

Hornsea Offshore Wind Farm

Project Two

Environmental Statement
Volume 6 – Onshore

Annex 6.9.4 Cumulative Noise Assessment

PINS Document Reference: 7.6.9.4
APFP Regulation: 5(2)(a)

January 2015

smartwind.co.uk

SMart Wind Limited

**Hornsea Offshore Wind Farm
Project Two –Environmental Statement**

Volume 6 - Onshore
Annex 6.9.4 – Cumulative Noise Assessment

SMart Wind Limited
11th Floor
140 London Wall
London
EC2Y 5DN

Tel 0207 7765500

Email info@smartwind.co.uk

Copyright © 2015.

All pre-existing rights reserved.

Liability

This report has been prepared by RPS, with all reasonable skill, care and diligence within the terms of their contracts with SMart Wind Ltd or their subcontractor to RPS placed under RPS' contract with SMart Wind Ltd as the case may be.

Document release and authorisation record	
PINS document reference	7.6.9.4
Report Number	UK06-050700-REP-0070
Date	January 2015
Client name	SMart Wind Limited



Table of Contents

Table 1: Operational Downwind and Day Evening Night Noise Levels

Table 2: Tonality check - Project 2 / Project 1 Cumulative

Table 3: Cumulative Project 2 and Project One Rating levels vs. background

Table 1: Operational Downwind and Day Evening Night Noise Levels

Project Two

Receptor	Project Two (1500 MW HVDC)					Project Two (1800 MW HVDC)					Project Two (1800 MW HVAC)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	33	30	30	29	36	33	29	29	29	35	31	23	23	23	29
Kettlebridge Lane	27	25	25	24	31	27	25	25	25	32	23	20	20	20	26
Rosedene Swinster Lane	30	27	27	27	33	30	27	28	27	34	24	21	22	21	28
Scrub Lane	30	26	27	27	33	29	26	26	26	32	26	20	20	20	26
The Moorings	25	23	22	22	29	26	23	24	23	30	20	17	18	17	24
The Willows Farm	23	23	21	21	27	25	23	23	23	29	19	16	16	16	22

Other Proposed Development

Receptor	Able Logistics Facility					URSA Glasswool Factory				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	-	52	52	44	54	-	46	39	39	47
Kettlebridge Lane	-	40	40	33	42	-	38	37	37	44
Rosedene Swinster Lane	-	44	44	37	46	-	40	38	38	45
Scrub Lane	-	42	42	35	44	-	40	38	38	45
The Moorings	-	40	40	33	42	-	38	37	37	44
The Willows Farm	-	40	40	33	42	-	38	36	36	43

Project One

Receptor	Project One (HVDC Converter)					Project One (HVAC Substation)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	33	24	28	28	34	28	26	26	25	32
Kettlebridge Lane	31	22	26	26	32	27	24	25	24	31
Rosedene Swinster Lane	32	24	28	27	34	27	25	25	25	31
Scrub Lane	31	22	26	26	32	26	23	23	23	29
The Moorings	30	22	26	26	32	26	24	24	24	31
The Willows Farm	29	22	26	25	32	25	23	23	23	30

Project Two and Able Logistics Facility

Receptor	Project Two (1500 MW HVDC)					Project Two (1800 MW HVDC)					Project Two (1800 MW HVAC)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	-	52	52	44	54	-	52	52	44	54	-	52	52	44	54
Kettlebridge Lane	-	40	40	34	42	-	40	40	34	42	-	40	40	33	42
Rosedene Swinster Lane	-	44	44	37	46	-	44	44	37	46	-	44	44	37	46
Scrub Lane	-	42	42	36	44	-	42	42	35	44	-	42	42	35	44
The Moorings	-	40	40	33	42	-	40	40	33	42	-	40	40	33	42
The Willows Farm	-	40	40	33	42	-	40	40	33	42	-	40	40	33	42

Project Two and URSA Glasswool Factory

Receptor	Project Two (1500 MW HVDC)					Project Two (1800 MW HVDC)					Project Two (1800 MW HVAC)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	-	46	39	39	47	-	46	39	39	47	-	46	39	39	47
Kettlebridge Lane	-	38	37	37	44	-	38	37	37	44	-	38	37	37	44
Rosedene Swinster Lane	-	40	38	38	45	-	40	38	38	45	-	40	38	38	45
Scrub Lane	-	40	38	38	45	-	40	38	38	45	-	40	38	38	45
The Moorings	-	38	37	37	44	-	38	37	37	44	-	38	37	37	44
The Willows Farm	-	38	36	36	43	-	38	36	36	43	-	38	36	36	43

Project Two and Project One HVDC

Receptor	Project Two (1500 MW HVDC)					Project Two (1800 MW HVDC)					Project Two (1800 MW HVAC)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	34	31	32	32	38	36	30	32	31	38	35	27	29	29	35
Kettlebridge Lane	32	27	29	28	35	32	27	29	29	35	31	24	27	27	33
Rosedene Swinster Lane	34	29	31	30	37	34	29	31	30	37	33	26	29	28	35
Scrub Lane	33	27	29	29	36	33	27	29	29	35	32	24	27	27	33
The Moorings	31	26	28	28	34	32	26	28	28	34	31	23	27	27	33
The Willows Farm	30	25	27	27	33	31	25	27	27	34	30	23	26	26	32

Project Two and Project One HVAC

Receptor	Project Two (1500 MW HVDC)					Project Two (1800 MW HVDC)					Project Two (1800 MW HVAC)				
	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	35	31	31	31	37	34	31	31	31	37	33	28	28	27	34
Kettlebridge Lane	30	28	28	27	34	30	28	28	28	35	28	26	26	26	32
Rosedene Swinster Lane	32	29	29	29	35	32	29	30	29	36	29	27	27	27	33
Scrub Lane	31	28	28	28	34	31	28	28	28	34	29	25	25	25	31
The Moorings	29	27	26	26	33	29	27	27	27	34	27	25	25	25	32
The Willows Farm	27	26	25	25	32	28	26	26	26	33	26	24	24	24	31

Table 2: Tonality check - Project 2 / Project 1 Cumulative

Based on Project 1 assessment

HVDC converter - Spectral Noise Immissions at Fairfield (GF)

1/3rd Octave Band Frequency (Hz)	50	63	80	100	125	160	200	250
L _{A,T} (DW) (dB)	29	27	23	25	14	14	11	10

HVAC substation - Spectral Noise Immissions at Fairfield (GF)

1/3rd Octave Band Frequency (Hz)	50	63	80	100	125	160	200	250
L _{A,T} (DW) (dB)	19	20	20	25	12	12	8	8

Cumulative HVDC and HVDC substation - Spectral Noise Immissions at Fairfield (GF)

1/3rd Octave Band Frequency (Hz)	50	63	80	100	125	160	200	250
Sum L _{A,T} (DW) (dB)	32	30	26	28	17	17	14	13
			80<100Hz 2	Not tonal	100>125Hz 11			

Cumulative HVAC and HVAC substation - Spectral Noise Immissions at Fairfield (GF)

1/3rd Octave Band Frequency (Hz)	50	63	80	100	125	160	200	250
Sum L _{A,T} (DW) (dB)	22	23	23	28	15	15	11	11
			80<100Hz 5	Tonal	100>125Hz 13			

Cumulative HVDC and HVAC substation - Spectral Noise Immissions at Fairfield (GF)

1/3rd Octave Band Frequency (Hz)	50	63	80	100	125	160	200	250
Sum L _{A,T} (DW) (dB)	30	28	25	28	16	16	13	12
			80<100Hz 3	Not tonal	100>125Hz 12			

Table 3: Cumulative Project Two and Project One Rating levels vs. background

Project Two + Project One HVDC

Project Two (1500 MW HVDC)

Name	Floor	Dir	L _{Aeq,T(DW)} (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	34	31	32	32	38
Kettlebridge Lane	1.FL	E	32	27	29	28	35
Rosedene Swinster Lane	1.FL	E	34	29	31	30	36
Scrub Lane	1.FL	E	33	27	29	29	35
The Moorings	1.FL	E	31	26	28	28	34
The Willows Farm	1.FL	S	30	25	27	27	33

Project Two and Project One HVDC : Project Two (1500 MW HVDC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Immission Prediction Wind Condition	Downwind		Downwind	
Background Noise Level, L_{A90} (dB)	35	40	35	40
Fairfield	-1	-6	Negligible	Negligible
Kettlebridge Lane	-3	-8	Negligible	Negligible
Rosedene Swinster Lane	-1	-6	Negligible	Negligible
Scrub Lane	-2	-7	Negligible	Negligible
The Moorings	-4	-9	Negligible	Negligible
The Willows Farm	-5	-10	Negligible	Negligible

<p>Rating correction 0 dB</p> <p>Maximum increase Night Day -1 to -5 dB -6 to -10 dB</p>
--

Project Two (1800 MW HVDC)

Name	Floor	Dir	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	36	30	32	31	38
Kettlebridge Lane	1.FL	E	32	27	29	29	35
Rosedene Swinster Lane	1.FL	E	34	29	31	30	37
Scrub Lane	1.FL	E	33	27	29	29	35
The Moorings	1.FL	E	32	26	28	28	34
The Willows Farm	1.FL	S	31	25	27	27	33

Project Two and Project One HVDC : Project Two (1800 MW HVDC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Immission Prediction Wind Condition	Downwind		Downwind	
Background Noise Level, L _{A90} (dB)	35	40	35	40
Fairfield	1	-4	Negligible	Negligible
Kettlebridge Lane	-3	-8	Negligible	Negligible
Rosedene Swinster Lane	-1	-6	Negligible	Negligible
Scrub Lane	-2	-7	Negligible	Negligible
The Moorings	-3	-8	Negligible	Negligible
The Willows Farm	-4	-9	Negligible	Negligible

<p>Rating correction 0 dB</p> <p>Maximum increase Night Day 1 to -4 dB -4 to -9 dB</p>
--

Project Two (1800 MW HVAC)

Name	Floor	Dir	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	35	27	29	29	35
Kettlebridge Lane	1.FL	E	31	24	27	27	33
Rosedene Swinster Lane	1.FL	E	33	26	29	28	35
Scrub Lane	1.FL	E	32	24	27	27	33
The Moorings	1.FL	E	31	23	27	27	33
The Willows Farm	1.FL	S	30	23	26	26	32

Project Two and Project One HVDC : Project Two (1800 MW HVAC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Immission Prediction Wind Condition	Downwind		Downwind	
Background Noise Level, L _{A90} (dB)	35	40	35	40
Fairfield	0	-5	Negligible	Negligible
Kettlebridge Lane	-4	-9	Negligible	Negligible
Rosedene Swinster Lane	-2	-7	Negligible	Negligible
Scrub Lane	-3	-8	Negligible	Negligible
The Moorings	-4	-9	Negligible	Negligible
The Willows Farm	-5	-10	Negligible	Negligible

<p>Rating correction 0 dB</p> <p>Maximum increase Night Day -5 to -10 dB</p>
--

**Project One (HVAC Substation)
Project Two (1500 MW HVDC)**

Name	Floor	Dir	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	35	31	31	31	37
Kettlebridge Lane	1.FL	E	30	28	28	27	34
Rosedene Swinster Lane	1.FL	E	32	29	29	29	36
Scrub Lane	1.FL	E	31	28	28	28	34
The Moorings	1.FL	E	29	27	26	26	33
The Willows Farm	1.FL	S	27	26	25	25	32

Project One (HVAC Substation) : Project Two (1500 MW HVDC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Immission Prediction Wind Condition	Downwind		Downwind	
Background Noise Level, L _{A90} (dB)	35	40	35	40
Fairfield	0	-5	Negligible	Negligible
Kettlebridge Lane	-5	-10	Negligible	Negligible
Rosedene Swinster Lane	-3	-8	Negligible	Negligible
Scrub Lane	-4	-9	Negligible	Negligible
The Moorings	-6	-11	Negligible	Negligible
The Willows Farm	-8	-13	Negligible	Negligible

<p>Rating correction 0 dB</p> <p>Maximum increase Night Day -5 to -13 0 to -8 dB dB</p>

Project Two (1800 MW HVDC)

Name	Floor	Dir	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	34	31	31	31	37
Kettlebridge Lane	1.FL	E	30	28	28	28	34
Rosedene Swinster Lane	1.FL	E	32	29	30	29	36
Scrub Lane	1.FL	E	31	28	28	28	34
The Moorings	1.FL	E	29	27	27	27	33
The Willows Farm	1.FL	S	28	26	26	26	32

Project One (HVAC Substation) : Project Two (1800 MW HVDC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Immission Prediction Wind Condition	Downwind		Downwind	
Background Noise Level, L _{A90} (dB)	35	40	35	40
Fairfield	-1	-6	Negligible	Negligible
Kettlebridge Lane	-5	-10	Negligible	Negligible
Rosedene Swinster Lane	-3	-8	Negligible	Negligible
Scrub Lane	-4	-9	Negligible	Negligible
The Moorings	-6	-11	Negligible	Negligible
The Willows Farm	-7	-12	Negligible	Negligible

<p>Rating correction 0 dB</p> <p>Maximum increase Night Day -1 to -7 dB -6 to -12 dB</p>
--

Project Two (1800 MW HVAC)

Name	Floor	Dir	L _{Aeq,T} (DW) (dB)	L _{day} (dB)	L _{eve} (dB)	L _{night} (dB)	L _{den} (dB)
Fairfield	1.FL	NE	33	28	28	27	34
Kettlebridge Lane	1.FL	E	28	26	26	26	32
Rosedene Swinster Lane	1.FL	E	29	27	27	27	33
Scrub Lane	1.FL	E	29	25	25	25	31
The Moorings	1.FL	E	27	25	25	25	31
The Willows Farm	1.FL	S	26	24	24	24	30

Project One (HVAC Substation) : Project Two (1800 MW HVAC)

Name	Rating / Background Noise Level Difference		Impact Magnitude	
	Downwind		Downwind	
Background Noise Level, L _{A90} (dB)	35	40	35	40
Fairfield	3	-2	Negligible	Negligible
Kettlebridge Lane	-2	-7	Negligible	Negligible
Rosedene Swinster Lane	-1	-6	Negligible	Negligible
Scrub Lane	-1	-6	Negligible	Negligible
The Moorings	-3	-8	Negligible	Negligible
The Willows Farm	-4	-9	Negligible	Negligible

<p>Rating correction 5 dB</p> <p>Maximum increase Night Day 3 to -4 dB -2 to -9 dB</p>
--