



NOISE IMPACT REPORT:

Re

Replacement Wind Turbine Generator

at

Longley Farm, Dunford Road, Holmfirth HD9 2JD

prepared for

350 Strategy Ltd

8 Allergill Park

Upperthong

Holmfirth

HD9 3XH

Attention: Rachel Lee

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1. SUMMARY

- 1.1 A noise impact assessment has been performed for a proposed replacement wind turbine generator (WTG) installation at Longley Farm, Dunford Road in Holmfirth.
- 1.2 Noise measurements (i.e. background levels) have been surveyed at the site locality over a weekend while a suitable range of wind speed conditions occurred.
- 1.3 A public domain noise report has been used for the particular WTG machine under consideration.
- 1.4 Predictions of noise impact affecting the nearest dwellings have been facilitated using a computer program specialised for environmental noise calculations.
- 1.5 The Planning Authority would be particularly concerned with daytime garden amenity and internal night time sleeping conditions.
- 1.6 This assessment shows that the wind turbine noise will be at worst 3dBA above background. As such the situation falls into the 'of marginal significance' category terms of British Standard BS4142. The noise at dwelling receptors, for night time and day-time (garden) amenity, will be compliant with World Health Organisation (WHO) guidance criteria.
- 1.7 In addition, the document 'ETSU-R-97' has been referenced: the proposal is acceptable to the recommendations therein.
- 1.8 It is recommended that this report be passed to the relevant parties with the expectation that the scheme will be acceptable to the planning authority from a noise impact aspect.

2. INTRODUCTION

2.1 WTG Site Address and Application:

- Longley Farm, Dunford Road, Holmfirth HD9 2JD

2.2 Purchase Order and References Supplied:

- Instructed by Rachel Lee, 350 Strategy Ltd as agent, on 02 September 2013.
- Purchase Order: Email dated 02 September 2013.

2.3 Instructions and Objectives

The proposed replacement of a wind turbine generator (WTG) has the potential to change the noise climate affecting residential neighbours. Accordingly, the Local Authority required this background noise survey together with predicted noise levels in the garden of the nearest residential properties for the proposed replacement turbine. If excessive, and thus a nuisance to residential neighbours, they would expect noise amelioration.

2.4 Site Description

The proposed site is at an elevated location in the rural Holmfirth area of Huddersfield, approximately 110m from the B6106 Dunford Road, in the region of 2km from the village of Holmfirth, and 9km from Huddersfield.

2.5 Locality Noise Context – Other Sources etc.:

- Rural location, animals and farming in the vicinity, road traffic.
- Topology- the area of interest is on a hillside gradient but can be considered relatively flat for acoustic purposes.
- There has been a turbine in place for 25 years but, it is understood, it has not operated for over a year. This machine, a VESTAS unit rated at 90kW, was the first commercial installation in the UK. Undoubtedly, the old machine would have been perceptibly noisier than the proposed new generation unit. The proposal machine will be located in practically the same position as the old WTG.

2.6 Noise-Sensitive Receptors:

- The nearest neighbouring properties (five in a terrace), at the junction of Dunford Road and Longley Edge Lane, are approximately 120m to the north west of the WTG proposed location. While there are other noise-sensitive receptors, these properties are taken to be the most critical (for shortest distance and lowest elevation and therefore likely to be experiencing less wind-speed originating background noise).

2.7 NVM performed the site environmental noise measurements and calculations using current practice and guidelines.

2.8 Abbreviations and a glossary are provided at Section 9 Appendix 1. Also, definitions of terms and further references are readily available at local authority websites, on the internet, etc.

Important:

This report addresses only the issues as stated above.

The use of this report is strictly limited to the named client for the specific purposes in the project defined above. Recipients or users are requested to contact NVM to confirm currency of this report.

3. WTG INSTALLATION

- 3.1 Figure 11-1 shows the site layout. The nearest dwellings are roughly 120m to the north-west, 275m to the north east and 200m south of the proposal site. Figure 11-2 illustrates the survey measurement location and location of the wind turbine generator.
- 3.2 The following type of wind turbine, horizontal rotor, 3-bladed, is under consideration; the manufacturer's information is understood as follows:
- Endurance X-29/225 kW, tower height of 30m, rotor diameter 29.1m, cut in wind speed 4m/s, rotor speed 37.8rpm. As a point of reference, a noise level is stated in the manufacturer's literature as 46.6dB(A) at 100m for a 8m/s wind speed. The data used in this study was obtained from the manufacturer's datasheet *NW 29 noise study 2, Noise study of Norwin 29/225 kW wind turbine*, date 18.02.2012, provided by 350 Strategy Ltd. The turbine is considered to emit no tonal sound.
 - The WTG is currently known as an 'Endurance' but previously was called 'Norwin'.

4. CRITERIA

- 4.1 Kirklees Council's preferred approach to noise assessment is usually to achieve 5dBA or greater below the background noise level (L_{A90}). Further supporting reference material follows.
- 4.2 The Assessment and Rating of Noise from Wind Farms (ETSU-R-97) was published in September 1996 by the UK's department of Trade and Industry (DTI). This document was formulated to facilitate large wind farms. ETSU guidance permits wind farm noise (L_{A90}) to be 5dB above the background noise for the daytime period. However, the lowest night-time limit for wind farm noise is set at L_{A90} 43dB. At properties where the occupier receives a financial benefit ETSU suggests that a higher limit of 45dBA may be appropriate.
- 4.3 British Standard BS 4142:1997, 'Method for rating noise affecting mixed residential and industrial areas' is used for determining the difference between a 'rated' industrial noise and background noise and is deemed to anticipate the likelihood of complaints from residents exposed to industrial sources. The greater this difference the greater is the likelihood of complaints. A difference of around +10dB or more indicates that complaints are likely. A difference of around +5dB is of marginal significance. If the rating level is more than 10dB below the measured background level then this is a positive indication that complaints are unlikely. Noise is averaged over a period of one hour for daytime events and five minutes for night events. Night is usually defined as 2300-0700hours. Hence a noise criterion may be based upon the background noise level pertaining to the complainant addresses. For example, the level considered acceptable may be equal to the measured background $L_{Aeq(90)}$ level plus 5dBA in order that the noise be of 'marginal significance'. Note that the BS4142 is not applicable to background noise situations less than 30dBA.
- 4.4 'Guidelines for Community Noise' are issued by the World Health Organisation (WHO). The WHO suggests that good sleeping conditions are provided at an internal dwelling noise limit level of 30dBA L_{eq} and moderate annoyance occurs for internal levels above 35dBA L_{eq} . The difference of noise level between outside noise and inside with a window partially open for ventilation may be taken to be 10 to 15dBA. Hence a noise level limit outside a bedroom may

be 45 to 50dBA L_{eq} . A standard for daytime noise levels affecting dwelling gardens is that they should not exceed 50dBA L_{eq} (1hour) free field.

- 4.5 If a 'façade' at 1 metre noise level is required based upon noise measured in the free field (away from all significant reflecting surfaces other than the ground), then this can be taken as the free field noise level plus 2.5dB.
- 4.6 Generally, background noise levels are higher in the day than those in the night.
- 4.7 Background related to wind noise tends to increase faster than noise from a WTG. Prominent noise level due to a WTG tends to occur at or just above its cut-in speed e.g. 3 to 5m/s wind speed. 'Natural' noise due to the wind then provides a certain increasing 'masking' of the WTG noise with increasing wind speed.
- 4.8 Local Planning Authorities have the capacity to set and vary the noise limit conditions to a degree but should provide justification for a variation from the normal standards and codes.

5. BASELINE CONDITIONS

- 5.1 The measurement approach, methodology and instrumentation list is set out in Section 10, Appendix 2. Meteorological conditions and notes are tabled also in Section 10. The instrumentation deployed at site is illustrated in photographs, Figure 10-1.
- 5.2 A survey was performed to establish the relevant baseline or background noise conditions at the proposal site. The survey data is tabled in Section 11, Appendix 3. Figure 11-1 identifies the measurement location in the application site plot plan area.
- 5.3 The noise survey was undertaken in accordance with normal good practice. The events surveyed were considered typical and representative in the site locality. The noise comprised mainly: vehicles passing, distant traffic, and passenger aircraft, etc.
- 5.4 Note that the wind speed for this survey was, for brief times, at the WTG cut-in speed (e.g. about 3 to 4m/s).
- 5.5 Based upon the measurement survey, the pertinent information is worst case (i.e. lowest environmental noise):
- Night time- L_{A90} (5 minute) = 35dB at 4m/s wind speed.
 - Day time- L_{A90} (1 hour) = 44dB at 4m/s wind speed.
- 5.6 These survey-measured noise levels are used in the criteria against which the WTG noise will be judged.

6. PROPOSAL IMPACT

6.1 Noise Assessment

6.1.1 A small group of noise receptor properties are closest to the proposed replacement WTG being at the Dunford Road / Longley Edge Lane junction.

6.1.2 Both night time internal amenity and garden amenity are treated.

6.1.3 Table 12-2 presents the assessment for amenity at night time, leading to Table 12-3 which gives the predicted noise levels at the nearest and most sensitive receptor location.

6.1.4 Table 12-4 shows the assessment for free-field noise and garden amenity in the daytime.

6.2 Noise Impact

6.2.1 It is important to appreciate that the impact of WTG noise is dependent upon the prevailing masking background environmental effects such as wind-in-foliage noise.

6.2.2 Referring to Table 12-3, an 'impact' is derived for façade noise level at night. In effect, the proposed turbine gives a noise level below the 50dBA WHO criterion-limit for outside a bedroom window. The ETSU and BS4142 ('marginal significance') standards are also satisfied. Therefore, internal amenity will be acceptable giving acceptable sleeping conditions.

6.2.3 The daytime noise impact for both WTG options is significantly below the background level at all calculated wind speeds, as shown in Table 12-4. Hence, garden amenity will be acceptable.

7. CONCLUSIONS

- 7.1 Background noise at the proposal area sensitive worse case receptor has been measured, the specific wind turbine generator noise at the same receptor has been predicted, and the results have been compared with the criteria.
- 7.2 The effect or impact of the proposed WTG is assessed as acceptable for both night and day.
- 7.3 Regarding the margin of safety or for error and other aspects such as meteorology and favourable or unfavourable (for noise transmission) wind direction has been considered. The latter is likely to make some 1 or 2 dBA difference. However, impact will still be safely below the levels that may cause concern for the majority of the time.
- 7.4 For the sake of completeness: There should be no concern at all for this proposal's WTG noise effect on animals since it is widely acknowledged that animals grazing in the immediate vicinity of large WTG farms are unconcerned about the noise.
- 7.5 The noise impact on public access areas is negligible. Ground borne noise will also be negligible for a machine such as proposed and given the large distances to sensitive properties.
- 7.6 Noise is not expected to be an obstacle in the planning process

8. RECOMMENDATIONS

- 8.1 As the noise levels will be acceptable (not being intrusive to neighbours), recommendations for noise amelioration are unnecessary. The proposed wind turbine generator should be acceptable.

9. APPENDIX 1 – ABBREVIATIONS AND GLOSSARY

Table 9-1 Abbreviations

BS	British Standard
dB, dBA, dB(A)	Noise level, A-weighted, decibels, dB
EIA	Environmental Impact Assessment
ES	Environmental Statement
Hz, kHz	Unit of frequency, one cycle per second; one thousand cycles per second
LAeq, LAeq,T	A-weighted equivalent noise level in dB, usually for a defined time duration, T
LA10	The noise level exceeded for 10% of the measurement period, often used to assess traffic noise
LA90	The noise level exceeded for 90% of the measurement period, often used as a proxy for background noise
LA max	A-weighted maximum noise level
m/s	Metres per second, speed
SPL	Sound Pressure Level
SWL	Sound Power Level

Table 9-2 Glossary

A-weighted Decibel	The most frequently used noise measurement representing the sound pressure level weighted to correspond to the frequency response for the human ear. A difference of 3 dB(A) may just be noticeable, and a difference of 10 dB(A) represents a subjective doubling or halving of loudness
Baseline Conditions	The conditions against which potential impacts arising from the Scheme are identified and evaluated
Decibel	Logarithmic ratio used to relate sound pressure to a standard reference value
Environmental Impact Assessment	A systematic study of the likely environmental effect of a project
Environmental Statement	Document that reports the findings of an Environmental Impact Assessment
Mitigation measure	Actions proposed to moderate adverse impacts and to enhance the beneficial ones arising from the whole or specific elements of the Scheme
Neighbour noise	- that produced by a person's neighbour
Neighbourhood noise	- that produced in the neighbourhood such as noise from pubs, commercial or local industry and construction sites, but not from transportation unless specifically stated
Noise	Unwanted sound
Noise spectrum	Noise described by analysis into frequency components
Octave	- ratio of 2:1 between adjacent frequency bands
Spatial	Regarding geographical space
Temporal	Regarding time

10. APPENDIX 2 – NOISE MEASUREMENT METHODOLOGY

- 10.1 Noise measurements were made using a microphone, fitted with a windshield including bird-spikes, connected to an integrating and logging sound level meter designed for these purposes. The microphone was in the free field, 1.6m above the ground. The measurement location was chosen to be equivalent to a quiet point in a representative garden.
- 10.2 All acoustic data are in decibels (dB) referenced to 20 micro Pascals. The instrumentation was calibrated before and after the survey: the calibration remained accurate and constant within 0.1dB. Measurements are free field unless otherwise mentioned.
- 10.3 The equipment was installed on Friday 20 September and collected on Monday 23 September. The monitoring was continuous and only attended by the consultant at the outset, at mid-way, and at the end of the survey. The survey duration was as reasonable as possible considering suitability of weather, commensurate with obtaining noise data at the critical wind speeds (near cut-in).
- 10.4 Noise data was stored in the computer memory and post-processed using proprietary software. The data was also passed to a computer spreadsheet program to further facilitate detailed inspection, graphing, and calculations.

Table 10-1 Instrumentation list

Item	Manufacturer	Model	Serial No.
Svan 959 sound level analyser	Svantek, Poland	Svan 959	11203
Microphone ½” pre-polarised type	Svantek, Poland	SV12L	11386
Microphone windshield, including secondary windshield and bird-spike	B&K	UA	
PC operating software	MicroSoft	Windows XP Pro	
MS Excel spreadsheet	MicroSoft	Excel 2010	

- 10.5 At set up, the weather was cloudy, 13°C, with wind at approximately 4.2m/s. Further weather details follow in the table below.

Table 10-2 Site measurement conditions (source; accuweather.com)

Date & time	Forecast	Temp	Cloud	Rain	Wind dir	Wind m/s
Friday 20 Sept 12:00	Partly Cloudy	12°	54%	7%	WNW	4.2
13:00	Partly Cloudy	12°	68%	7%	WNW	4.2
14:00	Partly Cloudy	12°	59%	7%	WNW	4.2
15:00	Partly Cloudy	13°	66%	7%	WNW	3.9
16:00	Partly Cloudy	13°	69%	7%	WNW	3.3
17:00	Partly Cloudy	14°	70%	7%	W	2.2
18:00	Partly Cloudy	13°	70%	7%	W	2.2
19:00	Partly Cloudy	11°	70%	5%	WNW	1.4
20:00	Mostly Cloudy	10°	83%	0%	W	1.7
21:00	Cloudy	9°	66%	0%	W	1.4
22:00	Cloudy	9°	50%	0%	W	1.4
23:00	Cloudy	8°	55%	0%	W	1.4
00:00	Cloudy	8°	61%	0%	WSW	1.4
Sat 21 Sept 01:00	Cloudy	8°	66%	0%	WSW	1.4
02:00	Mostly Cloudy	8°	76%	1%	SW	1.4
03:00	Mostly Cloudy	8°	86%	1%	SW	1.4
04:00	Cloudy	9°	96%	1%	SSW	1.4
05:00	Cloudy	9°	90%	1%	SSW	1.4
06:00	Mostly Cloudy	8°	83%	1%	SSW	1.4
07:00	Mostly Cloudy	8°	77%	3%	SSW	1.4
08:00	Partly Cloudy	9°	72%	7%	S	1.4
09:00	Partly Cloudy	10°	68%	7%	S	1.4
10:00	Partly Cloudy	11°	64%	7%	S	1.7
11:00	Partly Cloudy	12°	73%	7%	SSW	1.7
12:00	Mostly Cloudy	13°	81%	7%	SSW	2.2
13:00	Cloudy	15°	90%	5%	SSW	2.2
14:00	Mostly Cloudy	15°	88%	1%	SW	2.8
15:00	Mostly Cloudy	16°	86%	1%	SW	2.8
16:00	Mostly Cloudy	17°	84%	1%	SW	3.9
17:00	Mostly Cloudy	16°	81%	1%	SW	2.2
18:00	Mostly Cloudy	16°	79%	1%	SW	2.2
19:00	Mostly Cloudy	15°	76%	1%	WSW	2.2
20:00	Partly Cloudy	14°	45%	0%	WSW	2.2
21:00	Partly Cloudy	14°	45%	0%	WSW	2.2
22:00	Partly Cloudy	14°	45%	0%	WSW	2.2
23:00	Partly Cloudy	14°	45%	0%	WSW	2.2
00:00	Partly Cloudy	14°	45%	0%	WSW	2.2
Sun 22 Sept 01:00	Partly Cloudy	14°	45%	0%	WSW	2.2
02:00	Cloudy	14°	90%	0%	SW	2.2
03:00	Cloudy	13°	90%	0%	SW	2.2
04:00	Cloudy	13°	90%	0%	SW	2.8
05:00	Fog	13°	90%	0%	SW	2.8
06:00	Fog	13°	90%	0%	SW	3.3
07:00	Fog	13°	90%	0%	WSW	4.2
08:00	Fog	13°	90%	0%	WSW	4.2
09:00	Fog	14°	88%	0%	WSW	2.8
10:00	Fog	15°	84%	0%	WSW	3.3
11:00	Mostly Cloudy	16°	76%	0%	WSW	4.2
12:00	Mostly Cloudy	17°	76%	0%	WSW	4.2
13:00	Mostly Cloudy	18°	76%	0%	W	4.2
14:00	Partly Sunny	18°	43%	0%	W	3.3
15:00	Partly Sunny	19°	38%	0%	W	2.8
16:00	Partly Sunny	20°	32%	0%	W	2.2
17:00	Partly Sunny	19°	40%	0%	W	1.7
18:00	Partly Sunny	17°	45%	0%	WNW	1.4
19:00	Partly Sunny	15°	45%	0%	WNW	1.4
20:00	Partly Cloudy	15°	49%	0%	WNW	1.4
21:00	Partly Cloudy	14°	43%	0%	WNW	1.4
22:00	Partly Cloudy	14°	37%	0%	WNW	0.8
23:00	Mostly Clear	14°	29%	0%	WNW	0.8
00:00	Mostly Clear	13°	21%	0%	WNW	0.8
Mon 23 Sept 01:00	Mostly Clear	13°	13%	0%	WNW	0.8
02:00	Mostly Clear	13°	11%	0%	W	0.8
03:00	Clear	13°	8%	0%	WSW	0.8
04:00	Mostly Clear	13°	13%	0%	WNW	0.8
05:00	Mostly Clear	13°	11%	0%	W	0.8
06:00	Clear	13°	8%	0%	WSW	0.8
07:00	Clear	13°	6%	0%	SW	0.6
08:00	Mostly Clear	11°	29%	0%	SW	1.7
09:00	Cloudy	12°	51%	0%	SSW	1.4
10:00	Partly Cloudy	13°	74%	0%	SSW	1.4
11:00	Fog	14°	78%	0%	SSW	1.4

10.6 The site situation and measurement microphone locations are illustrated below.



Figure 10-1 Photographs showing the microphone situation on site

11. APPENDIX 3 –SITE AND MEASURED NOISE DATA

11.1 The site location is shown below identifying the existing turbine and nearest residential properties.



Figure 11-1 Site layout (courtesy Google earth)



Figure 11-2 Site measurement location (courtesy Google earth)

11.2 The figure above shows the site area and the noise measurement location within the site namely:

- Location 1 a secluded unobtrusive place, representative of the rear dwelling noise climate. The noise measurement location was chosen to be representative for the nearest neighbour's garden amenity.

11.3 The noise (L_{Aeq} and L_{A90}) measured, in 5 minute durations, is summarised in the next table.

Table 11-1 Measured noise data, SPL dB

Date & time	File No	L _{AEQ}	L _{A90}	Date & time	File No	L _{AEQ}	L _{A90}	Date & time	File No	L _{AEQ}	L _{A90}
20/09/2013 11:00	@R2	60.7	46	20/09/2013 15:35	@R57	61.9	41.4	20/09/2013 20:10	@R112	57.5	35.4
20/09/2013 11:05	@R3	59.8	42	20/09/2013 15:40	@R58	60.6	42.1	20/09/2013 20:15	@R113	57.7	34.3
20/09/2013 11:10	@R4	61.1	40.8	20/09/2013 15:45	@R59	62.1	42.6	20/09/2013 20:20	@R114	59.2	35.1
20/09/2013 11:15	@R5	60.3	44	20/09/2013 15:50	@R60	62.5	42.9	20/09/2013 20:25	@R115	57.5	33
20/09/2013 11:20	@R6	59.5	38.5	20/09/2013 15:55	@R61	62.9	47.1	20/09/2013 20:30	@R116	55.9	33.9
20/09/2013 11:25	@R7	61.1	44.4	20/09/2013 16:00	@R62	63.8	49.1	20/09/2013 20:35	@R117	59.6	37.5
20/09/2013 11:30	@R8	59.5	41.4	20/09/2013 16:05	@R63	62.5	48.9	20/09/2013 20:40	@R118	57.2	35.3
20/09/2013 11:35	@R9	61.6	40.6	20/09/2013 16:10	@R64	63.3	41.6	20/09/2013 20:45	@R119	58.7	33.3
20/09/2013 11:40	@R10	58.6	38.6	20/09/2013 16:15	@R65	61.8	40.7	20/09/2013 20:50	@R120	54.8	33.4
20/09/2013 11:45	@R11	57.5	38.5	20/09/2013 16:20	@R66	63.5	36.4	20/09/2013 20:55	@R121	55.5	33.9
20/09/2013 11:50	@R12	58.4	41.9	20/09/2013 16:25	@R67	63	38.8	20/09/2013 21:00	@R122	56.7	30.8
20/09/2013 11:55	@R13	60.4	40.3	20/09/2013 16:30	@R68	61.9	45.4	20/09/2013 21:05	@R123	58.8	30
20/09/2013 12:00	@R14	61.1	39.8	20/09/2013 16:35	@R69	63.1	40.2	20/09/2013 21:10	@R124	54.7	34.2
20/09/2013 12:05	@R15	61	39.2	20/09/2013 16:40	@R70	62.3	48.1	20/09/2013 21:15	@R125	53.7	29.5
20/09/2013 12:10	@R16	61.3	42.4	20/09/2013 16:45	@R71	67.5	39.1	20/09/2013 21:20	@R126	57.2	28.7
20/09/2013 12:15	@R17	61.5	49.7	20/09/2013 16:50	@R72	63.6	51	20/09/2013 21:25	@R127	54.6	29.6
20/09/2013 12:20	@R18	61.5	43.9	20/09/2013 16:55	@R73	62.7	46.4	20/09/2013 21:30	@R128	58.4	30.3
20/09/2013 12:25	@R19	58.7	40.3	20/09/2013 17:00	@R74	60.7	39.3	20/09/2013 21:35	@R129	58.5	31
20/09/2013 12:30	@R20	62.1	40.4	20/09/2013 17:05	@R75	61.7	45.5	20/09/2013 21:40	@R130	56.2	29.9
20/09/2013 12:35	@R21	60.2	39.3	20/09/2013 17:10	@R76	62	43.6	20/09/2013 21:45	@R131	52.4	29.7
20/09/2013 12:40	@R22	59.4	40.9	20/09/2013 17:15	@R77	62.1	41.3	20/09/2013 21:50	@R132	54.2	29.3
20/09/2013 12:45	@R23	59.8	39.8	20/09/2013 17:20	@R78	62.7	45.7	20/09/2013 21:55	@R133	54.4	30
20/09/2013 12:50	@R24	56.8	40.2	20/09/2013 17:25	@R79	63.5	50.5	20/09/2013 22:00	@R134	53.1	29.6
20/09/2013 12:55	@R25	61.3	44.3	20/09/2013 17:30	@R80	62.8	49.1	20/09/2013 22:05	@R135	55.7	28.5
20/09/2013 13:00	@R26	61.4	43.3	20/09/2013 17:35	@R81	62.5	47.4	20/09/2013 22:10	@R136	56.9	28
20/09/2013 13:05	@R27	58.6	41.2	20/09/2013 17:40	@R82	62.1	45.4	20/09/2013 22:15	@R137	56	27.4
20/09/2013 13:10	@R28	59.3	40.3	20/09/2013 17:45	@R83	63.4	49.7	20/09/2013 22:20	@R138	51.6	28.3
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21/09/2013 01:05	@R171	48	26.5
21/09/2013 01:10	@R172	26.4	25
21/09/2013 01:15	@R173	27.1	25.1
21/09/2013 01:20	@R174	53.3	25.8
21/09/2013 01:25	@R175	29.3	25.4
21/09/2013 01:30	@R176	55.3	26.5
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21/09/2013 02:05	@R183	54.3	26.1
21/09/2013 02:10	@R184	47.9	24.9
21/09/2013 02:15	@R185	46.1	25
21/09/2013 02:20	@R186	50.3	27.2
21/09/2013 02:25	@R187	47.4	28.5
21/09/2013 02:30	@R188	43.7	28.6
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21/09/2013 03:10	@R196	28.7	27.1
21/09/2013 03:15	@R197	29.4	26.8
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21/09/2013 03:25	@R199	28.3	26.9
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21/09/2013 03:40	@R202	47.3	24.4
21/09/2013 03:45	@R203	46.9	24
21/09/2013 03:50	@R204	24.2	23
21/09/2013 03:55	@R205	25.5	23.5
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21/09/2013 04:05	@R207	53.4	23.5
21/09/2013 04:10	@R208	24.5	23.1
21/09/2013 04:15	@R209	41.6	25.2
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21/09/2013 04:25	@R211	30.1	27.3
21/09/2013 04:30	@R212	29.4	28.1
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21/09/2013 04:40	@R214	49.4	29.6
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21/09/2013 05:05	@R219	53	29.1
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Date & time	File No	L _{AEQ}	L _{A90}
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21/09/2013 05:50	@R228	53.3	29
21/09/2013 05:55	@R229	52	31.1
21/09/2013 06:00	@R230	33.6	29.9
21/09/2013 06:05	@R231	33	29.8
21/09/2013 06:10	@R232	51.1	32.7
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21/09/2013 06:25	@R235	48.5	34
21/09/2013 06:30	@R236	49.8	33.9
21/09/2013 06:35	@R237	53.3	32.8
21/09/2013 06:40	@R238	50.7	32.6
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21/09/2013 06:50	@R240	57.8	32.8
21/09/2013 06:55	@R241	55.7	32.2
21/09/2013 07:00	@R242	54.3	32.3
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21/09/2013 07:10	@R244	52.3	30.7
21/09/2013 07:15	@R245	59.1	34.6
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21/09/2013 08:30	@R260	56.5	31.6
21/09/2013 08:35	@R261	58.9	31.7
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21/09/2013 08:45	@R263	60.4	39.3
21/09/2013 08:50	@R264	59.8	37.8
21/09/2013 08:55	@R265	60	34.3
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21/09/2013 09:25	@R271	60	41.1
21/09/2013 09:30	@R272	60.8	42.3
21/09/2013 09:35	@R273	61.4	42
21/09/2013 09:40	@R274	60.8	40.7
21/09/2013 09:45	@R275	59.8	41.2
21/09/2013 09:50	@R276	60.7	41.7
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21/09/2013 10:00	@R278	61.8	43.4
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Date & time	File No	L _{AEQ}	L _{A90}
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21/09/2013 10:50	@R288	58.6	41.6
21/09/2013 10:55	@R289	60.4	42.1
21/09/2013 11:00	@R290	59.4	41.6
21/09/2013 11:05	@R291	60.6	46.8
21/09/2013 11:10	@R292	60.3	40.7
21/09/2013 11:15	@R293	59.5	40.4
21/09/2013 11:20	@R294	58.8	40
21/09/2013 11:25	@R295	58.6	43.2
21/09/2013 11:30	@R296	61.7	49
21/09/2013 11:35	@R297	59.3	40.4
21/09/2013 11:40	@R298	63.3	44.6
21/09/2013 11:45	@R299	61.1	42.4
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21/09/2013 11:55	@R301	60.3	39.7
21/09/2013 12:00	@R302	60.3	37.8
21/09/2013 12:05	@R303	60.7	44.3
21/09/2013 12:10	@R304	58	38
21/09/2013 12:15	@R305	60.7	44
21/09/2013 12:20	@R306	62.2	46.8
21/09/2013 12:25	@R307	61.1	42.4
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21/09/2013 12:35	@R309	60.7	40.8
21/09/2013 12:40	@R310	60.5	37.3
21/09/2013 12:45	@R311	60.1	44.3
21/09/2013 12:50	@R312	59.2	41.3
21/09/2013 12:55	@R313	59.5	40.7
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21/09/2013 13:05	@R315	59.6	41
21/09/2013 13:10	@R316	61.2	48.1
21/09/2013 13:15	@R317	60.7	42.6
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21/09/2013 13:40	@R322	58.7	40.3
21/09/2013 13:45	@R323	59	44.5
21/09/2013 13:50	@R324	58.8	41.6
21/09/2013 13:55	@R325	57.2	37.3
21/09/2013 14:00	@R326	62.4	38.7
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21/09/2013 14:30	@R332	59.6	42.6
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21/09/2013 14:40	@R334	59.6	41
21/09/2013 14:45	@R335	58.3	39.7
21/09/2013 14:50	@R336	60.2	43
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Date & time	File No	L _{AEQ}	L _{A90}
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21/09/2013 15:15	@R341	61.9	47
21/09/2013 15:20	@R342	59.7	39.1
21/09/2013 15:25	@R343	61.1	39.9
21/09/2013 15:30	@R344	60.2	39.2
21/09/2013 15:35	@R345	59.3	40.4
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21/09/2013 15:45	@R347	57.5	38.4
21/09/2013 15:50	@R348	57.3	39.1
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21/09/2013 16:00	@R350	60	43.9
21/09/2013 16:05	@R351	60.2	44.7
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21/09/2013 16:20	@R354	61.7	43.5
21/09/2013 16:25	@R355	61.9	48
21/09/2013 16:30	@R356	61.1	39
21/09/2013 16:35	@R357	60.4	40.6
21/09/2013 16:40	@R358	56.9	39.4
21/09/2013 16:45	@R359	60.6	38
21/09/2013 16:50	@R360	57.3	37.6
21/09/2013 16:55	@R361	65.9	40.7
21/09/2013 17:00	@R362	60.9	39.8
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21/09/2013 17:25	@R367	61.8	39.9
21/09/2013 17:30	@R368	61.5	46.7
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21/09/2013 17:45	@R371	59.6	39.6
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21/09/2013 18:40	@R382	60.5	37.3
21/09/2013 18:45	@R383	58.3	35.9
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21/09/2013 18:55	@R385	59.6	35.2
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21/09/2013 19:05	@R387	57.7	34.3
21/09/2013 19:10	@R388	59	38.4
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21/09/2013 19:25	@R391	60.2	37.6
21/09/2013 19:30	@R392	60.2	38.9
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Date & time	File No	L _{AEQ}	L _{A90}
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21/09/2013 20:15	@R401	55.2	35.3
21/09/2013 20:20	@R402	57.3	36.1
21/09/2013 20:25	@R403	55	36.3
21/09/2013 20:30	@R404	56.1	35.8
21/09/2013 20:35	@R405	58.6	35.8
21/09/2013 20:40	@R406	57.4	35.6
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21/09/2013 21:05	@R411	52.7	36.6
21/09/2013 21:10	@R412	55.6	37.3
21/09/2013 21:15	@R413	53.5	36.1
21/09/2013 21:20	@R414	57.9	37.6
21/09/2013 21:25	@R415	54.5	36
21/09/2013 21:30	@R416	52.8	36.6
21/09/2013 21:35	@R417	55	35.8
21/09/2013 21:40	@R418	53.4	35.2
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21/09/2013 21:55	@R421	56.3	37.2
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21/09/2013 23:20	@R438	52.1	35.6
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22/09/2013 00:05	@R447	54.3	33.3
22/09/2013 00:10	@R448	51.2	33.1
22/09/2013 00:15	@R449	50.8	35.3
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22/09/2013 00:25	@R451	53.7	35.3

Date & time	File No	L _{AEQ}	L _{A90}
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22/09/2013 00:40	@R454	54.7	37.3
22/09/2013 00:45	@R455	53.5	36.6
22/09/2013 00:50	@R456	51.4	37.4
22/09/2013 00:55	@R457	49.7	39.3
22/09/2013 01:00	@R458	45.8	36.6
22/09/2013 01:05	@R459	52.1	37.2
22/09/2013 01:10	@R460	49.4	36.2
22/09/2013 01:15	@R461	46.1	36.1
22/09/2013 01:20	@R462	38.6	36.2
22/09/2013 01:25	@R463	54	35.2
22/09/2013 01:30	@R464	50.2	36.6
22/09/2013 01:35	@R465	49.3	37.4
22/09/2013 01:40	@R466	45.6	37.6
22/09/2013 01:45	@R467	50.2	37.9
22/09/2013 01:50	@R468	50.1	37.3
22/09/2013 01:55	@R469	41.9	38.9
22/09/2013 02:00	@R470	48.7	40.1
22/09/2013 02:05	@R471	42	38.4
22/09/2013 02:10	@R472	52.4	39.1
22/09/2013 02:15	@R473	49	37
22/09/2013 02:20	@R474	47.7	37.3
22/09/2013 02:25	@R475	51.8	35.5
22/09/2013 02:30	@R476	38.2	36.1
22/09/2013 02:35	@R477	38.4	34.3
22/09/2013 02:40	@R478	39.1	35.6
22/09/2013 02:45	@R479	43.2	38
22/09/2013 02:50	@R480	48.4	39.6
22/09/2013 02:55	@R481	54.5	38.3
22/09/2013 03:00	@R482	48	36.2
22/09/2013 03:05	@R483	38.5	36
22/09/2013 03:10	@R484	37.6	35
22/09/2013 03:15	@R485	47.8	34.1
22/09/2013 03:20	@R486	40.8	34.1
22/09/2013 03:25	@R487	38.1	35.2
22/09/2013 03:30	@R488	47.2	36.2
22/09/2013 03:35	@R489	40.8	35.6
22/09/2013 03:40	@R490	39.2	35.1
22/09/2013 03:45	@R491	47.3	36.6
22/09/2013 03:50	@R492	43.8	38
22/09/2013 03:55	@R493	38	34.6
22/09/2013 04:00	@R494	37.5	34.3
22/09/2013 04:05	@R495	49	34.7
22/09/2013 04:10	@R496	38.4	35
22/09/2013 04:15	@R497	39.4	36.5
22/09/2013 04:20	@R498	39	34.6
22/09/2013 04:25	@R499	39.5	36.6
22/09/2013 04:30	@R500	37.7	34.5
22/09/2013 04:35	@R501	36.6	34.3
22/09/2013 04:40	@R502	38.1	35.2
22/09/2013 04:45	@R503	50.8	37
22/09/2013 04:50	@R504	47.5	37.5
22/09/2013 04:55	@R505	47.4	35.5
22/09/2013 05:00	@R506	45.2	36.1
22/09/2013 05:05	@R507	37.2	34.3
22/09/2013 05:10	@R508	50	34.3

Date & time	File No	L _{AEQ}	L _{A90}
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22/09/2013 05:25	@R511	50.3	32.8
22/09/2013 05:30	@R512	47.1	32.7
22/09/2013 05:35	@R513	51.1	34
22/09/2013 05:40	@R514	36.1	33.3
22/09/2013 05:45	@R515	36.6	34.4
22/09/2013 05:50	@R516	50	32.7
22/09/2013 05:55	@R517	51.8	33.6
22/09/2013 06:00	@R518	58.5	34.8
22/09/2013 06:05	@R519	48.6	35
22/09/2013 06:10	@R520	37.5	35.1
22/09/2013 06:15	@R521	35.8	33.4
22/09/2013 06:20	@R522	49.9	33.5
22/09/2013 06:25	@R523	37	34.2
22/09/2013 06:30	@R524	54.3	34.1
22/09/2013 06:35	@R525	38.2	35.1
22/09/2013 06:40	@R526	47.7	34.3
22/09/2013 06:45	@R527	55.1	32.5
22/09/2013 06:50	@R528	56.7	31.8
22/09/2013 06:55	@R529	50.5	36.2
22/09/2013 07:00	@R530	51.2	34.9
22/09/2013 07:05	@R531	47	35.7
22/09/2013 07:10	@R532	53.5	37
22/09/2013 07:15	@R533	55.6	37.3
22/09/2013 07:20	@R534	48.7	35.9
22/09/2013 07:25	@R535	50.6	38
22/09/2013 07:30	@R536	54.5	38.2
22/09/2013 07:35	@R537	56.3	37.5
22/09/2013 07:40	@R538	49	37.3
22/09/2013 07:45	@R539	52.5	39
22/09/2013 07:50	@R540	53.5	38.1
22/09/2013 07:55	@R541	48.5	37.1
22/09/2013 08:00	@R542	52.8	38.5
22/09/2013 08:05	@R543	53.6	37.3
22/09/2013 08:10	@R544	51.8	36.7
22/09/2013 08:15	@R545	56.8	38.4
22/09/2013 08:20	@R546	57.3	37.5
22/09/2013 08:25	@R547	56.3	35.6
22/09/2013 08:30	@R548	55.6	35
22/09/2013 08:35	@R549	56.5	37.4
22/09/2013 08:40	@R550	57.4	38.3
22/09/2013 08:45	@R551	52.1	36.3
22/09/2013 08:50	@R552	57.7	38.2
22/09/2013 08:55	@R553	62.5	39.2
22/09/2013 09:00	@R554	57.7	36.6
22/09/2013 09:05	@R555	58.9	37.7
22/09/2013 09:10	@R556	58.6	37.9
22/09/2013 09:15	@R557	61.5	43.1
22/09/2013 09:20	@R558	58.4	39.8
22/09/2013 09:25	@R559	57.5	40.1
22/09/2013 09:30	@R560	58.2	39.4
22/09/2013 09:35	@R561	60.2	39.6
22/09/2013 09:40	@R562	61.9	38.9
22/09/2013 09:45	@R563	59	38
22/09/2013 09:50	@R564	57.7	37
22/09/2013 09:55	@R565	59.7	40.7

Date & time	File No	L _{AEQ}	L _{A90}
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22/09/2013 10:10	@R568	67.8	46.2
22/09/2013 10:15	@R569	60.1	42.7
22/09/2013 10:20	@R570	60.3	45.9
22/09/2013 10:25	@R571	59.2	43
22/09/2013 10:30	@R572	58.7	41.1
22/09/2013 10:35	@R573	65.2	42.7
22/09/2013 10:40	@R574	60.7	41.2
22/09/2013 10:45	@R575	60.8	43.6
22/09/2013 10:50	@R576	59.3	42.1
22/09/2013 10:55	@R577	63.6	44.9
22/09/2013 11:00	@R578	59.9	44.3
22/09/2013 11:05	@R579	60.1	45.7
22/09/2013 11:10	@R580	58.9	46.7
22/09/2013 11:15	@R581	59.7	42.6
22/09/2013 11:20	@R582	59.8	42.6
22/09/2013 11:25	@R583	59.6	44.5
22/09/2013 11:30	@R584	61.4	41.9
22/09/2013 11:35	@R585	61.1	45.7
22/09/2013 11:40	@R586	59.7	45.5
22/09/2013 11:45	@R587	61.3	44.6
22/09/2013 11:50	@R588	62.3	48.3
22/09/2013 11:55	@R589	66.8	44.4
22/09/2013 12:00	@R590	63.6	42.3
22/09/2013 12:05	@R591	58.9	39.9
22/09/2013 12:10	@R592	62.4	45.2
22/09/2013 12:15	@R593	60.5	44.3
22/09/2013 12:20	@R594	62.5	44.2
22/09/2013 12:25	@R595	65.9	41.4
22/09/2013 12:30	@R596	62.5	47.8
22/09/2013 12:35	@R597	59.7	42.6
22/09/2013 12:40	@R598	60.5	41.3
22/09/2013 12:45	@R599	59.1	39.3
22/09/2013 12:50	@R600	61.7	43.2
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22/09/2013 13:00	@R602	61.3	41.2
22/09/2013 13:05	@R603	60.5	39.4
22/09/2013 13:10	@R604	59.8	42.1
22/09/2013 13:15	@R605	69.1	45
22/09/2013 13:20	@R606	59	38.9
22/09/2013 13:25	@R607	61	44.1
22/09/2013 13:30	@R608	59.5	38.4
22/09/2013 13:35	@R609	60	44.2
22/09/2013 13:40	@R610	59.3	39.2
22/09/2013 13:45	@R611	61.6	41.5
22/09/2013 13:50	@R612	60.8	45.2
22/09/2013 13:55	@R613	59.7	45.3
22/09/2013 14:00	@R614	62.2	42.5
22/09/2013 14:05	@R615	59.9	43.9
22/09/2013 14:10	@R616	61.1	42.8
22/09/2013 14:15	@R617	59.5	44.4
22/09/2013 14:20	@R618	59.7	37.9
22/09/2013 14:25	@R619	62.8	42.6
22/09/2013 14:30	@R620	59.2	38.3
22/09/2013 14:35	@R621	60.4	44.1
22/09/2013 14:40	@R622	60.6	45

Date & time	File No	L _{AEQ}	L _{A90}
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22/09/2013 14:50	@R624	59.8	42.3
22/09/2013 14:55	@R625	60.7	42.9
22/09/2013 15:00	@R626	60.5	39.7
22/09/2013 15:05	@R627	61.2	44.8
22/09/2013 15:10	@R628	60.8	38.8
22/09/2013 15:15	@R629	60	41.2
22/09/2013 15:20	@R630	62.2	47.4
22/09/2013 15:25	@R631	60.9	41.7
22/09/2013 15:30	@R632	59.3	37.7
22/09/2013 15:35	@R633	60.5	40.7
22/09/2013 15:40	@R634	56.1	35.7
22/09/2013 15:45	@R635	59.3	40.7
22/09/2013 15:50	@R636	61.6	39
22/09/2013 15:55	@R637	60.4	37.9
22/09/2013 16:00	@R638	58.8	37.6
22/09/2013 16:05	@R639	61	44.2
22/09/2013 16:10	@R640	61.3	46.7
22/09/2013 16:15	@R641	61	39.5
22/09/2013 16:20	@R642	61.7	39.8
22/09/2013 16:25	@R643	61.6	46.8
22/09/2013 16:30	@R644	58.3	36.5
22/09/2013 16:35	@R645	58.1	36.2
22/09/2013 16:40	@R646	61.1	41.6
22/09/2013 16:45	@R647	60.6	39.1
22/09/2013 16:50	@R648	59.9	43.3
22/09/2013 16:55	@R649	61.2	45.3
22/09/2013 17:00	@R650	60.2	37.8
22/09/2013 17:05	@R651	59.5	37.3
22/09/2013 17:10	@R652	61.6	44.9
22/09/2013 17:15	@R653	62.4	39.7
22/09/2013 17:20	@R654	60	37.3
22/09/2013 17:25	@R655	64	35.9
22/09/2013 17:30	@R656	58.3	35.4
22/09/2013 17:35	@R657	59.9	36.7
22/09/2013 17:40	@R658	59.2	35.6
22/09/2013 17:45	@R659	61.2	39.4
22/09/2013 17:50	@R660	61.1	34.5
22/09/2013 17:55	@R661	57.7	37.5
22/09/2013 18:00	@R662	61.3	36.6
22/09/2013 18:05	@R663	62.2	45
22/09/2013 18:10	@R664	60.7	37.4
22/09/2013 18:15	@R665	58.6	38.5
22/09/2013 18:20	@R666	61.8	41.2
22/09/2013 18:25	@R667	62.1	40.3
22/09/2013 18:30	@R668	65.2	42.3
22/09/2013 18:35	@R669	58.5	38.6
22/09/2013 18:40	@R670	59.4	37.4
22/09/2013 18:45	@R671	61.4	36.7
22/09/2013 18:50	@R672	59.7	35.7
22/09/2013 18:55	@R673	56.2	36.7
22/09/2013 19:00	@R674	61.1	42
22/09/2013 19:05	@R675	61.8	40.9
22/09/2013 19:10	@R676	59.6	40.2
22/09/2013 19:15	@R677	59.5	38.3
22/09/2013 19:20	@R678	59.8	37.1
22/09/2013 19:25	@R679	58.1	38.8

Date & time	File No	L _{AEQ}	L _{A90}
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22/09/2013 19:35	@R681	58.8	35.5
22/09/2013 19:40	@R682	57.7	37.6
22/09/2013 19:45	@R683	58.4	33.8
22/09/2013 19:50	@R684	59.4	35.7
22/09/2013 19:55	@R685	58.4	35.4
22/09/2013 20:00	@R686	58.2	35.6
22/09/2013 20:05	@R687	57.9	36.1
22/09/2013 20:10	@R688	58	37.5
22/09/2013 20:15	@R689	55.7	35.5
22/09/2013 20:20	@R690	58.6	39.3
22/09/2013 20:25	@R691	58.1	35
22/09/2013 20:30	@R692	59.3	36.2
22/09/2013 20:35	@R693	57.3	35.9
22/09/2013 20:40	@R694	57.1	33.9
22/09/2013 20:45	@R695	57.6	35.5
22/09/2013 20:50	@R696	54.7	35.3
22/09/2013 20:55	@R697	54.6	34.6
22/09/2013 21:00	@R698	58.4	37.8
22/09/2013 21:05	@R699	54.5	34.2
22/09/2013 21:10	@R700	57.8	38
22/09/2013 21:15	@R701	55.7	33.6
22/09/2013 21:20	@R702	56	34.7
22/09/2013 21:25	@R703	52.9	33.3
22/09/2013 21:30	@R704	54.2	34.7
22/09/2013 21:35	@R705	51.6	33.6
22/09/2013 21:40	@R706	56.2	34.7
22/09/2013 21:45	@R707	55.5	34.9
22/09/2013 21:50	@R708	52.7	35.5
22/09/2013 21:55	@R709	53.9	33.7
22/09/2013 22:00	@R710	48.1	34.7
22/09/2013 22:05	@R711	53.6	35.1
22/09/2013 22:10	@R712	55.4	34.9
22/09/2013 22:15	@R713	34.7	33.1
22/09/2013 22:20	@R714	56.2	34.2
22/09/2013 22:25	@R715	50.6	33.1
22/09/2013 22:30	@R716	55.2	32.4
22/09/2013 22:35	@R717	53.2	33.1
22/09/2013 22:40	@R718	55.5	34.9
22/09/2013 22:45	@R719	53.2	33.9
22/09/2013 22:50	@R720	41.9	31.7
22/09/2013 22:55	@R721	50.3	31.9
22/09/2013 23:00	@R722	45.7	34.4
22/09/2013 23:05	@R723	53.7	32.6
22/09/2013 23:10	@R724	49.4	32
22/09/2013 23:15	@R725	54.4	28.3
22/09/2013 23:20	@R726	33.8	28.2
22/09/2013 23:25	@R727	50	31.2
22/09/2013 23:30	@R728	55.4	28.1
22/09/2013 23:35	@R729	53.1	32.4
22/09/2013 23:40	@R730	54.4	34.6
22/09/2013 23:45	@R731	34.9	33.5
22/09/2013 23:50	@R732	51.2	34.6
22/09/2013 23:55	@R733	35.4	34
23/09/2013 00:00	@R734	48.3	33.6
23/09/2013 00:05	@R735	51.1	35.3
23/09/2013 00:10	@R736	35.7	34.3

Date & time	File No	L _{AEQ}	L _{A90}
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23/09/2013 00:20	@R738	49.7	33.2
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23/09/2013 00:30	@R740	35.4	34
23/09/2013 00:35	@R741	51	32.2
23/09/2013 00:40	@R742	48	32.8
23/09/2013 00:45	@R743	46	33.5
23/09/2013 00:50	@R744	34.7	33.1
23/09/2013 00:55	@R745	49.8	32.3
23/09/2013 01:00	@R746	47.7	34.7
23/09/2013 01:05	@R747	47.4	33.6
23/09/2013 01:10	@R748	50.1	34.2
23/09/2013 01:15	@R749	50	33
23/09/2013 01:20	@R750	51	33.1
23/09/2013 01:25	@R751	33.7	32.1
23/09/2013 01:30	@R752	34.3	32.7
23/09/2013 01:35	@R753	43.3	33.3
23/09/2013 01:40	@R754	34.6	33.2
23/09/2013 01:45	@R755	34.4	33
23/09/2013 01:50	@R756	34.8	33
23/09/2013 01:55	@R757	34	32
23/09/2013 02:00	@R758	44.8	32.3
23/09/2013 02:05	@R759	43.5	32.1
23/09/2013 02:10	@R760	33	31.6
23/09/2013 02:15	@R761	32.4	31.1
23/09/2013 02:20	@R762	34.2	31
23/09/2013 02:25	@R763	48.8	30.1
23/09/2013 02:30	@R764	33	31.9
23/09/2013 02:35	@R765	32.3	30.4
23/09/2013 02:40	@R766	39.3	31.3
23/09/2013 02:45	@R767	39.2	35.2
23/09/2013 02:50	@R768	48.1	32.3
23/09/2013 02:55	@R769	52.3	27.5
23/09/2013 03:00	@R770	43.4	25.6
23/09/2013 03:05	@R771	27.2	25.2
23/09/2013 03:10	@R772	37.2	26.3
23/09/2013 03:15	@R773	47	27
23/09/2013 03:20	@R774	26.1	25
23/09/2013 03:25	@R775	35.6	23.7
23/09/2013 03:30	@R776	50.7	25.6
23/09/2013 03:35	@R777	54.2	26.1
23/09/2013 03:40	@R778	48.4	26.6
23/09/2013 03:45	@R779	46.8	27.5
23/09/2013 03:50	@R780	53.7	29.3
23/09/2013 03:55	@R781	52.7	25.5
23/09/2013 04:00	@R782	26.4	25.3
23/09/2013 04:05	@R783	34.4	28.9
23/09/2013 04:10	@R784	49.3	25.3
23/09/2013 04:15	@R785	26.7	25.1
23/09/2013 04:20	@R786	47.2	25.4
23/09/2013 04:25	@R787	53.5	28.7
23/09/2013 04:30	@R788	53.8	28.7
23/09/2013 04:35	@R789	50.8	29.6
23/09/2013 04:40	@R790	52.3	28
23/09/2013 04:45	@R791	51.4	26.5
23/09/2013 04:50	@R792	53.7	29.5
23/09/2013 04:55	@R793	48.7	27.6

Date & time	File No	L _{AEQ}	L _{A90}
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23/09/2013 05:05	@R795	53.4	28.8
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23/09/2013 05:15	@R797	56.1	33.4
23/09/2013 05:20	@R798	57	31.5
23/09/2013 05:25	@R799	52.2	28.5
23/09/2013 05:30	@R800	56.2	30.5
23/09/2013 05:35	@R801	52.8	29.6
23/09/2013 05:40	@R802	55.6	34.6
23/09/2013 05:45	@R803	55	30.5
23/09/2013 05:50	@R804	56.5	31.9
23/09/2013 05:55	@R805	56	30.6
23/09/2013 06:00	@R806	56.3	36.4
23/09/2013 06:05	@R807	56.9	33.9
23/09/2013 06:10	@R808	57.9	35.7
23/09/2013 06:15	@R809	56.3	33.3
23/09/2013 06:20	@R810	60.3	36.7
23/09/2013 06:25	@R811	59	33.6
23/09/2013 06:30	@R812	60.4	36
23/09/2013 06:35	@R813	59	37.3
23/09/2013 06:40	@R814	57.3	38.5
23/09/2013 06:45	@R815	60.1	43
23/09/2013 06:50	@R816	60.6	37.5
23/09/2013 06:55	@R817	62.1	45.1
23/09/2013 07:00	@R818	60	37.4
23/09/2013 07:05	@R819	62.2	38
23/09/2013 07:10	@R820	61.9	42.3
23/09/2013 07:15	@R821	61.9	41.6
23/09/2013 07:20	@R822	62.3	43.5
23/09/2013 07:25	@R823	62	38.6
23/09/2013 07:30	@R824	60.9	44.2
23/09/2013 07:35	@R825	63.2	39.7
23/09/2013 07:40	@R826	62	47.1
23/09/2013 07:45	@R827	63	38.8
23/09/2013 07:50	@R828	63.7	44.6
23/09/2013 07:55	@R829	63.7	44.6
23/09/2013 08:00	@R830	61.6	40.8
23/09/2013 08:05	@R831	61.3	35
23/09/2013 08:10	@R832	61.8	45.1
23/09/2013 08:15	@R833	62.3	42.3
23/09/2013 08:20	@R834	64.8	46.3
23/09/2013 08:25	@R835	62.8	47
23/09/2013 08:30	@R836	57.6	38.1
23/09/2013 08:35	@R837	62.5	40.6
23/09/2013 08:40	@R838	61.1	37.6
23/09/2013 08:45	@R839	59.6	36.5
23/09/2013 08:50	@R840	62.4	50.2
23/09/2013 08:55	@R841	60.9	38.2
23/09/2013 09:00	@R842	59.7	40
23/09/2013 09:05	@R843	60.6	44.7
23/09/2013 09:10	@R844	59.2	37.8
23/09/2013 09:15	@R845	59.9	36.2
23/09/2013 09:20	@R846	59.3	37.6
23/09/2013 09:25	@R847	60.3	36.6
23/09/2013 09:30	@R848	60.1	35
23/09/2013 09:35	@R849	58.5	39.5
23/09/2013 09:40	@R850	58.7	35.2

Date & time	File No	L _{AEQ}	L _{A90}
23/09/2013 09:45	@R851	59.5	33.4
23/09/2013 09:50	@R852	64.3	36
23/09/2013 09:55	@R853	58.4	38.2
23/09/2013 10:00	@R854	56.6	33.9
23/09/2013 10:05	@R855	60.3	41.5
23/09/2013 10:10	@R856	58.7	31.5
23/09/2013 10:15	@R857	58.8	36.7
23/09/2013 10:20	@R858	58.7	36.7
23/09/2013 10:25	@R859	58	35.5

Date & time	File No	L _{AEQ}	L _{A90}
23/09/2013 10:30	@R860	56.6	36.4
23/09/2013 10:35	@R861	61.3	39
23/09/2013 10:40	@R862	58.5	34.4
23/09/2013 10:45	@R863	58.6	34.5
23/09/2013 10:50	@R864	60.8	36.7
23/09/2013 10:55	@R865	56.7	35
23/09/2013 11:00	@R866	58.1	35.6
23/09/2013 11:05	@R867	58	36
23/09/2013 11:10	@R868	56.9	37.1

Date & time	File No	L _{AEQ}	L _{A90}
23/09/2013 11:15	@R869	56.2	34.9
23/09/2013 11:20	@R870	56.7	34.6
23/09/2013 11:25	@R871	58	35.1
23/09/2013 11:30	@R872	59.1	39.4
23/09/2013 11:35	@R873	59	35.8
23/09/2013 11:40	@R874	58.5	34.7
23/09/2013 11:45	@R875	60	40.3
23/09/2013 11:50	@R876	57.5	34.5
23/09/2013 11:51	@R877	59.1	43.6

11.4 The above tabled data: L_{Aeq} is the A-weighted equivalent noise level in dB, and L_{A90} is the level exceeded 90% of the time.

11.5 The figure below shows the wind speed (m/s) alongside the noise trend (5 minute, dBA) over the measured period.

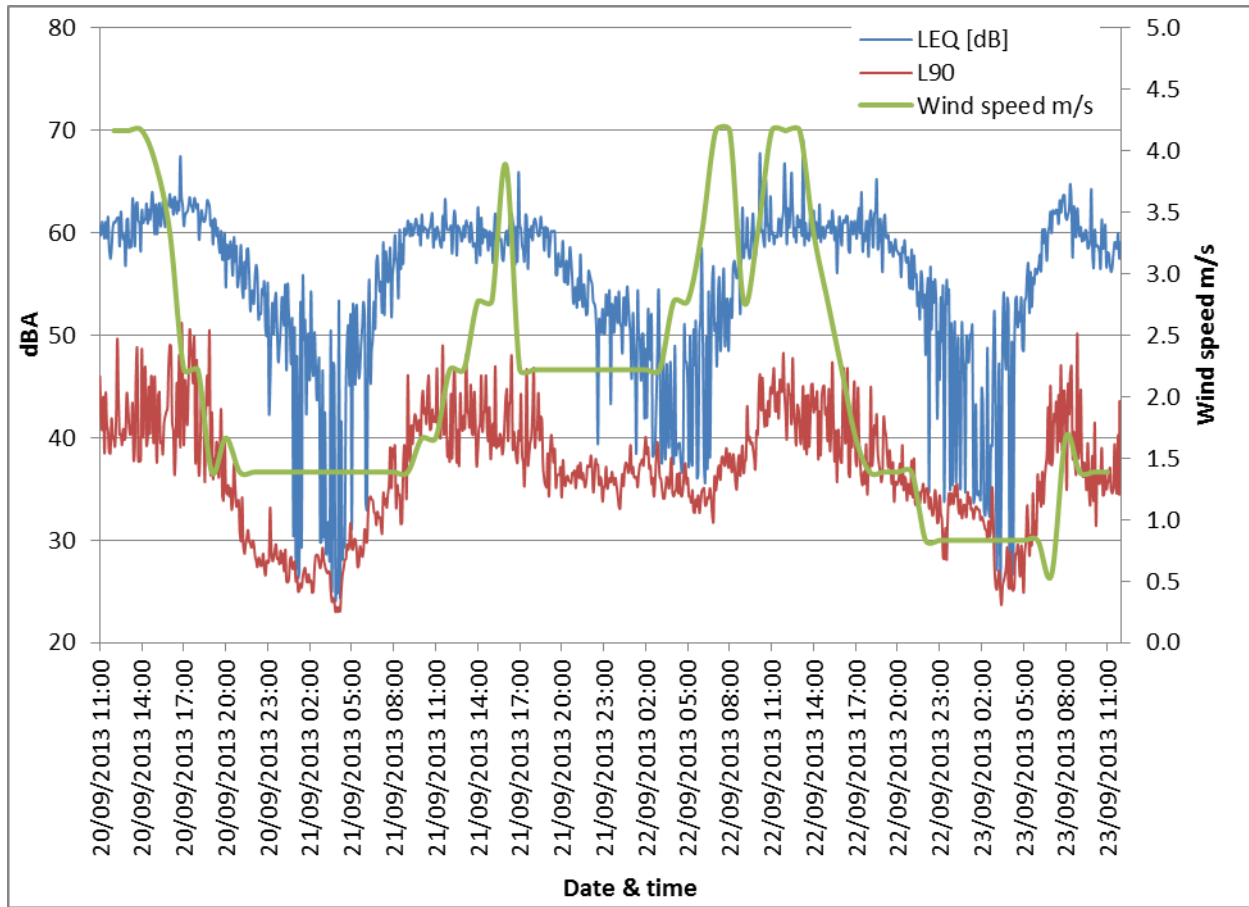





Figure 11-3 Noise trend (dBA) with wind speed (m/s)

11.6 As the 4m/s wind speed did not occur in the night time period, an estimate has been made using the data, 51.2dB L_{Aeq} and 35dBA L_{90} , recorded at 0700 on 22/09/2013.

12. APPENDIX 4 – PROPOSAL NOISE PREDICTION

12.1 Modelling Principles

12.1.1 The noise calculation computer program Cadna A (Computer Aided Noise Abatement, a proprietary package by Datakustik) is a leading software package for calculation and presentation of environmental noise. It has been used here to predict the noise emission to the locality i.e. noise modelling. The model incorporates:

- distance or range between source and receiver
- distance above ground
- site topology
- multiple noise sources (point, line, and surface types)
- octave bandwidths 31Hz to 8KHz covering the main audible frequency range
- screening (top and sides) effects of buildings etc
- reflection from buildings and the ground
- meteorological conditions
- acoustically variable surfaces for the ground and reflecting wall surfaces
- noise contours, colour coded, may be produced (e.g. spaced at 1dBA intervals for 1.5metres above the ground on a 3m x 3m grid unless specified otherwise).
- In the model noise maps and when appropriate, noise ‘point’ sources are denoted with the symbol: . Line sources such as roads are identified using parallel dotted lines. Horizontal area emitting sources (e.g. industrial area, roofs) are shown as a solid blue lined rectangle and/or : . Vertical plane area sources and horizontal area sources are shown in as heavy red lines (e.g. walls radiating noise).
- Noise measurement locations or calculated receiver/receptor/immission points are signified with a symbol: . A label alongside the symbol may identify the receiver location number with a noise level in dBA. Unless mentioned otherwise, the noise levels are for 1.5m above the ground surface.
- Barriers and bunds may be shown as heavy red lines.

12.1.2 The WTG may be assumed to radiate noise as a ‘point’ type source.

12.1.3 Buildings as barriers or reflectors are not relevant. Two orders of reflection from surfaces were used. A ground absorption of 0.7 was used representative of majority soft ground. A ‘structured’ type surface (giving some absorption) was used for all building walls.

12.1.4 An environmentally neutral meteorology (relative humidity of 70% and air temperature 10C with zero wind speed) was used unless stated otherwise.

12.2 Noise Model Details

12.2.1 The sound power levels for the proposed turbine are listed below.

Table 12-1 Wind turbine acoustic data

Apparent Sound Power Level $L_{W,a,K}$ (dB)	Wind speed m/s						
	4	5	6	7	8	9	10
Endurance X-29/225	92.5	93.6	94.7	95.8	97.0	98.1	99.2

12.2.2 In this modelling calculation, the noise radiation strength from the WTG was set at SWL 95dBA (for a 6m/s wind speed) 30m above the ground as a point source per the information supplied from the client.

12.2.3 The noise model results are shown in the figure below.

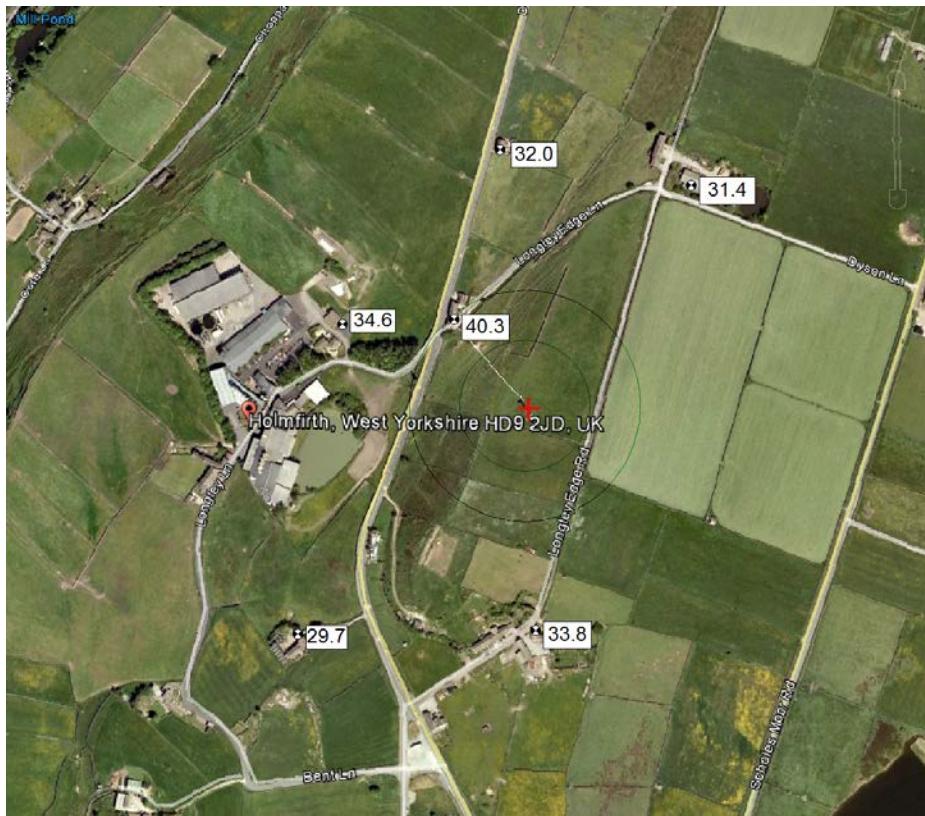


Figure 12-1 Site noise prediction

12.2.4 The figure above shows the proposed WTG noise source (red cross) and receptor locations at neighbouring properties with a legend containing a dBA value. The ground absorption in the sound path was set to 0.7 (1 being for porous soil, 0 being for reflecting surfaces).

12.2.5 The following table presents the results of the assessment and arrives at the noise impact.

Table 12-2 Case 1; predicted noise impact for the WTG options, night time

Wind speed at 10m Height m/s	4	5	6	7	8	9	10	11
SWL, ($L_{WA,K}$ dB)	92.5	93.6	94.7	95.8	97.0	98.1	99.2	100.3
Predicted Receptor SPL (free field, L_{Aeq} dB)	38.1	39.2	40.3	41.4	42.6	43.7	44.8	45.9
Measured Background (L_{A90} dB free field)	35	36	38	40	42	44	46	48
LA90 dB impact	3.1	3	2	1	0	-1	-2	-2

12.2.6 The table above gives the impact (background noise minus the predicted noise at the receptor location) of the proposals as dBA below the background noise level for the range of wind speed of interest.

12.2.7 Basically, the sound power levels at 6m/s wind speed from the reports were used in a calculation that gave the receptor noise level 40.3dB. The background noise at 4m/s was measured at 35dB. From this, the background noise for other wind speeds was obtained by use of a curve formula from other work. Hence, the impact across the whole WTG operational speed range was deduced.

12.2.8 Consideration case 1 is the predicted, worse case, façade level noise at night time as listed in the table below (by adding 2.5dB to the free field level).

Table 12-3 Predicted noise impact at façade, night time

for wind speeds:	4 to 11 m/s Wind speed at 10m Height:							
	4	5	6	7	8	9	10	11
Predicted SPL (façade level L_{Aeq} dB)	40.6	41.7	42.8	43.9	45.1	46.2	47.3	48.4
Endurance 225								

The WHO criterion is for no more than LA 50dB.

12.2.9 Case 2 in the next table gives the impact of the WTG proposal for the day time, using the background measured L_{90} 44dBA at a wind speed of 4m/s.

Table 12-4 Case 2; predicted noise impact, garden, day time

Wind speed at 10m Height m/s	4	5	6	7	8	9	10	11
SWL, ($L_{WA,K}$ dB)	92.5	93.6	94.7	95.8	97.0	98.1	99.2	100.3
Predicted Receptor SPL (free field, L_{Aeq} dB)	38.1	39.2	40.3	41.4	42.6	43.7	44.8	45.9
Measured Background (L_{A90} dB, free field)	44	45	47	49	51	53	55	57
Impact, LA dB	-5.9	-6	-7	-8	-9	-10	-11	-11

13. APPENDIX 5 – PROPOSAL NOISE ASSESSMENT, MITIGATION

- 13.1 Given the results of study (the impact is predicted to be acceptable), no mitigation is required.
The turbine option is acceptable.