

EWEA Noise Wind Turbine Noise Workshop

Pre- and Post Construction
Noise Measurements

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UK Wind Turbine Noise Planning



ETSU-R-97

- X dB LA90 or 5 dB above 'prevailing' b/g, whichever is greater
 - X varies with time of day and other factors
 - Day-time: X=35-40
 - Night-time: X=43
 - Land-owner: X=45
 - B/G quantified as a function of wind speed
 - B/G averaged over relevant period
 - night 2300-0700
 - 'sensitive' day-time hours (1800-2300, Sat pm and all day Sun)



Pre-Construction Measurements

- Need to carry out measurements to set noise limits for assessment and for eventual turbine operation.
- Location, positioning and circumstances of measurements are crucial.
 - Easy target for criticism
 - Covered in depth in Consultation Draft of Institute of Acoustics Good Practice Guide

<http://www.ioa.org.uk/about-us/news-article.asp?id=260>



B/G Noise Measurements

for wind turbine sites

- Precise location of instrumentation
 - Proximity to facades
 - Proximity to trees
 - Boiler flues, water features, wind chimes, driveways
- Effects of season
 - Trees and foliage
 - Running water
 - Harvesting and other farm / animal activity
- Access / Can't measure everywhere
- Effects of wind direction over survey period



B/G Noise Measurements

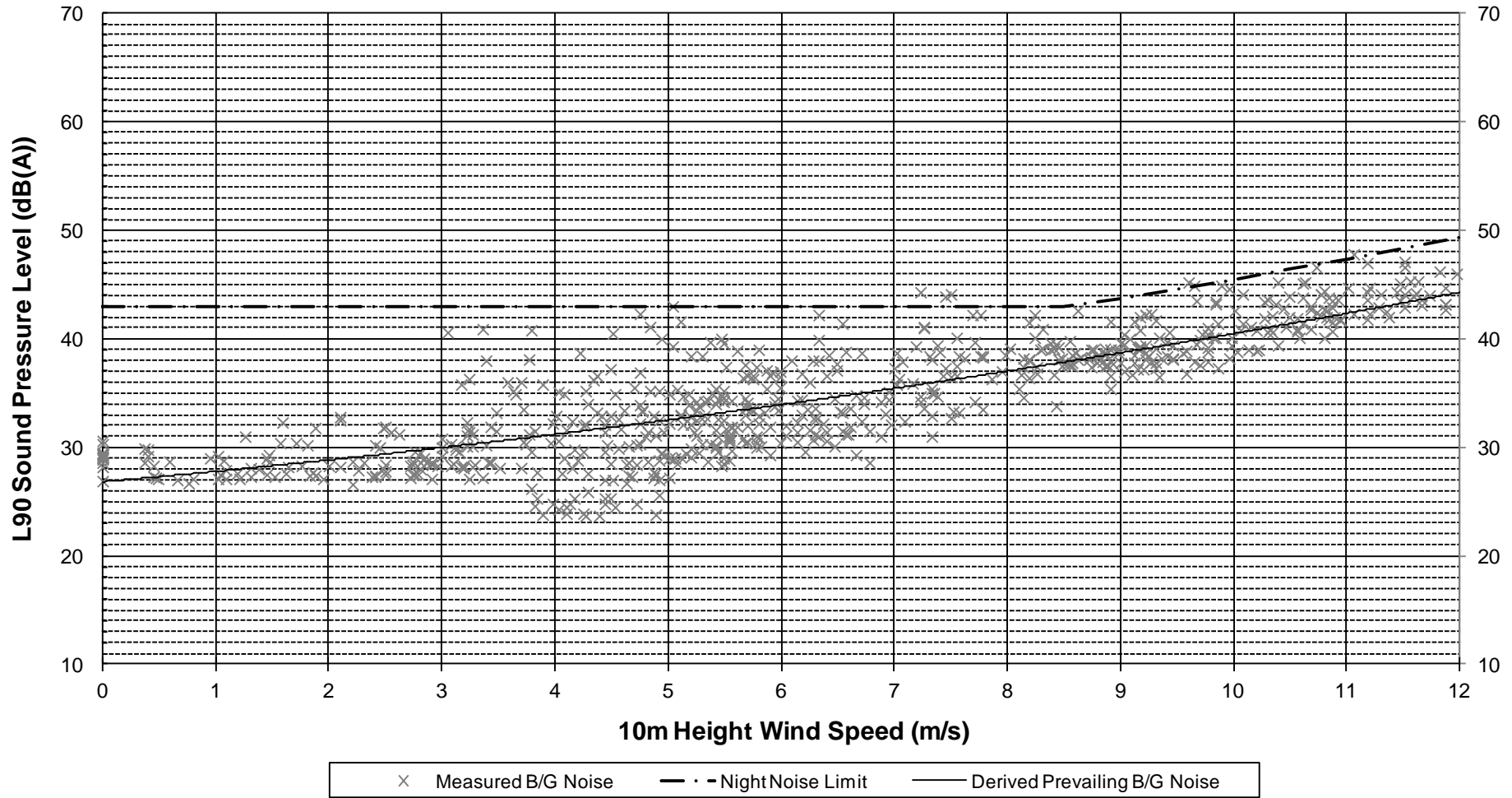
for wind turbine sites

- Direct effects of wind & wind shield performance
- Rainfall – how and where to measure
- Other ‘extraneous data’
 - birdsong
 - early morning traffic
 - what is ‘extraneous’?
- Wind speed measurement
 - Height
 - Mast or remote sensing
 - Calibration

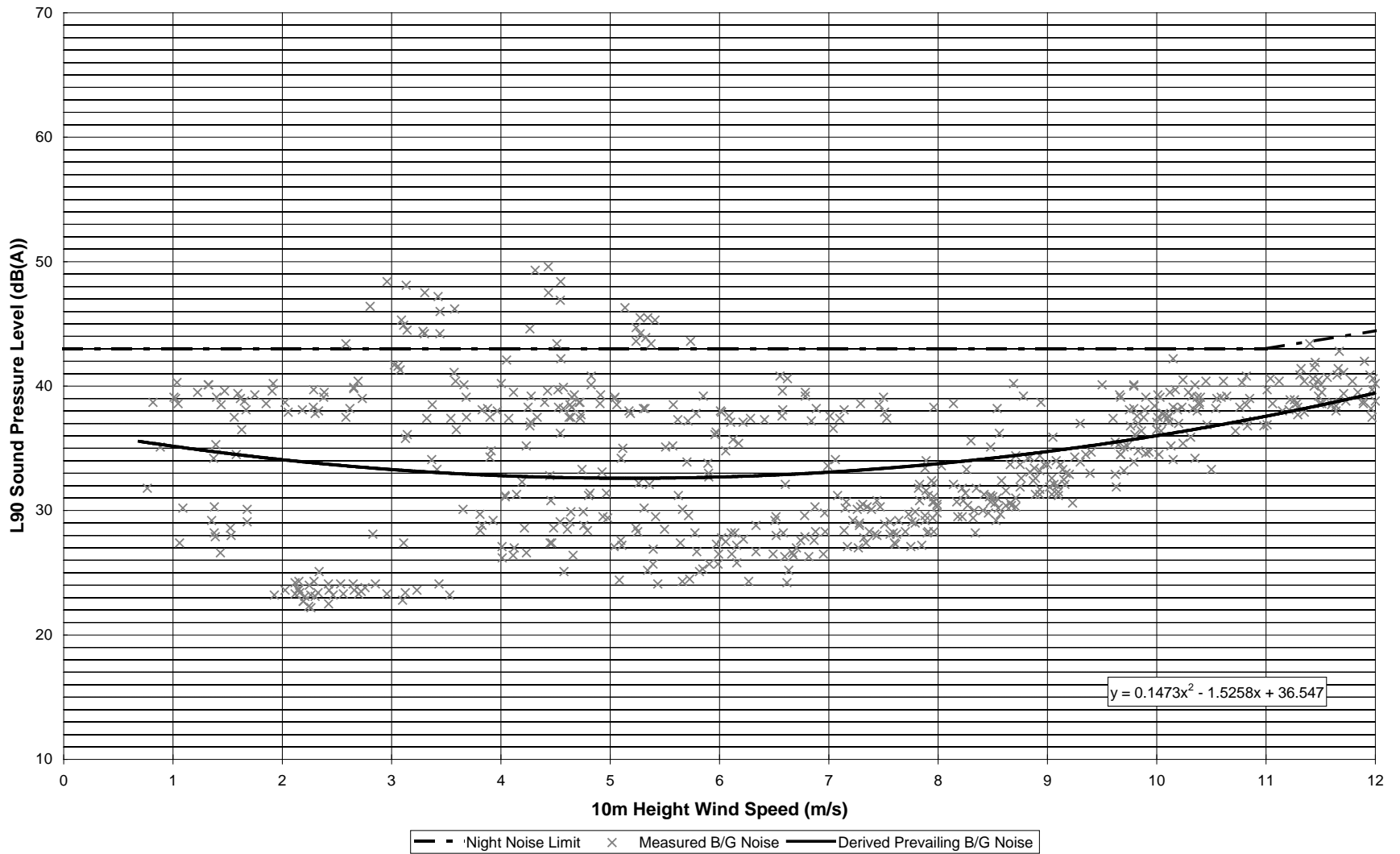




W/F Noise Assessment Background Noise vs Wind Speed (Night Hours 2300-0700)



W/F Noise Assessment
Background Noise and Derived Limits vs Wind Speed
(Night Hours 2300-0700)



Pre-Construction Measurements

- Given the number of variables and uncertainties, do we need to re-structure out approach to baseline measurements.
- One approach might be to look at non-wind dependant background noise and noise limits which are not wind speed dependant.

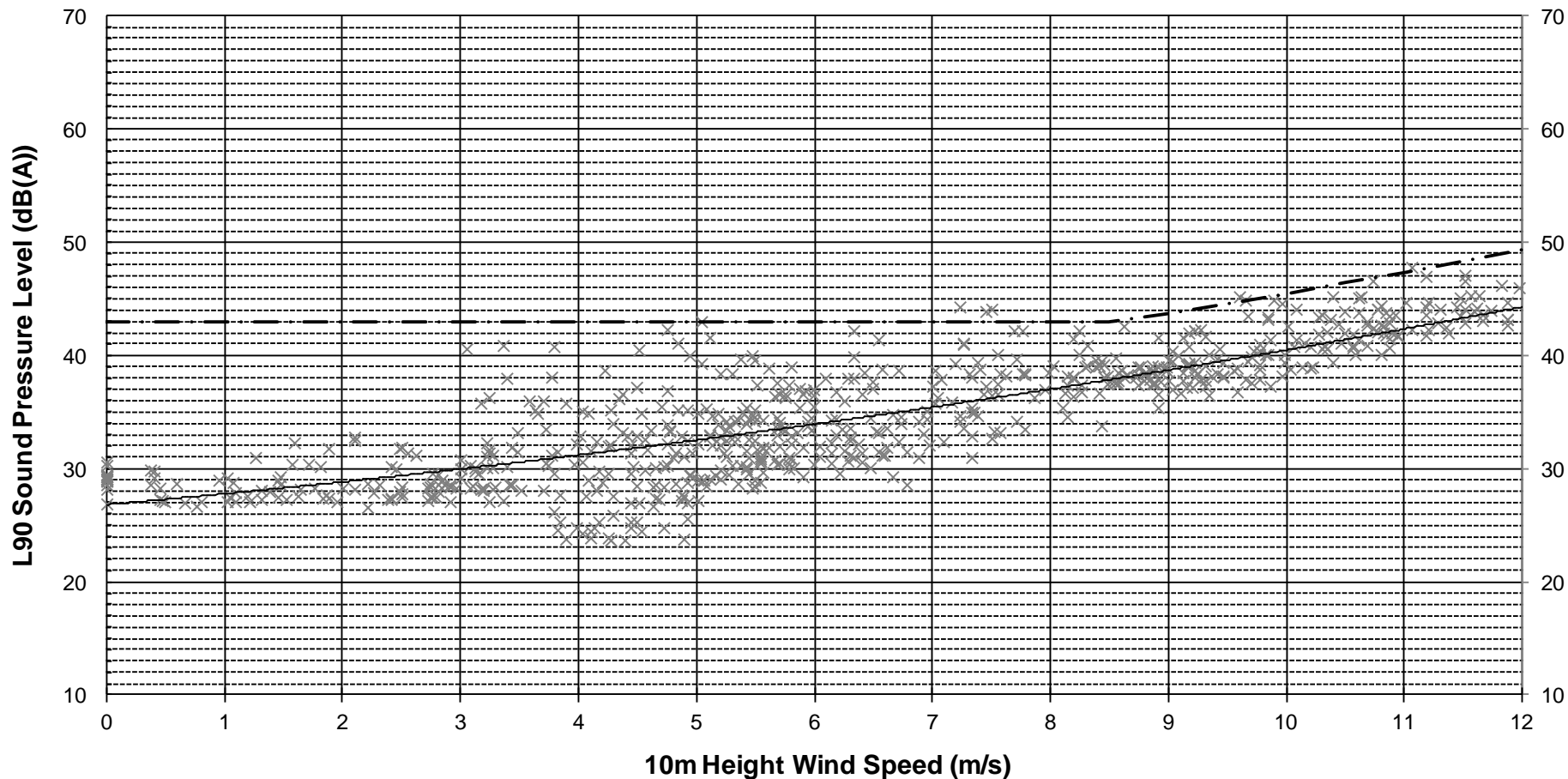


Post-Construction Measurements

- Need to carry out measurements to determine whether limits are being met.
- May be in response to complaints or as required by planning conditions.
- Precise positioning less crucial but other significant challenges.
- Assessment of tonal noise will require audio recordings.



W/F Noise Assessment Background Noise vs Wind Speed (Night Hours 2300-0700)

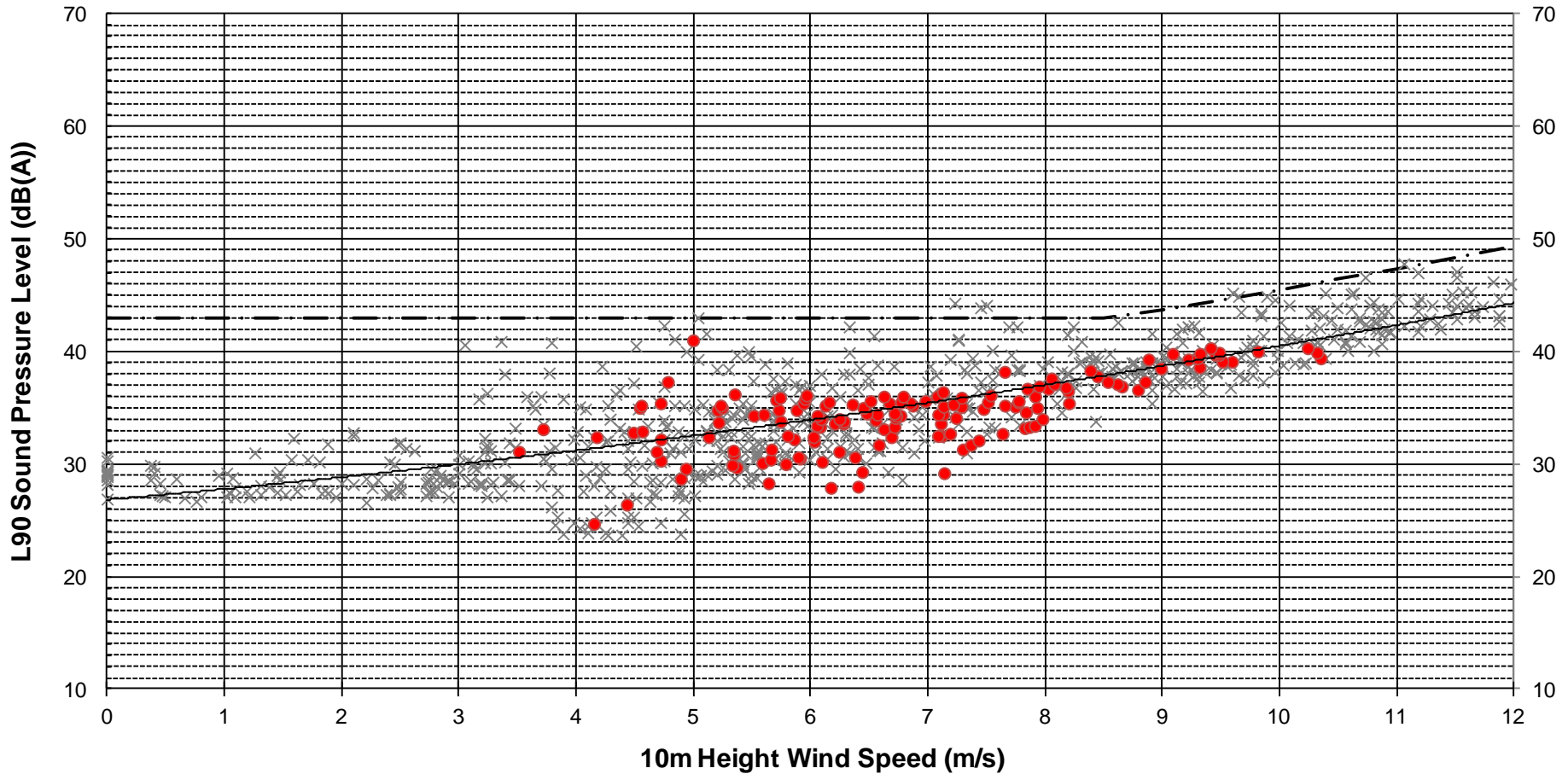


× Measured B/G Noise - · - Night Noise Limit — Derived Prevailing B/G Noise



W/F Noise Assessment

Operational Noise & Background Noise vs Wind Speed (Night Hours 2300-0700)

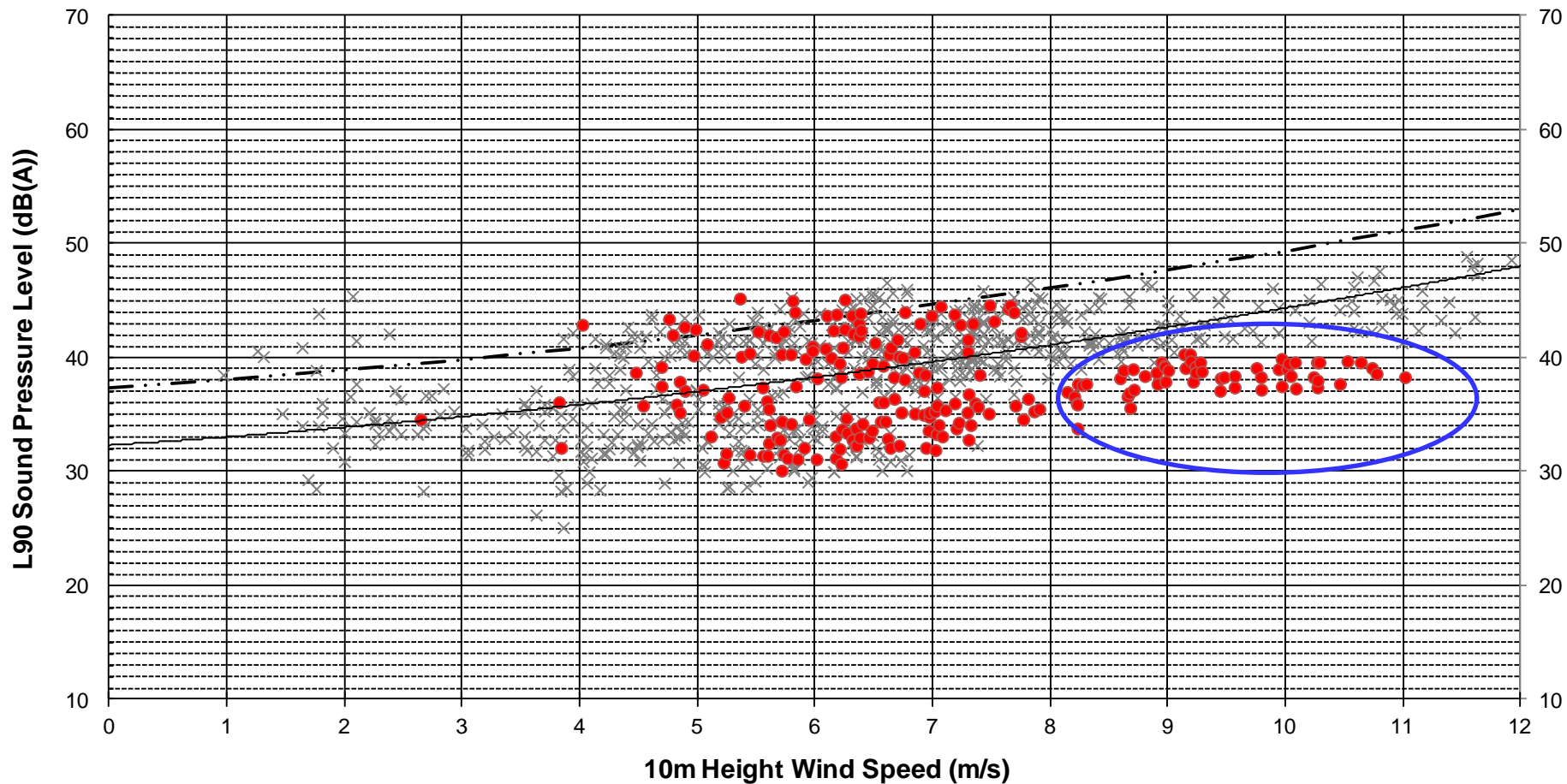


— · — Night Noise Limit × Measured B/G Noise ● Including Turbine Operation — Derived Prevailing B/G Noise



W/F Noise Assessment

Operational Noise and Background Noise vs Wind Speed (Amenity Hours)

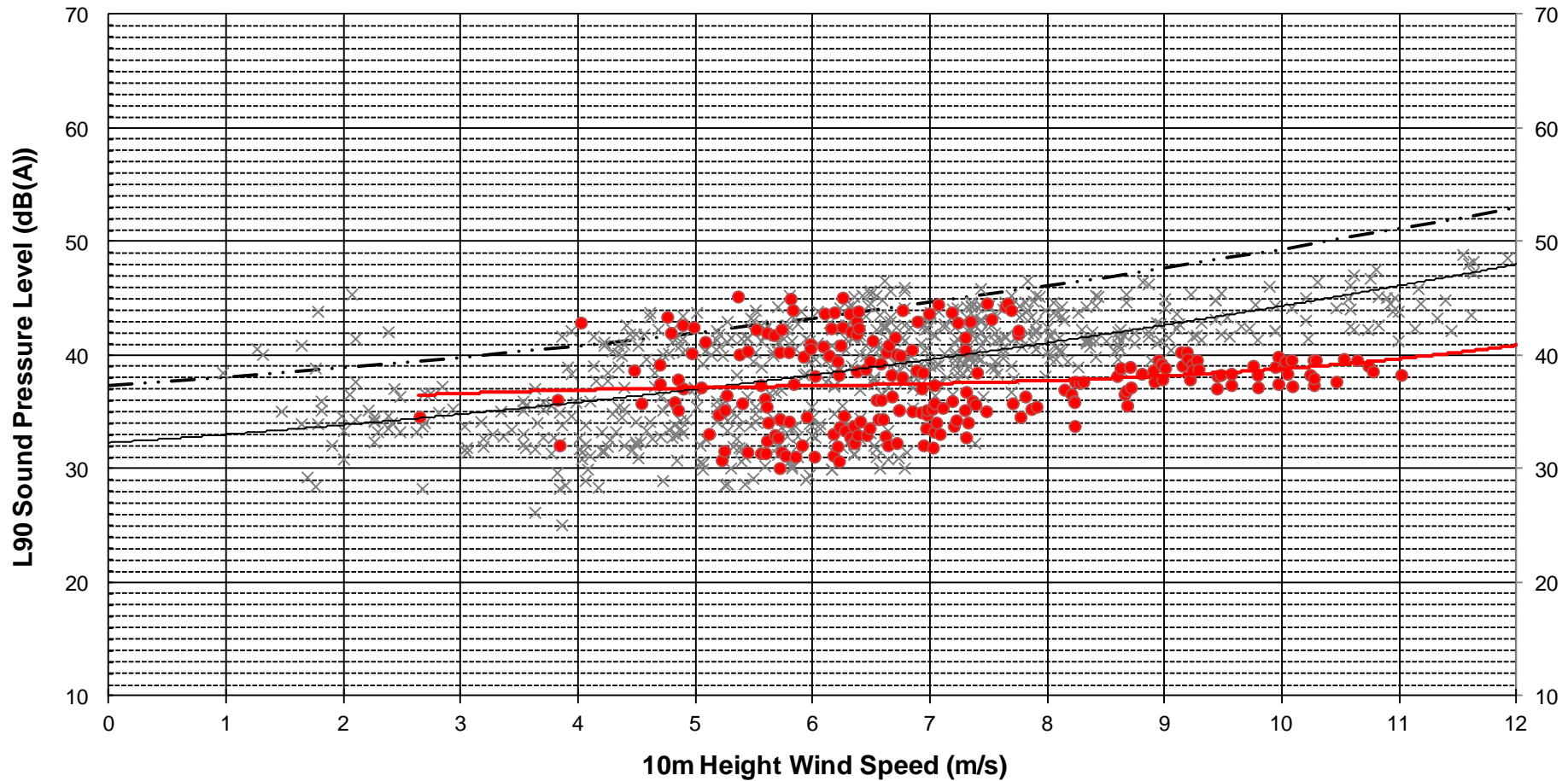


— · · Lower Noise Limit × Measured B/G Noise ● Including Turbine Operation — Derived Prevailing B/G Noise



W/F Noise Assessment

Operational Noise and Background Noise vs Wind Speed (Amenity Hours)

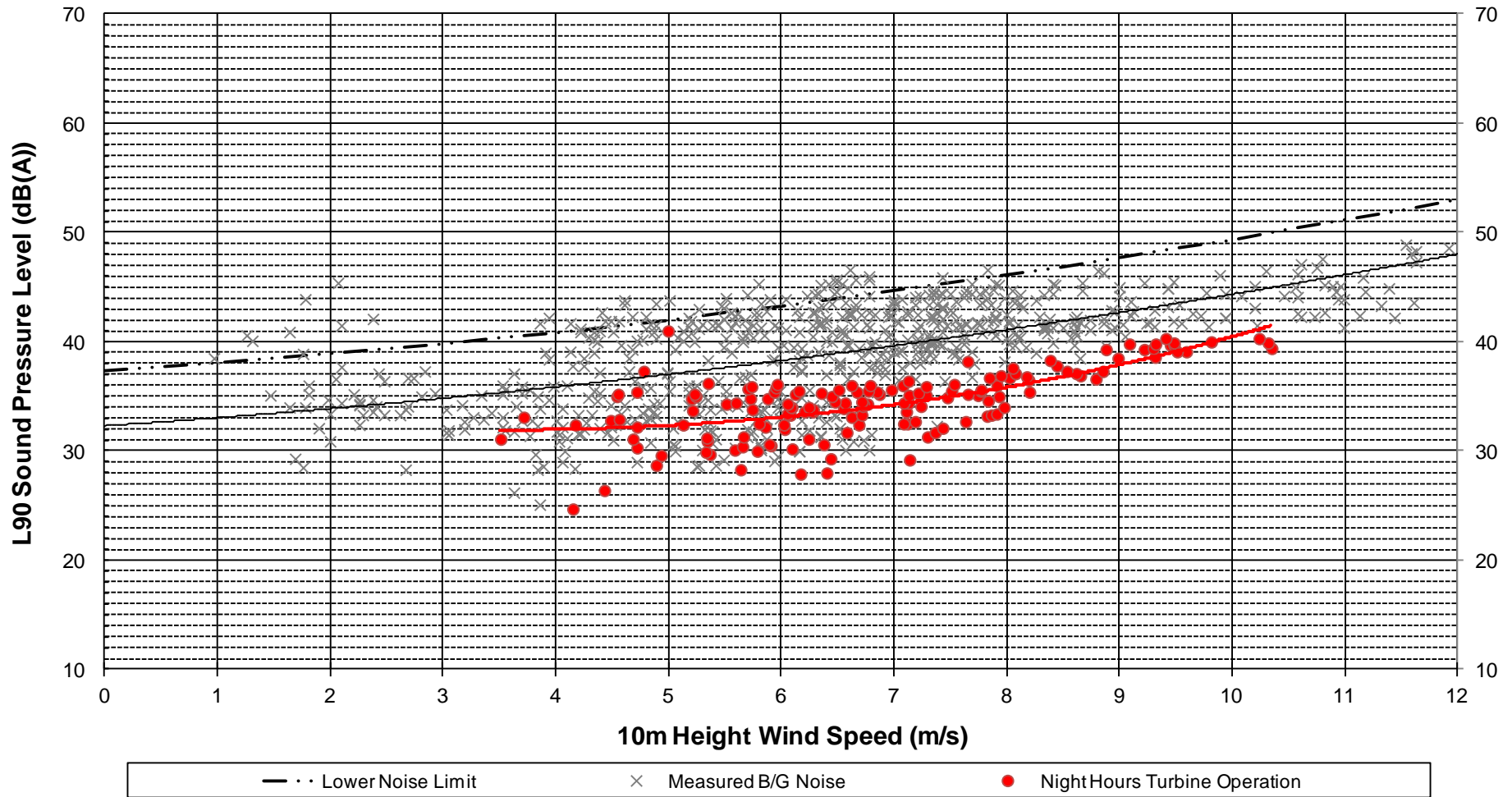


— · · Lower Noise Limit × Measured B/G Noise ● Including Turbine Operation — Derived Prevailing B/G Noise



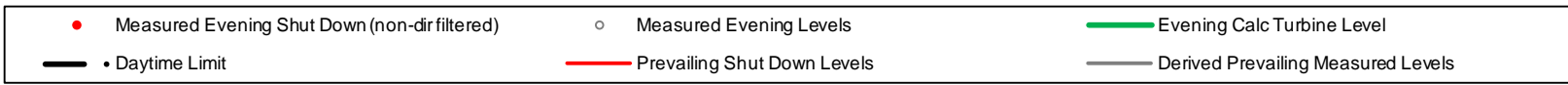
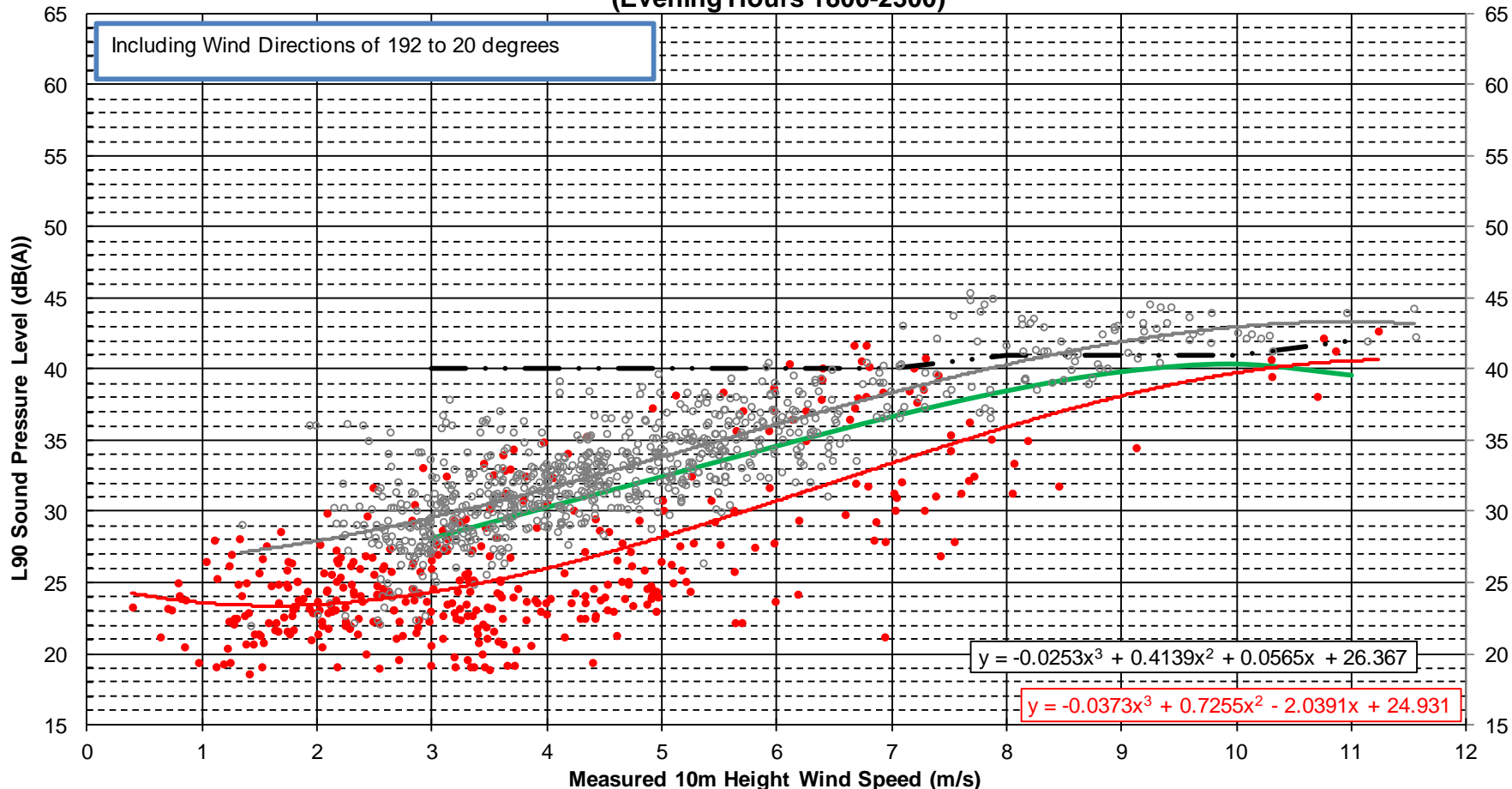
W/F Noise Assessment

Operational Noise and Background Noise vs Wind Speed (Amenity Hours)

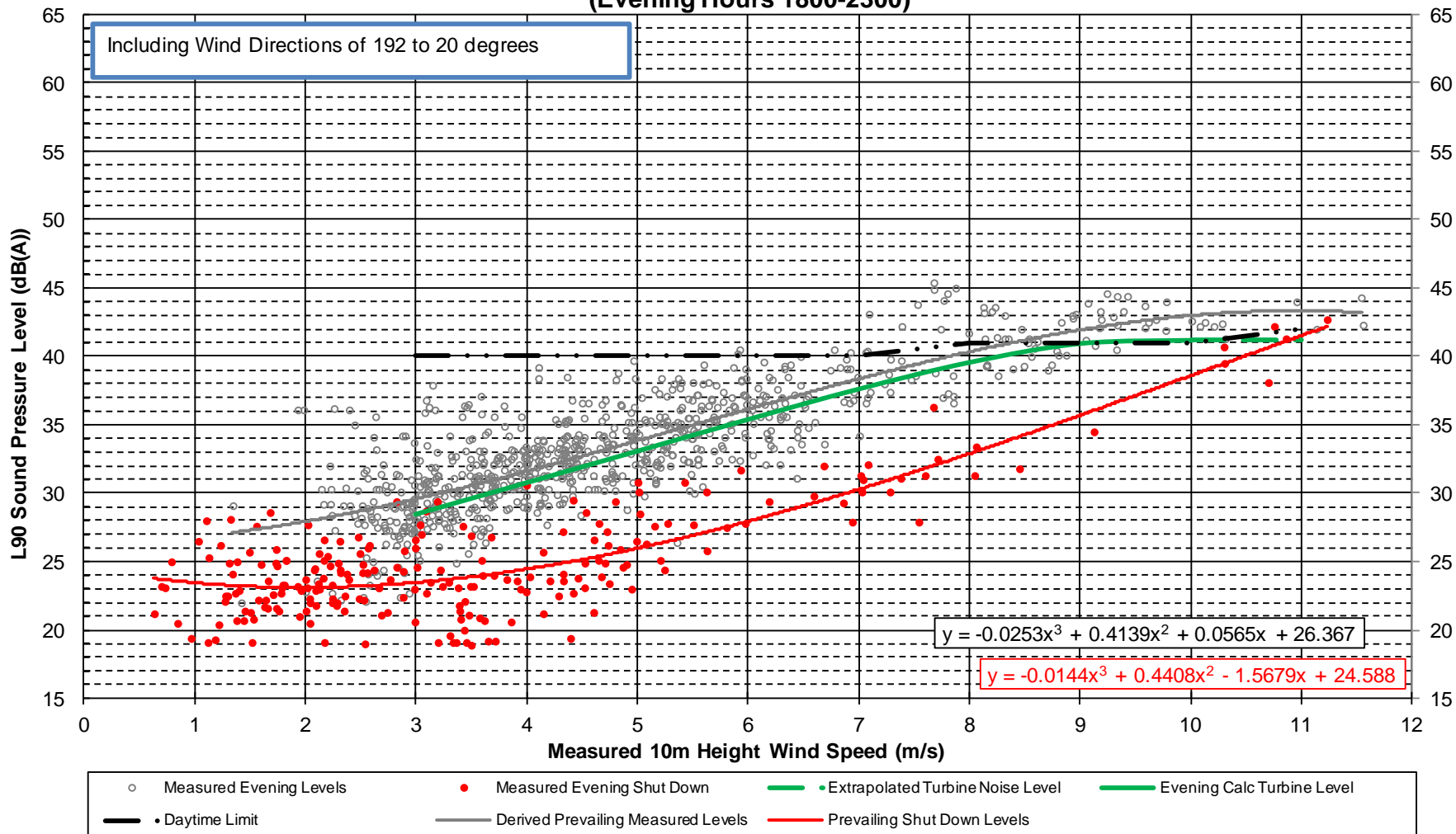


Another Wind Farm Noise Assessment

Measured Noise vs Wind Speed (Evening Hours 1800-2300)

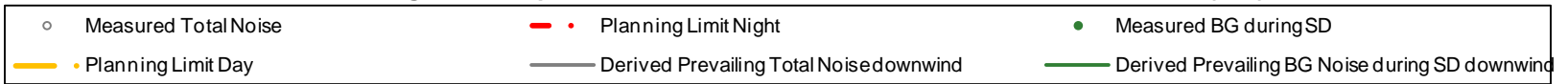
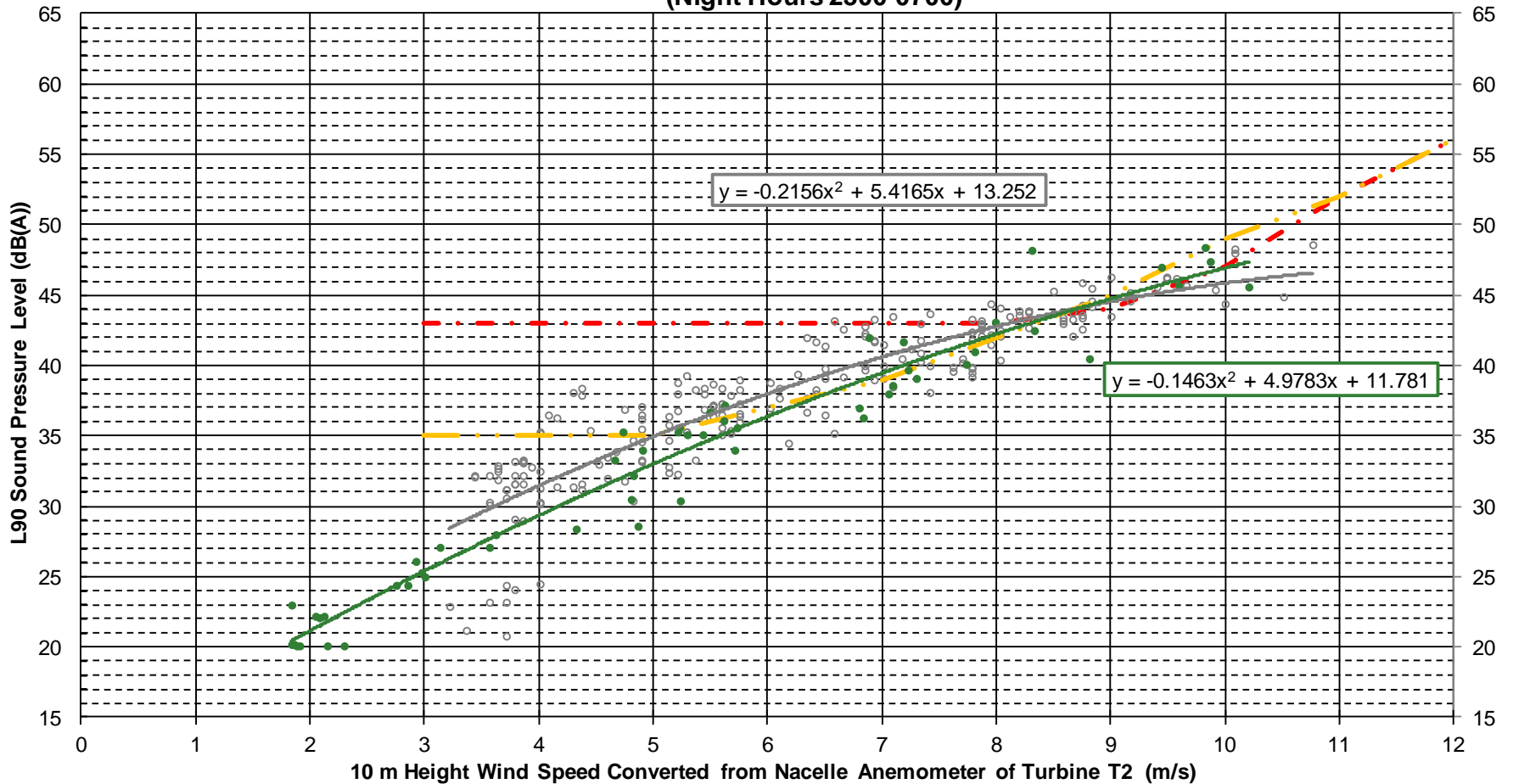


Another Wind Farm Noise Assessment Measured Noise vs Wind Speed (Evening Hours 1800-2300)



Compliance Noise Assessment

Measured Total Noise/BG Noise (downwind) (Night Hours 2300-0700)

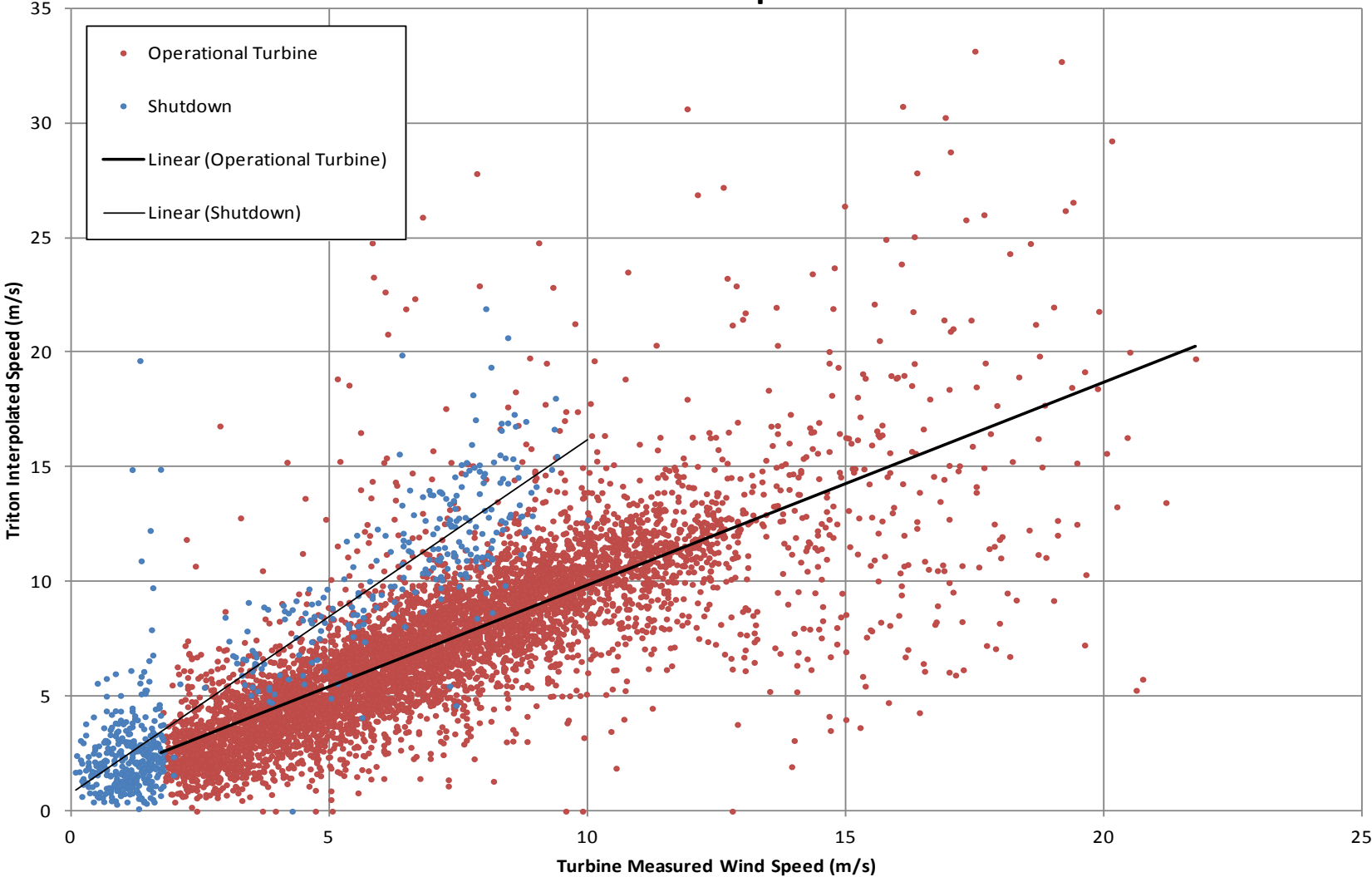


Noise Data

- Definition of downwind (worst case)?
- Biggest problem is 'background' or other competing noise.
 - Use of L_{A90} in UK helps with this.
 - Only use results of night-time measurements if possible
- Can correct for background up to a point:
 - Requires significant shut-downs (~1hr per night/day)
 - Can only be representative of periods when shut-downs occur
 - Noise during operation may be ~ same level as b/g
- Significant amount of data may be required



Turbine vs Triton Wind Speed Velocities



Wind Data

- Noise measurements without wind data are meaningless.
- Anemometry data not always available.
- 10 metre mast data only useable where limits are referenced to actual 10m height wind speed.
- Wind speed from power output and power curve is only of use below rated power.
- Wind speed from nacelle may not be reliable especially when shut-down.
- SoDAR / LiDAR maybe best option for compliance tests. May prevent meaningful measurements by third parties however.



Questions?

