:45:00 | 42.5 | 10  | 2.2 |
| 09/02/2010 | 01:00:00 | 41.5 | 30  | 3.6 |
| 09/02/2010 | 01:15:00 | 41.5 | 30  | 3.6 |
| 09/02/2010 | 01:30:00 | 41   | 30  | 3.6 |
| 09/02/2010 | 01:45:00 | 41   | 30  | 3.6 |
| 09/02/2010 | 02:00:00 | 41   | 20  | 4.0 |
| 09/02/2010 | 02:15:00 | 40.5 | 20  | 4.0 |
| 09/02/2010 | 02:30:00 | 40.5 | 20  | 4.0 |
| 09/02/2010 | 02:45:00 | 40.5 | 20  | 4.0 |
| 12/02/2010 | 01:00:00 | 43.5 | 10  | 2.7 |
| 12/02/2010 | 01:15:00 | 43.5 | 10  | 2.7 |
| 12/02/2010 | 01:30:00 | 44   | 10  | 2.7 |
| 12/02/2010 | 01:45:00 | 44   | 10  | 2.7 |
| 12/02/2010 | 02:00:00 | 44.5 | 360 | 2.7 |
| 12/02/2010 | 02:15:00 | 44   | 360 | 2.7 |
| 12/02/2010 | 02:30:00 | 43   | 360 | 2.7 |
| 12/02/2010 | 02:45:00 | 42.5 | 360 | 2.7 |
| 12/02/2010 | 03:00:00 | 42   | 360 | 2.7 |
| 12/02/2010 | 03:15:00 | 43.5 | 360 | 2.7 |
| 12/02/2010 | 03:30:00 | 43.5 | 360 | 2.7 |
| 12/02/2010 | 03:45:00 | 44   | 360 | 2.7 |
| 13/02/2010 | 00:00:00 | 42.5 | 40  | 3.6 |
| 13/02/2010 | 00:15:00 | 41.5 | 40  | 3.6 |
| 13/02/2010 | 00:30:00 | 40.5 | 40  | 3.6 |
| 13/02/2010 | 00:45:00 | 40.5 | 40  | 3.6 |

|            |          |      |    |     |
|------------|----------|------|----|-----|
| 13/02/2010 | 01:00:00 | 40   | 30 | 3.1 |
| 13/02/2010 | 01:15:00 | 39.5 | 30 | 3.1 |
| 13/02/2010 | 01:30:00 | 41   | 30 | 3.1 |
| 13/02/2010 | 01:45:00 | 39.5 | 30 | 3.1 |
| 13/02/2010 | 02:00:00 | 40.5 | 10 | 3.1 |
| 13/02/2010 | 02:15:00 | 40   | 10 | 3.1 |
| 13/02/2010 | 02:30:00 | 40   | 10 | 3.1 |
| 13/02/2010 | 02:45:00 | 40   | 10 | 3.1 |
| 13/02/2010 | 03:00:00 | 39.5 | 10 | 2.7 |
| 13/02/2010 | 03:15:00 | 39.5 | 10 | 2.7 |
| 13/02/2010 | 03:30:00 | 39.5 | 10 | 2.7 |
| 13/02/2010 | 03:45:00 | 40   | 10 | 2.7 |
| 14/02/2010 | 00:00:00 | 40   | 20 | 4.5 |
| 14/02/2010 | 00:15:00 | 41.5 | 20 | 4.5 |
| 14/02/2010 | 00:30:00 | 41.5 | 20 | 4.5 |
| 14/02/2010 | 00:45:00 | 41.5 | 20 | 4.5 |
| 14/02/2010 | 01:00:00 | 41.5 | 10 | 4.0 |
| 14/02/2010 | 01:15:00 | 40.5 | 10 | 4.0 |
| 14/02/2010 | 01:30:00 | 40   | 10 | 4.0 |
| 14/02/2010 | 01:45:00 | 40.5 | 10 | 4.0 |
| 14/02/2010 | 02:00:00 | 41   | 30 | 2.2 |
| 14/02/2010 | 02:15:00 | 41   | 30 | 2.2 |
| 14/02/2010 | 02:30:00 | 40.5 | 30 | 2.2 |
| 14/02/2010 | 02:45:00 | 42.5 | 30 | 2.2 |
| 14/02/2010 | 03:00:00 | 40.5 | 20 | 2.2 |
| 14/02/2010 | 03:15:00 | 40.5 | 20 | 2.2 |
| 14/02/2010 | 03:30:00 | 41   | 20 | 2.2 |
| 14/02/2010 | 03:45:00 | 41   | 20 | 2.2 |
| 17/02/2010 | 01:00:00 | 44   | 70 | 2.2 |
| 17/02/2010 | 01:15:00 | 43.5 | 70 | 2.2 |
| 17/02/2010 | 01:30:00 | 40.5 | 70 | 2.2 |
| 17/02/2010 | 01:45:00 | 39.5 | 70 | 2.2 |
| 17/02/2010 | 02:00:00 | 40.5 | 60 | 2.2 |
| 17/02/2010 | 02:15:00 | 41.5 | 60 | 2.2 |
| 17/02/2010 | 02:30:00 | 42   | 60 | 2.2 |
| 17/02/2010 | 02:45:00 | 39   | 60 | 2.2 |
| 18/02/2010 | 02:00:00 | 39   | 50 | 2.7 |
| 18/02/2010 | 02:15:00 | 38.5 | 50 | 2.7 |
| 18/02/2010 | 02:30:00 | 38.5 | 50 | 2.7 |
| 18/02/2010 | 02:45:00 | 39   | 50 | 2.7 |
| 18/02/2010 | 03:00:00 | 38.5 | 60 | 3.6 |
| 18/02/2010 | 03:15:00 | 38.5 | 60 | 3.6 |
| 18/02/2010 | 03:30:00 | 38.5 | 60 | 3.6 |
| 18/02/2010 | 03:45:00 | 38.5 | 60 | 3.6 |
| 22/02/2010 | 03:00:00 | 41   | 50 | 4.5 |
| 22/02/2010 | 03:15:00 | 43   | 50 | 4.5 |
| 22/02/2010 | 03:30:00 | 43.5 | 50 | 4.5 |
| 22/02/2010 | 03:45:00 | 43.5 | 50 | 4.5 |
| 23/02/2010 | 01:00:00 | 43.5 | 70 | 4.0 |
| 23/02/2010 | 01:15:00 | 44   | 70 | 4.0 |
| 23/02/2010 | 01:30:00 | 43.5 | 70 | 4.0 |
| 23/02/2010 | 01:45:00 | 43.5 | 70 | 4.0 |
| 23/02/2010 | 02:00:00 | 43   | 60 | 4.0 |
| 23/02/2010 | 02:15:00 | 43   | 60 | 4.0 |

|             |                     |           |     |     |
|-------------|---------------------|-----------|-----|-----|
| 23/02/2010  | 02:30:00            | 42.5      | 60  | 4.0 |
| 23/02/2010  | 02:45:00            | 43        | 60  | 4.0 |
| 23/02/2010  | 03:00:00            | 42        | 60  | 4.0 |
| 23/02/2010  | 03:15:00            | 41.5      | 60  | 4.0 |
| 23/02/2010  | 03:30:00            | 43.5      | 60  | 4.0 |
| 23/02/2010  | 03:45:00            | 44.5      | 60  | 4.0 |
| 28/02/2010  | 00:00:00            | 44.5      | 360 | 4.0 |
| 28/02/2010  | 00:15:00            | 44.5      | 360 | 4.0 |
| 28/02/2010  | 00:30:00            | 44.5      | 360 | 4.0 |
| 28/02/2010  | 00:45:00            | 45        | 360 | 4.0 |
| 28/02/2010  | 01:00:00            | 45.5      | 350 | 3.6 |
| 28/02/2010  | 01:15:00            | 45        | 350 | 3.6 |
| 28/02/2010  | 01:30:00            | 44.5      | 350 | 3.6 |
| 28/02/2010  | 01:45:00            | 44.5      | 350 | 3.6 |
| 02/03/2010  | 00:00:00            | 45        | 30  | 3.1 |
| 02/03/2010  | 00:15:00            | 44.5      | 30  | 3.1 |
| 02/03/2010  | 00:30:00            | 45        | 30  | 3.1 |
| 02/03/2010  | 00:45:00            | 46        | 30  | 3.1 |
| 02/03/2010  | 01:00:00            | 45.5      | 50  | 2.2 |
| 02/03/2010  | 01:15:00            | 43.5      | 50  | 2.2 |
| 02/03/2010  | 01:30:00            | 43.5      | 50  | 2.2 |
| 02/03/2010  | 01:45:00            | 43.5      | 50  | 2.2 |
| 02/03/2010  | 02:00:00            | 45.5      | 70  | 0.9 |
| 02/03/2010  | 02:15:00            | 45        | 70  | 0.9 |
| 02/03/2010  | 02:30:00            | 42.5      | 70  | 0.9 |
| 02/03/2010  | 02:45:00            | 41.5      | 70  | 0.9 |
| <b>Mean</b> | <b>(nearest dB)</b> | <b>42</b> |     |     |

**Table 3 Night time (2300-0400) background noise (filtered to reflect downwind conditions), taken from long-term survey Jan–March 2010 at Greenhill Farm**