Directional Cumulative Assessment

Review of directional cumulative assessment at 1 no. property (H079) with an exceedance of 0.1 dB during day-time period at 8 m/s.

When considering noise impacts of wind turbines, the effects of propagation in different wind directions can be considered. The day to day operations of the proposed development will not result in a worst-case condition of all noise locations being downwind of all turbines at the same time i.e. omni-directional predictions. Therefore, to address this issue, a review of expected noise levels downwind of the turbines has been prepared for various wind directions in accordance with the IoA GPG Guidance.

For any given wind direction, a property can be assigned one of the following classifications in relation to turbine noise propagation:

- Downwind (i.e. 0° ±80°);
- Crosswind (i.e. 90° ±10° and 270° ±10°);
- Upwind (i.e. 180° ±70°).

Figure 1 illustrates the directivity attenuation factor that has beenapplied to turbines when considering noise propagation in downwind conditions.

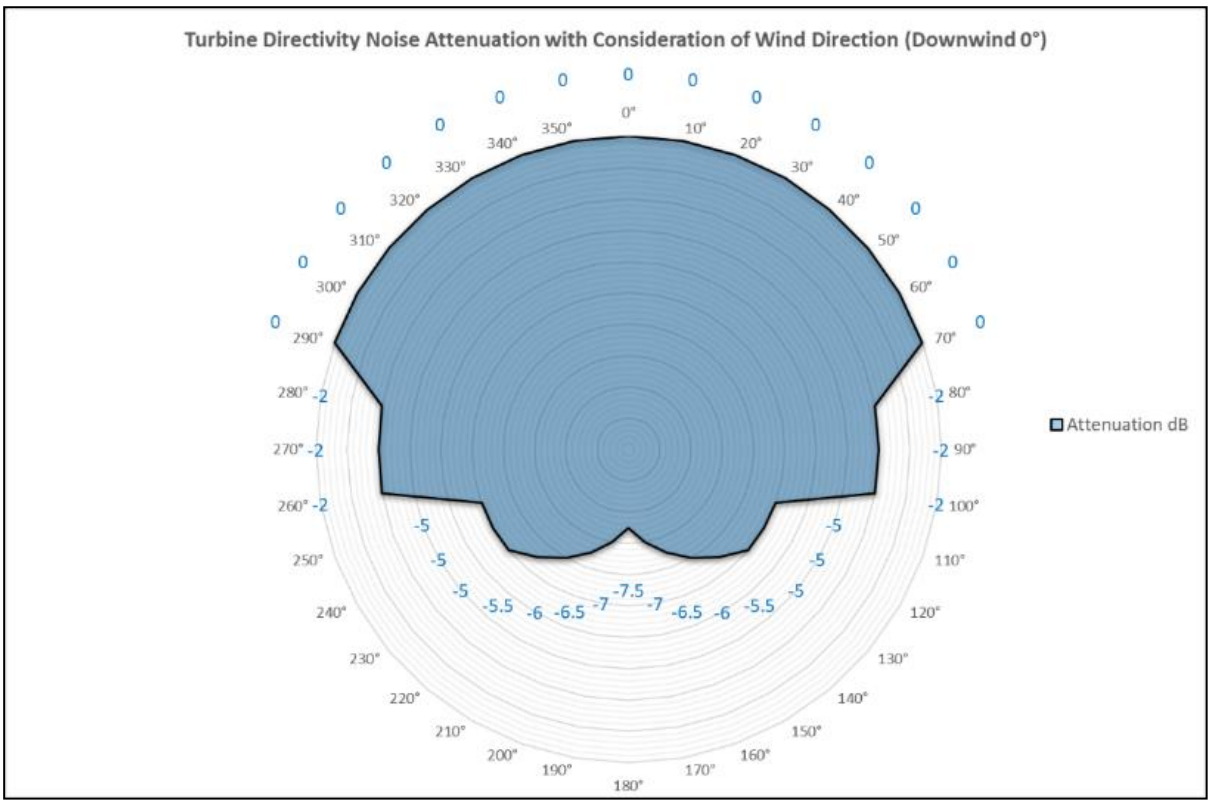

Figure 1 Turbine Directivity Attenuation with Consideration of Wind Direction

The number of locations with cumulative exceedances of the noise criteria is just 1 no. property of the 175 no. properties assessed. At H079 the exceedance was 0.1 dB during day-time at 8 m/s. Directional cumulative noise predictions models have been developed to identify the number and magnitude of exceedances to the noise criteria at H079 with the proposed turbines operating in standard mode.

Cumulative directional results with all turbines operating in standard operating mode are presented in Table 1 to Table 8 for each of the various wind direction sectors that have been assessed.

Table 1 Summary of Cumulative Results Standard Operating Mode in North Wind Direction (0°)

NSL Ref.	Parameter	Derived $L_{A90,\ 10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	24.8	28.5	32.8	35.7	36.3	37.0	37.0
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 2 Summary of Cumulative Results Standard Operating Mode in Northeast Wind Direction (45°)

NSL Ref.	Parameter	Derived $L_{A90,\ 10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	23.1	26.8	34.6	34	34.6	35.3	35.3
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 3 Summary of Cumulative Results Standard Operating Mode in East Wind Direction (90°)

NSL Ref.	Parameter	Derived $L_{A90,\ 10\text{-}min}$ Levels (dB) at Various Standardised 10 m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	22.8	26.5	30.8	33.7	34.3	35.0	35.0
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 4 Summary of Cumulative Results Standard Operating Mode in South East Wind Direction (135°)

NSL Ref.	Parameter	Derived $L_{A90,\ 10\text{-}min}$ Levels (dB) at Various Standardised 10 m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	24.8	28.5	32.8	35.7	36.3	37.0	37.0
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 5 Summary of Cumulative Results Standard Operating Mode in South Wind Direction (180°)

NSL Ref.	Parameter	Derived $L_{A90,\,10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	26.9	30.6	34.9	37.8	38.4	39.1	39.1
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 6 Summary of Cumulative Results Standard Operating Mode in Southwest Wind Direction (225°)

NSL Ref.	Parameter	Derived $L_{A90,\,10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	27.6	31.3	35.6	38.5	39.1	39.8	39.8
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 7 Summary of Cumulative Results Standard Operating Mode in West Wind Direction (270°)

NSL Ref.	Parameter	Derived $L_{A90,\,10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	27.7	31.4	35.7	38.6	39.2	39.9	39.9
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

Table 8 Summary of Cumulative Results Standard Operating Mode in Northwest Wind Direction (315°)

NSL Ref.	Parameter	Derived $L_{A90,\,10\text{-}min}$ Levels (dB) at Various Standardised 10m Height Wind Speeds						
		4	5	6	7	8	9	10
H079	Predicted	26.9	30.6	34.9	37.8	38.4	39.1	39.1
	Daytime Criterion	40.0	40.0	40.0	40.0	40.0	45.0	45.0
	Daytime Excess	--	--	--	--	--	--	--
	Night-time Criterion	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Night-time Excess	--	--	--	--	--	--	--

When cumulative directionality is considered there are no NSLs that exceed the noise criteria.