

# **Monitoring the noise emissions from the Cotton Farm Wind Farm.**

## **Introduction**

As many of you are aware Hunts DC (HDC) have instigated a programme to re-monitor the noise coming from the wind farm. The premise behind this is to ensure it is still compliant with the terms and conditions laid down in the 2010 planning approval. There have been significant modifications to the turbine blades by the fitting of serrated strips. These strips are an attempt to reduce turbine noise to comply with warranty issues (The turbines are noisier than the manufacturer warranty guarantees) It is also hoped, by the manufacturers and the Wind Farm owners, that this modification will also reduce the Amplitude Modulation (AM) noise as experienced by residents locally and also, as a totally separate issue, ensure the turbines comply to the planning regulation ETSU-R-97. ETSU was used in the original planning application and the new monitoring exercise is to re-assess the noise levels and to check to see if they comply (or not) to the planning approvals noise condition 24.

## **Past, present and future monitoring of CFWF**

### **ETSU**

As many will be also aware our community set up our own recording station and met mast and have recorded, and still are recording, nearly all the noise output from the (WF) site. The developers also set up their own six month noise monitoring exercise in 2013. When the WF developer's data was assessed by HDC they identified a number of breaches of the planning approval conditions. In other words the WF was NOT compliant to ETSU in normal operations.

*Note: The community acoustician, among other professionals, concur with the 'non-compliance' assessment. The assessment of the developer's data cross referenced with our own community monitor data suggest the breaches are more severe than originally thought by the HDC EH department and their contracted acoustician. Further analysis has identified exactly when and how severe these breaches are.*

The current exercise, controlled by HDC with the co-operation of the WF owners (Greencoat UK wind PLC) and CFRA, is to test the WF noise emissions to see if it is compliant or not in accordance with the original planning condition (ETSU) by using agreed monitoring equipment and methodology of sampling and assessment.

### **EAM**

However, testing for ETSU compliance is not the only exercise being carried out. There is the separate issue of 'problem noise' known as experienced by local residents. It is in the form of 'whooping' sounds from the turning turbine blades. This is often likened to 'aircraft not going away', or 'tumble driers with shoes inside', etc. These are noises which are irregular and variable in volume and pitch and deemed as a 'nuisance' by many hearing it, especially at night. This noise is known as Excessive AM(EAM) and is NOT covered by the ETSU specification. This is why the recording of the noise output from the WF is being recorded in 'real time' to record the noise emissions in audio as well.

Our local authorities have already requested help from DECC (now DBEIS) in December 2015 on the basis of the many and continuing complaints and now with five years of evidence collected by the community the Government has not positively responded. The councils, without guidance from central Government, should make its own decision to solve the increasingly serious problem of (E)AM at all frequencies by using existing legislation.

The EAM noise does NOT have a specific planning condition approved by Government and recommendations by the wind industry at the CFWF appeal has been for it to be covered by (Statutory) Nuisance Laws. However, turbine noise is recognised as a nuisance and man made noises can be, and are, covered by the UK Standard, BS4142. Turbine noise is a manmade noise but turbines, uniquely, are NOT covered by BS4142. They are covered by ETSU which by-passes BS4142 noise regulations including AM. In 2014 BS4142 was upgraded

and it can be used for turbine AM noise control. In fact it can replace ETSU completely, a fact being strongly resisted by the wind industry. The whole reason for BS4142:2014 (as it is now known) is to protect communities where manmade noise exists and needs to be controlled. However, these are arguments to be used in court. If the original BS4142 was used instead of ETSU, CFWF would not be approved.

### Monitoring Assessment during the winter 2017/18

The 'real time' monitoring will also provide the audio data for analysis by various authorities and professionals and to be tested against Statutory Nuisance rules, BS4142:2014, et al.

The monitoring at CFWF will last approximately 3 months. Four specific sites have been designated for monitoring locations and the monitoring equipment will be installed by a company called DNV-GL.<sup>1</sup> The sampling data will be available to all parties as will the meteorological and SCADA (Supervisory Control and Data Acquisition) data which record the control of power, blade position and other details from the turbines. During this period, the turbines will be occasionally shut down to record the actual background noise levels to be compared with turbine noise under different wind directions and speeds. It is well known there are big differences in the background noise levels with turbines on and off. See fig 1 below showing a 10dB rise. Every 10dB rise represents a doubling of the volume of the sound coming from the wind farm site.

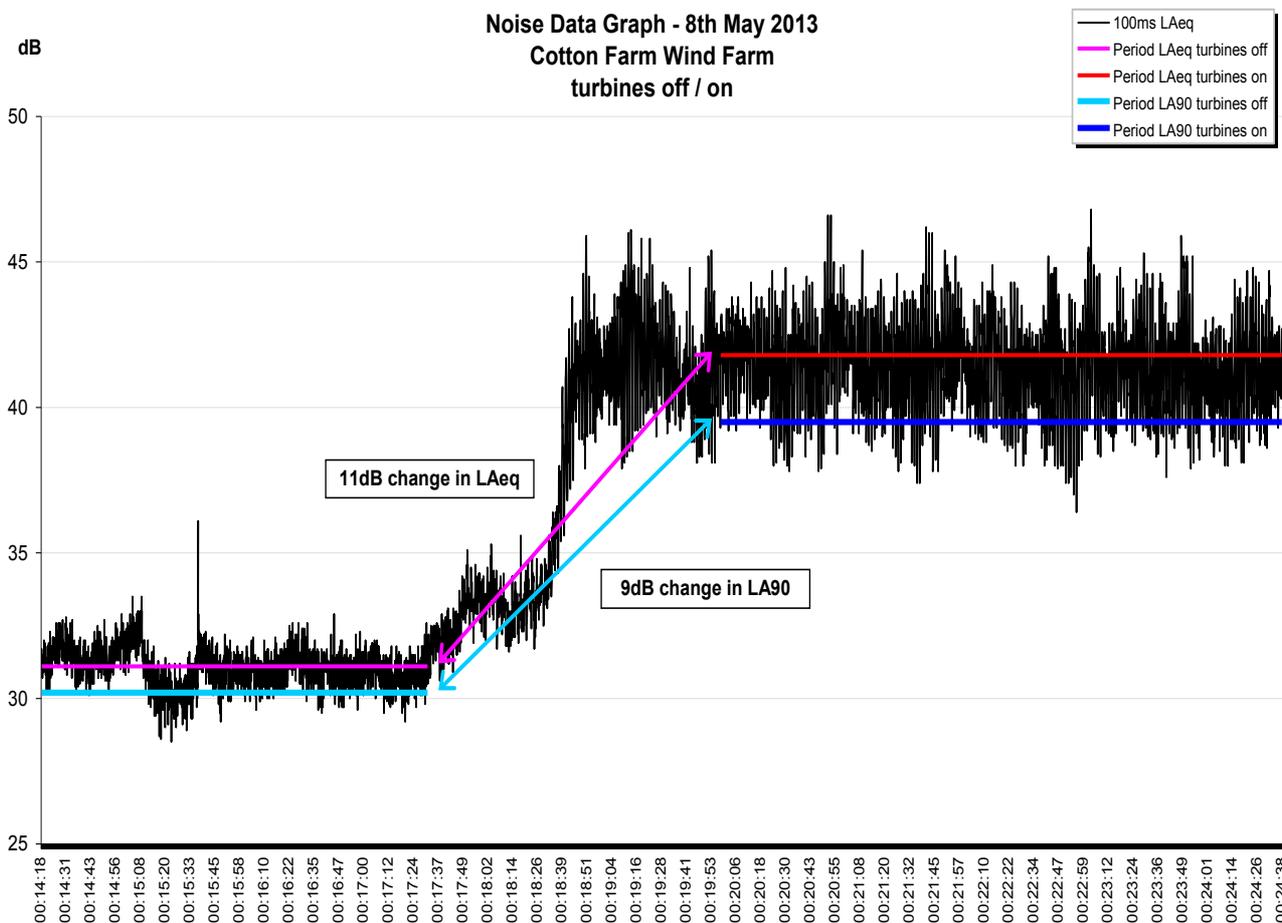


Fig 1

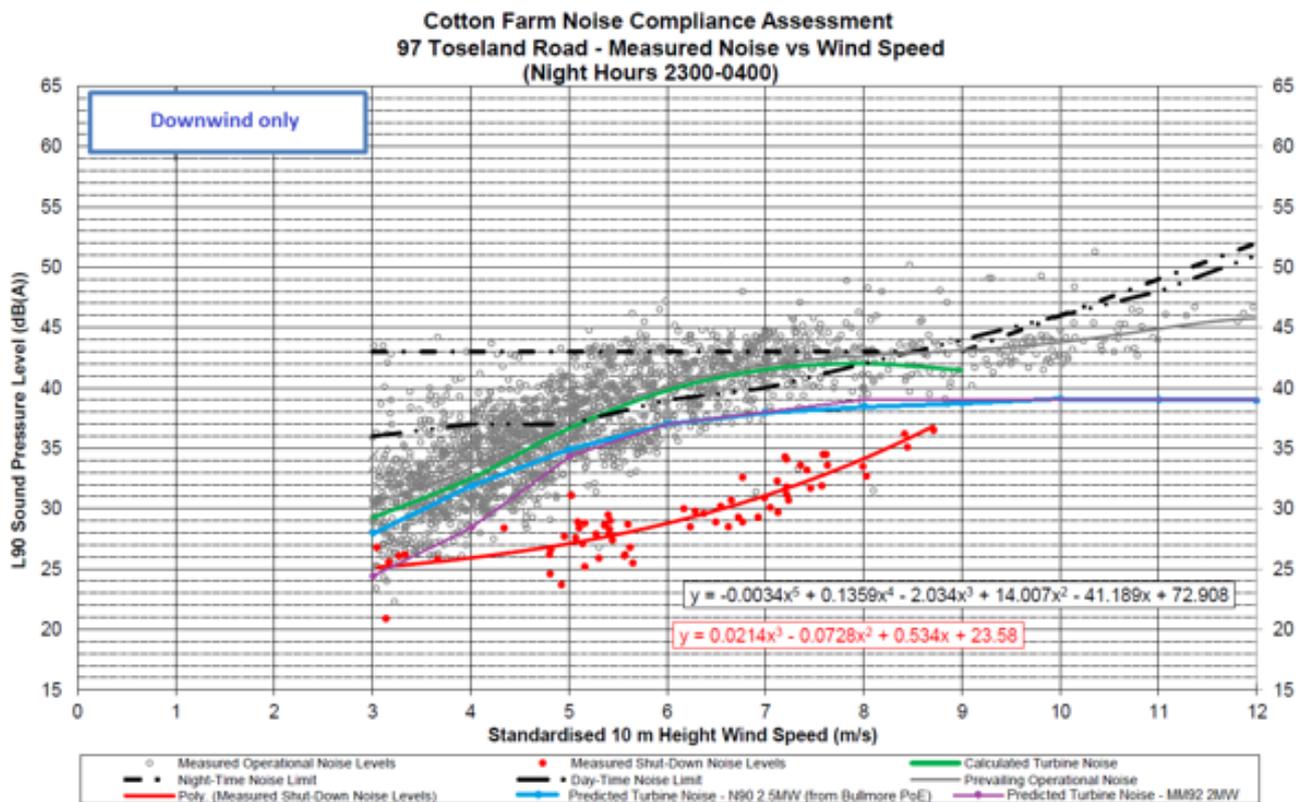
<sup>1</sup> January 2018 update. DNV/GL after a long period of prevarication proved they did not have the level of professionalism or understanding of how to record the noise emissions in the way required. A new company, Hayes McKenzie Partnership (HMP) were contracted by Greencoat, at very short notice, to carry out the recording in real time. The data is to be available and assessed by others, not HMP.

## HDC Analysis of the collected data and the HDC decision under ETSU.

When all the data is collected in and analysed HDC will be in a position to make a decision with respect to the ETSU requirements in accordance with the planning approval condition 24. It is expected, and hoped, this decision will be made based on examination of all the assessments and proof methodology being made by all parties. This decision, it is recommended, is to be based on the methodology of each individual assessor being clearly laid out and their interpretation of the ETSU specification specifically identified and why they used it. It is well known ETSU has sections where the interpretation of the processes can be stretched and/or 'misunderstood'.

## Historical assessment.

Other parties will have sufficient data to analyse the original planning sampling allowing for comparisons to be made against the original Noise Impact Assessment (NIA) published with the planning application documentation in 2007. Original comparisons have already been made by the CFRA acousticians using the HDC data identifying breaches of planning condition 24. CFRA acousticians, using the HDC findings have applied them to the NIA original prediction chart, in Fig 2 below, showing the predictions to the 'actual' were significantly underestimated.



56. The points to note are the **blue** calculated turbine noise (polynomial) line by HL and the **green** actual turbine noise line by the EHO using the HMP recording. Note it goes above the dotted black line, which is the maximum allowable noise level line from 5m to 8m/sec wind speed. Also note the actual and much lower background noise measurements (**red**) recorded when the turbines are switched off. This indicates how quiet the actual background noise normally is at the comparable wind speeds.

The chart above highlights the big difference between the original prediction by Hoare Lea (HL), the original acoustics company's assessment, and the actual recorded noise levels. HDC have advised they will not carry out this assessment but third party acousticians probably will. There are other factors not included in the fig 2 analysis which will, very likely, prove the assessment shown here is an underestimate of the true facts.

There are concerns regarding the methodology and tactics used in ETSU to get planning permission for turbines to be installed so close to habitation. It is hoped many of these concerns will be correctly assessed and properly addressed.

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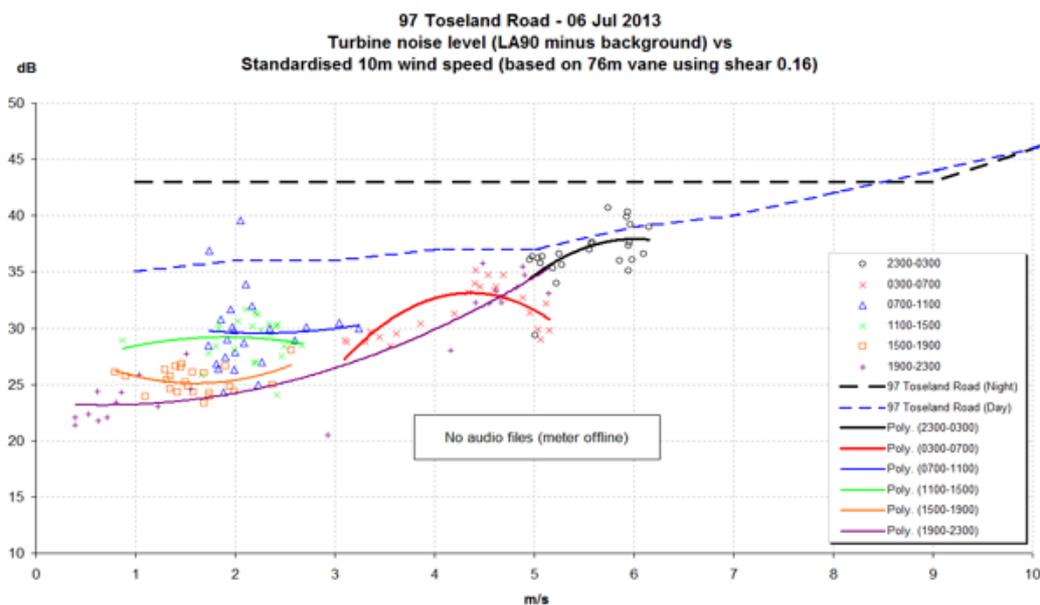
The objectives outlined in the document above as suggested at the CFRA meeting can be bullet pointed to being-:

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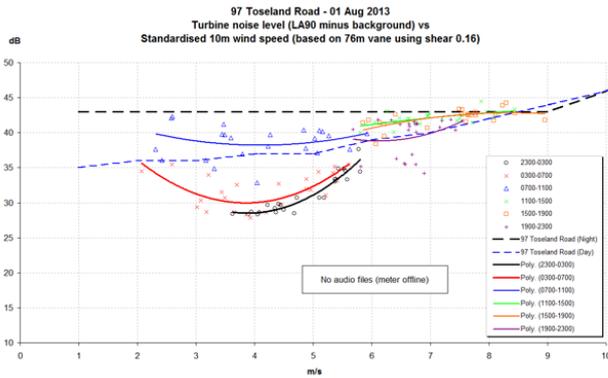
**ETSU interpretation needs to be agreed in advance of assessment.** This will remove any ambiguity in interpretation of ETSU. For example the number of data sets used to produce the dB polynomial is, according to ETSU, a minimum of 20 data sets. There is no maximum number of data sets written in ETSU. This should be clarified by advising a maximum number of data sets.

CFRA recommends 24. (24 x 10min per data set = 240 mins or 4 hours.) The 10 minute time limit per data set allows for as near a stable condition as possible for as near an accurate set of data for averaging. (i.e. wind direction, speed and similarity of noise collected on the monitor) To use a specific number of data sets, as ETSU states a minimum being 20 allows for trends or changes to be reflected in the data set progression into a polynomial when measured on a dB over wind speed scale. If there is no limit on the maximum number the assessment by others would be variable increasingly inaccurate and further extension covering hours or days (It has been done) will inevitably produce a polynomial that is bound to be below the upper limit.

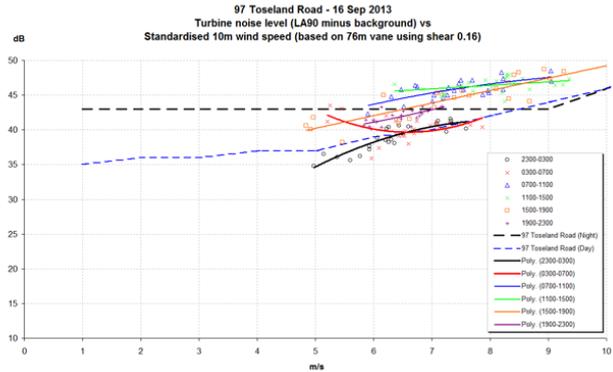
**Lots of compliant periods like this lead to averages being below the compliance level but this simply means the non-compliant periods are a minority or their exceedance is not as excessive as compliant periods are below the limits / line**



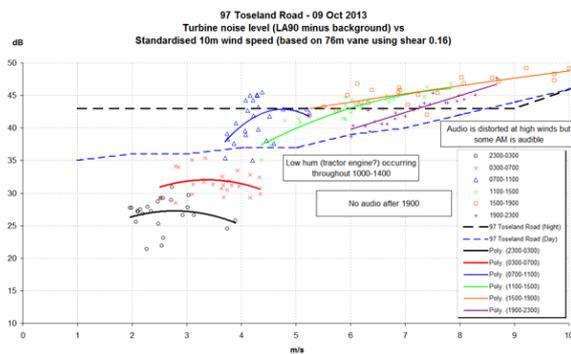
## Some compliance and non-compliance



## Higher level of non-compliance



## Increasing noise with increasing wind speed and non-compliances



Each line (or polynomal) is based on 24 x 10min data sets. Each 10 min average, i.a.w. ETSU LA90 rules, are plotted on the chart. Each colour represents a time period as per the table on the right. Each line is produced by drawing thru' the average of these plotted marks. Each line covers 4 hours of data. The dotted lines, top is the night at 43db the lower one day starting at 35dB are the maximum level of dB allowed at the respective wind speed in M/sec. This data is based on the 2013 Baywa/HMP data. It is this pictorial record that needs to be presented to prove the compliance, or not, of Condition 24 of the CFWF planning approval.

## 2

### Compliance in accordance to the Condition 24 of the planning approval document.

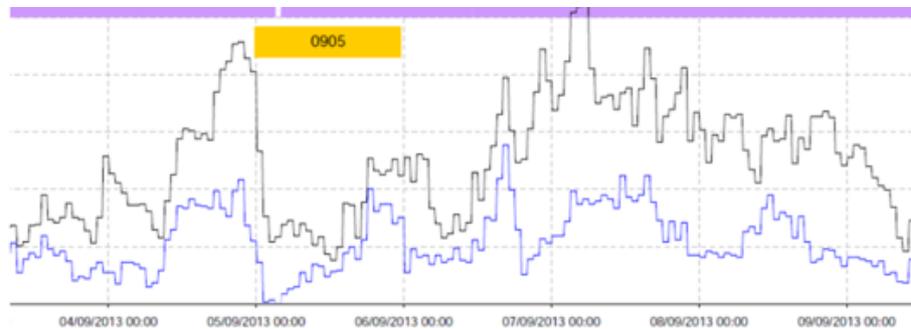
There has to be agreement in the understanding of the clauses of the conditions laid down. This should be agreed in advance of ensure a common agreement of the conditions. For example HDC have stated that the ETSU modification, published in 2014 known as the Good Practice Guide (GPG) is to be used in the assessment. This means the 10m heights for a receptor (someone's home) for wind speeds are calculated by using the turbine(s) 80m wind speed. However, the CFWF approval was made in 2010 before the GPG was published. The approval states standardised wind speed. This should be read, as I understand it, as 10m at the receptor site. This ensures remote effects like wind shear or hub height wind speeds are not distorting the data at the receptor site.

Table 1 - Between 07:00 and 23:00 - Noise level dB  $L_{A90}$ , 10-minute

Location	Standardised wind speed at 10 metre height (m/s) within the site averaged over 10-minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
Cotton Farm	40	40	40	40	40	40	40	42	45	47	50	52
Duck End Farm House	35	35	35	36	38	40	43	46	49	52	54	56
Green Acres	35	36	36	37	37	39	40	42	44	46	48	51
97 Toseland Road	35	36	36	37	37	39	40	42	44	46	48	51
College Farm	35	35	35	37	38	40	41	43	44	46	49	52
Bullens Farm	35	35	35	37	38	40	41	43	44	46	49	52
Hollow Farm	35	35	35	37	38	40	41	43	44	46	49	52
Green Farm	35	36	36	37	37	39	40	42	44	46	48	51
Great Parlow Close	35	35	35	35	35	37	40	42	45	47	50	52
Toseland Hall	35	36	36	37	37	39	40	42	44	46	48	51

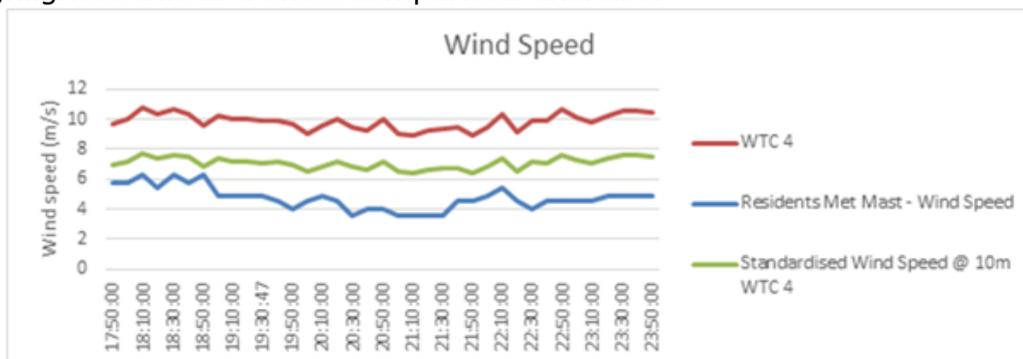
The use of the GPG does allow for these distortions up to a point by recognising there is an ambiguity. HDC have recognised these differences as has the industry through the IoA working group's insertion of the GPG.

CFRA has also identified the differences between actual 10m wind speeds from their permanent 10m met mast and the calculated wind speeds using the GPG method<sup>2</sup>. For example,



The bottom (blue) line is the 10m actual measurement, each averaged over an hour, and line above (Black) the GPG calculation based on the turbine hub height.

HDC also highlighted this in a short comparison exercise.



This six hour period shows several facts. First the level of wind speed at the 10m actual (Blue) is about 2dB less than the GPG (green) calculated 10m assumption. The red line being the actual (SCADA) 80m hub height wind about 600m away.

The other point to note the GPG method will provide an almost exact mirror image of the hub height wind data ignoring variations due to shear conditions, etc. The 10m Actual is not a mirror image. This is further proven as shear conditions alter, as can be seen in the 7 day record above.

It is a point to note, and my understanding, the condition 24 maximum dB allowance at varying speeds could possibly, and legally, be altered in the light of ACTUAL 10m wind data. The tables are only calculations based on evidence for the planning document and the actual data is far more accurate **SHOULD BE USED TO ALTER THE CONDITION 24 ESTIMATES**. Using the above charts the 43db level could be reduced by a minimum of 2dB to 41dB and the daytime reduced to 33dB. Looking at the polynomials in item one graphs above the level of non-compliance would be far greater and more numerous.

It is a further point to note, the wind industry, in their assessment of the Denbrook WF, have clearly stated they cannot use the GPG because the WF was approved long before the GPG was published. Someone is wrong.

<sup>2</sup> If a 10m actual wind speed figure to be used in the LA90 calculation and not the 80m SCADA/ GPG calculation, the assessment for compliance would be much more accurate.