HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

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1 Construction noise model inputs

1.1 Plant octave band sound power levels

1.1.1 The octave band sound pressure levels associated with each plant item assumed in the Park and Ride construction noise assessment are presented in table 1-1.

1.1.2 The sound power level, L_{WA}, has been derived from the sound pressure level at a distance of 10m from the source using point source hemispherical geometric spreading (20 log r + 8dB).

Table 1- 1 Plant list octave band sound pressure levels

Equipment	Reference	Linear Octave Band Sound Pressure Levels, dB by 1/1 Centre Band Frequency, Hz								A-weighted sound pressure level, $L_{Aeq,T}$ dB at 10m	L_{WA}
		63	125	250	500	1000	2000	4000	8000		
Excavator mounted rock breaker	BS 5228:2009+A1:2014 Table C.9.13	85	88	85	89	92	88	86	81	95	123
Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	67	70	67	65	63	62	60	55	69	97
Dump Truck	BS 5228:2009+A1:2014 Table C.6.26	88	84	75	73	75	72	68	60	79	107
Tipper lorry	BS 5228:2009+A1:2014 Table C.8.20	88	82	74	74	74	73	70	67	79	107
Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	75	75	62	58	55	54	48	40	63	91
Dozer	BS 5228:2009+A1:2014 Table C.8.9	76	78	71	70	71	65	60	55	74	102
Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	94	76	77	75	76	73	68	63	80	108
Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	85	88	77	75	77	74	69	63	81	109
Compressor for mini piling	BS 5228:2009+A1:2014 Table C.3.19	75	71	65	70	71	69	62	57	75	103
Cement mixer truck (idling)	BS 5228:2009+A1:2014 Table C.4.19	77	71	65	65	66	66	60	51	71	99
Vibratory roller	BS 5228:2009+A1:2014 Table C.5.20	90	82	73	72	70	65	59	54	75	103
Lorry with lifting boom	BS 5228:2009+A1:2014 Table C.4.53	81	78	76	74	72	69	64	56	77	105
Telescopic handler	BS 5228:2009+A1:2014 Table C.4.54	79	73	66	65	78	66	54	47	79	107
Large rotary bored piling rig	BS 5228:2009+A1:2014 Table C.3.14	84	92	81	80	78	76	68	61	83	111
Tracked mobile crane	BS 5228:2009+A1:2014 Table C.3.29	81	77	69	67	62	60	61	51	70	98
Concrete pump	BS 5228:2009+A1:2014 Table C.3.26	82	82	72	71	69	68	62	54	75	103
Tracked mobile crane	BS 5228:2009+A1:2014 Table C.3.28	81	77	66	62	59	57	51	46	67	95
Road planer	BS 5228:2009+A1:2014 Table C.5.7	81	87	79	77	77	74	70	67	82	110
Wheeled backhoe loader	BS 5228:2009+A1:2014 Table C.2.8	74	66	64	64	63	60	59	50	68	96
Vibratory plate (petrol)	BS 5228:2009+A1:2014 Table C.2.41	70	74	71	78	74	75	63	58	80	108
Petrol hand-held circular saw	BS 5228:2009+A1:2014 Table C.4.70	72	89	81	80	80	82	86	85	91	119

1.2 Plant list and activity sound power levels used in noise assessment

1.2.1 The assumed plant list and calculated activity sound power levels used in assessment of monthly Park and Ride construction scenarios are provided in table 1-2.

1.2.2 The plant sound power levels have been corrected for the quantity and % on-time of each plant item. The activity sound power levels have been calculated from the summation of the individual corrected plant sound power levels.

Table 1- 2 Plant list and activity sound power levels

Activity ID	Activity Name	Plant and machinery	BS 5228-1:2009+A1 2014 Ref	% On-time	No. Plant	dB L_{wA}	Corrected dB L_{wA}	Activity L_{WA}, dB
1	Demolition of existing buildings	Excavator mounted rock breaker	BS 5228:2009+A1:2014 Table C.9.13	80	1	123	122	122
		Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	1	97	96	
		Dump Truck	BS 5228:2009+A1:2014 Table C.6.26	80	1	107	106	
		Tipper lorry	BS 5228:2009+A1:2014 Table C.8.20	80	1	107	106	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	
2	Top Soil Removal	Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	4	97	102	116
		Dozer	BS 5228:2009+A1:2014 Table C.8.9	80	3	102	106	
		Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	80	3	108	112	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	3	109	113	
3	Craning in of cabins at site compound areas.	Compressor for mini piling	BS 5228:2009+A1:2014 Table C.3.19	80	2	103	105	110
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
4	Car parks 5 & Transfer Building area formation	Cement mixer truck (idling)	BS 5228:2009+A1:2014 Table C.4.19	80	1	99	98	113
		Vibratory roller	BS 5228:2009+A1:2014 Table C.5.20	80	1	103	102	
		Lorry with lifting boom	BS 5228:2009+A1:2014 Table C.4.53	80	1	105	104	
		Telescopic handler	BS 5228:2009+A1:2014 Table C.4.54	80	1	107	106	
		Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	80	1	108	107	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	
5	Piling for Main Transfer Building	Large rotary bored piling rig	BS 5228:2009+A1:2014 Table C.3.14	80	1	111	110	113
		Tracked mobile crane	BS 5228:2009+A1:2014 Table C.3.29	80	1	98	97	
		Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	1	97	96	
		Concrete pump	BS 5228:2009+A1:2014 Table C.3.26	80	1	103	102	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	

Activity ID	Activity Name	Plant and machinery	BS 5228-1:2009+A1 2014 Ref	% On-time	No. Plant	dB L_{wA}	Corrected dB L_{wA}	Activity L_{WA}, dB
6	Erect Transfer Building structure	Tracked mobile crane	BS 5228:2009+A1:2014 Table C.3.29	80	2	98	100	111
		Telescopic handler	BS 5228:2009+A1:2014 Table C.4.54	80	1	107	106	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
7	Car parks 2, 3 and 4 formation. Laying surfaces in car parks.	Cement mixer truck (idling)	BS 5228:2009+A1:2014 Table C.4.19	80	1	99	98	113
		Vibratory roller	BS 5228:2009+A1:2014 Table C.5.20	80	1	103	102	
		Lorry with lifting boom	BS 5228:2009+A1:2014 Table C.4.53	80	1	105	104	
		Telescopic handler	BS 5228:2009+A1:2014 Table C.4.54	80	1	107	106	
		Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	80	1	108	107	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	
8	Final Road Construction	Road planer	BS 5228:2009+A1:2014 Table C.5.7	80	1	110	109	114
		Cement mixer truck (idling)	BS 5228:2009+A1:2014 Table C.4.19	80	1	99	98	
		Vibratory roller	BS 5228:2009+A1:2014 Table C.5.20	80	1	103	102	
		Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	80	1	108	107	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Tipper lorry	BS 5228:2009+A1:2014 Table C.8.20	80	1	107	106	
9	Car park 1 formation	Cement mixer truck (idling)	BS 5228:2009+A1:2014 Table C.4.19	80	1	99	98	113
		Vibratory roller	BS 5228:2009+A1:2014 Table C.5.20	80	1	103	102	
		Lorry with lifting boom	BS 5228:2009+A1:2014 Table C.4.53	80	1	105	104	
		Telescopic handler	BS 5228:2009+A1:2014 Table C.4.54	80	1	107	106	
		Articulated dump truck (dumping rubble)	BS 5228:2009+A1:2014 Table C.1.11	80	1	108	107	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	

Activity ID	Activity Name	Plant and machinery	BS 5228-1:2009+A1 2014 Ref	% On-time	No. Plant	dB L_{wA}	Corrected dB L_{wA}	Activity L_{WA}, dB
10	Paving and landscaping, footpaths and soft landscaping.	Wheeled backhoe loader	BS 5228:2009+A1:2014 Table C.2.8	80	1	96	95	119
		Vibratory plate (petrol)	BS 5228:2009+A1:2014 Table C.2.41	80	1	108	107	
		Petrol hand-held circular saw	BS 5228:2009+A1:2014 Table C.4.70	80	1	119	118	
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	1	109	108	
		Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	1	97	96	
11	Demobilisation	Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	4	97	102	116
		Articulated dump truck	BS 5228:2009+A1:2014 Table C.5.17	80	3	109	113	

1.3 Activity octave band sound power levels used in noise assessment

1.3.1 Octave band sound pressure levels for each plant item have been normalised such that the summation of levels across all bands gives an A-weighted broadband sound pressure level at 10m that is equal to those presented in table 1-1. The normalised values for each plant item have then been grouped and used to derive octave band activity sound power levels in the same way as the broadband sound power levels.

1.3.2 The resulting octave band activity sound power levels associated with each activity assumed in the Park and Ride construction noise assessment are presented in table 1-3.

Table 1- 3 Assumed Park and Ride activities during indicative programme

Activity ID	Activity Name	Linear Octave Band Sound Power Levels, dB by 1/1 Centre Band Frequency, Hz								dB (A)
		63	125	250	500	1000	2000	4000	8000	
1	Demolition of existing buildings	119	117	112	116	119	115	113	108	122
2	Top Soil Removal	126	120	112	110	112	109	104	98	116
3	Craning in of cabins at site compound areas.	113	115	104	104	106	103	97	92	110
4	Car parks 5 & Transfer Building area formation	123	117	109	107	110	105	100	94	113
5	Piling for Main Transfer Building	116	121	110	108	108	105	99	93	113
6	Erect Transfer Building structure	115	116	105	103	108	102	97	90	111
7	Car parks 2, 3 and 4 formation. Laying surfaces in car parks.	123	117	109	107	110	105	100	94	113
8	Final Road Construction	124	119	111	109	109	107	102	99	114
9	Car park 1 formation	123	117	109	107	110	105	100	94	113
10	Paving and landscaping, footpaths and soft landscaping.	113	119	110	110	110	111	114	112	119
11	Demobilisation	126	120	112	110	112	109	104	98	116

1.4 Assumed Park and Ride activities during indicative programme

1.4.1 The programmed works activities associated with the Park and Ride are presented in table 1-4.

Table 1- 4 Assumed Park and Ride construction activities during indicative programme

Activity ID	Activity Name	Start Month	End Month	Assumed works programme by month															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Demolition of existing buildings	1	2	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Top Soil Removal	2	5	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Craning in of cabins at site compound areas.	3	6	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-
4	Car parks 5 & Transfer Building area formation	3	10	-	-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-
5	Piling for Main Transfer Building	6	7	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-
6	Erect Transfer Building structure	8	10	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-
7	Car parks 2, 3 and 4 formation. Laying surfaces in car parks.	8	13	-	-	-	-	-	-	-	X	X	X	X	X	X	-	-	-	-	-
8	Final Road Construction	8	13	-	-	-	-	-	-	-	X	X	X	X	X	X	-	-	-	-	-
9	Car park 1 formation	14	17	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	-
10	Paving and landscaping, footpaths and soft landscaping.	10	13	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-
11	Demobilisation	14	18	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X

2 Construction noise model outputs and assessment

2.1 Noise levels at residential receptor groups

2.1.1 The summary of noise levels for each month of the programme at the worst affected receptor in each group of residential properties (high sensitivity) due to the Park and Ride construction works are presented in table 2-1.

2.1.2 The assessment periods for construction are 07:00 – 19:00 Monday to Friday and 07:00 – 13:00 Saturdays.

Table 2- 1 Summary of noise levels at residential properties

Receptor Group	Calculated Free-Field Noise Level, dB $L_{Aeq,T}$																	
	Mnth 1	Mnth 2	Mnth 3	Mnth 4	Mnth 5	Mnth 6	Mnth 7	Mnth 8	Mnth 9	Mnth 10	Mnth 11	Mnth 12	Mnth 13	Mnth 14	Mnth 15	Mnth 16	Mnth 17	Mnth 18
London Road, north of the Park and Ride	62	62	56	56	56	55	54	57	57	60	59	59	59	54	46	46	46	54
Alltwen Goch, south of the Park and Ride	56	56	55	55	55	54	53	55	55	58	57	57	57	55	52	52	52	52
Minffordd Road area, south of the Park and Ride	58	58	49	49	49	47	46	52	52	54	53	53	53	48	39	39	39	47
A55, west of the Park and Ride	59	59	52	52	52	50	49	53	53	56	55	55	55	51	43	43	43	50
Bryn Goleu, east of the Park and Ride	57	57	60	60	60	55	55	58	58	63	63	63	63	63	60	60	60	59
Holyhead Road, north of the Park and Ride	55	55	55	55	55	53	52	54	54	58	57	57	57	55	52	52	52	53
Llanfihangel-yn-Nhywyn	55	55	45	45	45	43	42	48	48	50	50	50	50	44	39	39	39	44

2.2 Assessment of effects at residential receptors

2.2.1 The summary of magnitudes of change and assessment of significance for each month of the programme at residential properties (high sensitivity) due to the Park and Ride construction works are presented in table 2-2.

Table 2- 2 Summary of effects and assessment of significance at residential properties

Magnitude of Change	Noise level from plant and machinery, dB $L_{Aeq,T}$	Significance of effect at residential receptor	Total number of effects at residential properties by programme month																
			Mnth 1	Mnth 2	Mnth 3	Mnth 4	Mnth 5	Mnth 6	Mnth 7	Mnth 8	Mnth 9	Mnth 10	Mnth 11	Mnth 12	Mnth 13	Mnth 14	Mnth 15	Mnth 16	Mnth 17	Mnth 18
Large	≥ 75.0	Major significance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	70.0 - 74.9	Major significance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small	65.0 - 69.9	Moderate significance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Negligible	< 65.0*	Minor (not significant)	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
*or less than a 3 dB increase in the pre-existing ambient noise level																				

2.3 Assessment of effects at non-residential receptors

2.3.1 The summary of non-residential receptors within 600m of the Park and Ride construction works area and the highest predicted noise level over the duration of the Park and Ride works programmed are presented in table 2-3

Table 2- 3 Summary of effects and assessment of significance at non-residential receptors

Receptor Group	Receptor Type	Sensitivity	Highest predicted noise level from plant and machinery, dB $L_{Aeq,T}$	Magnitude of change	Significance of effect at non-residential receptor
Footpath to the north	Open-air amenities used for recreation	Medium	62	Negligible	Negligible (not significant)
Waste transfer station at Refail Newydd	Commercial	Low	54	Negligible	Negligible (not significant)
Function rooms at Cartio Môn	Commercial	Low	63	Negligible	Negligible (not significant)
Commercial premises at Llanfihangel-yn-Nhywyn.	Commercial	Low	55	Negligible	Negligible (not significant)

3 Operation noise model inputs

3.1 Octave band sound power levels used in noise assessment

3.1.1 The activities and assumed sources associated with the Park and Ride operation are presented in table 3-1. Each activity occurs during both daytime and night time periods unless specified.

3.1.2 The assessment periods for operation are 1 hour during daytime (07:00 – 23:00) and 15 minute during night time (23:00 – 07:00) operation.

Table 3- 1 Activity list with associated sources and sound power levels

Activity No.	Activity	Source	% On-time	No. Plant	dB L_{wA}	Corrected dB L_{wA}	Activity L_{WA}, dB
1	Heat Pump	Heat Pump	100	7	92	100	100
2	Car Parks - Day	Car Door Slam	1	550	89	96	97
		Car Idle	5	550	76	90	
3	Car Parks - Night	Car Door Slam	1	100	89	89	90
		Car Idle	5	100	76	83	
4	Car Movement	Car Movement	100	1	90	90	90
5	Bus Idle - Day	Bus Idle	25	11	76	80	80
6	Bus Idle - Night	Bus Idle	100	2	76	79	79
7	Bus Movement	Bus Movement	100	1	106	106	106

3.2 Octave band sound power levels used in noise assessment

3.2.1 The octave band sound power levels associated with each activity assumed in the operation noise assessment are presented in table 3-2.

Table 3- 2 Octave band sound power levels for each activity

Activity ID	Activity Name	Linear Octave Band Sound Power Levels, dB by 1/1 Centre Band Frequency, Hz								L_{WA}
		63	125	250	500	1000	2000	4000	8000	
1	Heat Pump	108	103	99	99	95	91	84	88	100
2	Car Parks - Day	97	94	90	93	92	91	88	80	97
3	Car Parks - Night	90	87	82	85	85	84	81	73	90
4	Car Movement	102	97	92	85	83	79	77	70	90
5	Bus Idle - Day	84	72	73	79	77	71	66	60	80
6	Bus Idle - Night	82	71	72	77	76	70	65	59	79
7	Bus Movement	108	110	103	102	103	97	92	87	106

4 Operation noise model outputs and assessment

4.1 Daytime assessment at worst affected residential receptor in each group

4.1.1 The daytime (worst hour) assessment at the worst affected property in each group of residential receptors, due to operation of the Park and Ride, is presented in table 4-1.

Table 4- 1 Daytime assessment at worst affected property in each group of residential receptors

Group	Alltwen Goch, south of the Park and Ride	Holyhead Road, north of the Park and Ride	London Road, north of the Park and Ride	A55, west of the Park and Ride	Minffordd Road area, south of the Park and Ride	Bryn Goleu, east of the Park and Ride	Llanfihangel-yn-Nhywyn
Specific Noise Level, $L_{Aeq,T}$	42	39	40	38	34	39	35
Acoustic Feature Correction, dB	3	3	3	3	3	3	3
Rating Level $L_{Ar,Tr}$	45	42	43	41	37	42	38
Background Level, $L_{A90,T}$	51	51	44	49	49	49	44
Excess of Rating over background, dB	-6	-9	-1	-8	-12	-7	-6
Consideration of Context	*No excess of Rating over background*						

4.2 Night-time assessment at worst affected residential receptor in each group

4.2.1 The night-time (worst 15-minutes) assessment at the worst affected property in each group of residential receptors, due to operation of the Park and Ride, is presented in table 4-2.

Table 4- 2 Night-time assessment at worst affected property in each group of residential receptors

Group	Alltwen Goch, south of the Park and Ride	Holyhead Road, north of the Park and Ride	London Road, north of the Park and Ride	A55, west of the Park and Ride	Minffordd Road area, south of the Park and Ride	Bryn Goleu, east of the Park and Ride	Llanfihangel-yn-Nhywyn
Specific Noise Level, $L_{Aeq,T}$	39	33	34	33	31	33	31
Acoustic Feature Correction, dB	3	3	3	3	3	3	3
Rating Level $L_{Ar,Tr}$	42	36	37	36	34	36	34
Background Level, $L_{A90,T}$	39	39	31	37	37	37	31
Excess of Rating over background, dB	3	-3	6	-1	-3	-1	3
Consideration of Context	*Contextual assessment indicates that all specific sound levels fall below any of the absolute criteria and are below the lowest observed adverse effect level for night noise for protection of the public, including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise*						

4.3 Initial assessment of effects at residential receptors

4.3.1 The initial summary of magnitudes of change and assessment of significance, prior to consideration of context, at residential properties (high sensitivity) due to operation of the Park and Ride are presented in table 4-3.

Table 4- 3 Summary of effects and assessment of significance at residential properties

Magnitude of change (effect)	Significance of effect at residential receptor (high sensitivity)	Approximate number of residential properties affected during day (07:00–19:00)	Approximate number of residential properties affected during night (19:00–07:00)
Large	Major significance	0	0
Medium	Major significance	0	0
Small	Moderate significance	0	1
Negligible	Minor (not significant)	85	84

4.4 Assessment of effects at residential receptors considering context

4.4.1 Following consideration of context, the summary of magnitudes of change and assessment of significance at residential properties (high sensitivity) due to operation of the Park and Ride are presented in table 4-4.

Table 4- 4 Summary of effects and assessment of significance at residential properties

Magnitude of change (effect)	Significance of effect at residential receptor (high sensitivity)	Approximate number of residential properties affected during day (07:00–19:00)	Approximate number of residential properties affected during night (19:00–07:00)
Large	Major significance	0	0
Medium	Major significance	0	0
Small	Moderate significance	0	0
Negligible	Minor (not significant)	85	85

5 Decommissioning noise model inputs

5.1 Plant list and activity sound power levels used in noise assessment

5.1.1 The assumed plant list and calculated activity sound power levels used in assessment of monthly Park and Ride decommissioning scenarios are provided in table 5-1. Individual plant sound power levels are presented in table 1-2.

Table 5- 1 Plant list and activity sound power levels

Activity ID	Activity Name	Plant and machinery	BS 5228-1:2009+A1 2014 Ref	% On-time	No. Plant	dB L_{wA}	Corrected dB L_{wA}	Activity L_{WA}, dB
1	Decommissioning	Excavator mounted rock breaker	BS 5228:2009+A1:2014 Table C.9.13	80	1	123	122	122
		Tracked excavator	BS 5228:2009+A1:2014 Table C.8.10	80	1	97	96	
		Dump Truck	BS 5228:2009+A1:2014 Table C.6.26	80	1	107	106	
		Tipper lorry	BS 5228:2009+A1:2014 Table C.8.20	80	1	107	106	
		Water jet pump	BS 5228:2009+A1:2014 Table C.3.13	80	1	91	90	

5.2 Octave Band Sound Power Levels Used in Noise Assessment

5.2.1 The octave band sound power levels associated with each activity assumed in the Park and Ride decommissioning noise assessment are presented in table 5-2.

Table 5- 2 Assumed Park and Ride activities during indicative programme

Activity ID	Activity Name	Linear Octave Band Sound Power Levels, dB by 1/1 Centre Band Frequency, Hz								dB (A)
		63	125	250	500	1000	2000	4000	8000	
1	Decommissioning	119	117	112	116	119	115	113	108	122

6 Decommissioning noise model outputs and assessment

6.1 Noise levels at residential receptors

6.1.1 The summary of noise levels at the worst affected receptor in each group of residential properties (high sensitivity) due to the Park and Ride decommissioning works are presented in table 6-1.

6.1.2 The assessment periods for decommissioning are 07:00 – 19:00 Monday to Friday and 07:00 – 13:00 Saturdays.

Table 6- 1 Summary of effects and assessment of significance at residential properties

Residential area likely to experience significant effects	Highest noise level causing significant effect dB $L_{Aeq,1hr}$
London Road, north of the Park and Ride	60
Alltwen Goch, south of the Park and Ride	60
Minffordd Road area, south of the Park and Ride	52
A55, west of the Park and Ride	57
Bryn Goleu, east of the Park and Ride	61
Holyhead Road, north of the Park and Ride	59
Llanfihangel-yn-Nhywyn	48

6.2 Assessment of effects at residential receptors

6.2.1 The summary of magnitudes of effect and assessment of significance at residential properties (high sensitivity) due to decommissioning works of the Park and Ride site are presented in table 6-2.

Table 6- 2 Summary of effects and assessment of significance at residential properties

Magnitude of Change	Noise Level from Plant and Machinery, dB $L_{Aeq,T}$	Significance of Effect at Residential Receptor	Approximate number of residential properties affected during day (07:00–19:00)
Large	≥ 75.0	Major significance	0
Medium	70.0 - 74.9	Major significance	0
Small	65.0 - 69.9	Moderate significance	0
Negligible	< 65.0*	Minor (not significant)	85
* or less than a 3.0dB increase in the pre-existing ambient noise level			

6.3 Assessment of effects at non-residential receptors

6.3.1 The summary of non-residential receptors within 600m of the Park and Ride decommissioning works area and the highest predicted noise level over the duration of the Park and Ride decommissioning are presented in table 6-3.

Table 6- 3 Summary of effects and assessment of significance at non-residential receptors

Receptor Group	Receptor Type	Sensitivity	Highest predicted noise level from plant and machinery, dB $L_{Aeq,T}$	Magnitude of change	Significance of effect at non-residential receptor
Footpath to the north	Open-air amenities used for recreation	Medium	60.4	Negligible	Negligible (not significant)
Waste transfer station at Refail Newydd	Commercial	Low	54.5	Negligible	Negligible (not significant)
Function rooms at Cartio Môn	Commercial	Low	64.5	Negligible	Negligible (not significant)
Commercial premises at Llanfihangel-yn-Nhywyn.	Commercial	Low	48.5	Negligible	Negligible (not significant)

7 Sensitivity testing

7.1 Car alarms during operation of the Park and Ride

7.1.1 The sensitivity tests for car alarm sound from the Park and Ride development have considered both day and night cumulative operational noise, and completed the assessment using the principles of BS 4142 [RD1] and the potential effects of $L_{Amax,F}$ noise levels during night-time periods and assessed using presented in WHO guidance [RD2].

7.1.2 The sensitivity test has been undertaken for each receptor group using the closest car park location to each group. However, it is noted that the majority of alarm source locations would likely be further from the assumed sound source location and benefit from additional screening provided by vehicles located between the alarm source and receiver.

7.1.3 A measured car alarm sound pressure level of 72dB $L_{Aeq,T}$ at 10m has been used to calculate a specific sound level from the closest car park location to each receptor group. The source term level was measured from a car alarm which sounded for a total of 28 seconds before disengaging. As car alarms for different vehicles will continue for varying durations, a cautious assumption that the source would occur for 50% of a 15 minute period before disengaging has been adopted. This provides levels of 69dB $L_{Aeq,15min}$ at 10m and 63dB $L_{Aeq,1hr}$ at 10m for night-time and daytime assessments, respectively.

7.1.4 A 5dB partial screening correction has been applied to one receptor group only, which is located behind a non-residential building. The 5dB screening correction has been adopted in opposition with a 10dB screening correction for a location with no line of site in order to maintain the cautious assessment.

7.1.5 As per the guidance in BS 4142 [RD1], a +3dB acoustic feature correction for intermittency has been applied along with a +2dB feature correction for tonality.

7.1.6 The car alarm specific sound levels have been logarithmically summed with the specific sound levels for the existing operational daytime and night-time assessments to obtain a cumulative specific sound level for the sensitivity test. The daytime sensitivity test results are presented in table 7-1.

Table 7- 1 Daytime $L_{Aeq,1hour}$ sensitivity test for the potential effects of car alarms at residential receptor groups

Group	Alltwen Goch, south of the Park and Ride	Holyhead Road, north of the Park and Ride	London Road, north of the Park and Ride	A55, west of the Park and Ride	Minffordd Road area, south of the Park and Ride	Bryn Goleu, east of the Park and Ride	Llanfihangel-yn-Nhywyn
Car Source Level, $L_{Aeq,T}$ at 10m	63	63	63	63	63	63	63
Distance from Source to Receiver, m	305	340	375	610	535	185	720
Screening Attenuation, dB						-5	
Car Alarm Specific Level, $L_{Aeq,T}$	33	32	32	27	28	33	26
Operational Assessment Specific Level, $L_{Aeq,T}$	42	39	40	38	34	39	35
Cumulative Specific Level, $L_{Aeq,15min}$	43	40	41	38	35	40	36
Acoustic Feature Correction, dB (intermittency)	3	3	3	3	3	3	3
Acoustic Feature Correction, dB (tonality)	2	2	2	2	2	2	2
Cumulative Rating Level, $L_{Ar,Tr}$	48	45	46	43	40	45	41
Background Sound Level, $L_{A90,T}$	51	51	44	49	49	49	44
Excess of Rating over background, dB	-3	-6	+2	-6	-9	-4	-3
Comment	+2dB excess at London Road receptor. Contextual assessment indicates that all specific sound levels fall below any of the absolute criteria.						

7.1.7 All cumulative specific levels for the daytime sensitivity test are below the WHO [RD2] guideline level for moderate annoyance for community noise in outdoor living areas.

7.1.8 No additional significant effects are likely should car alarms occur at the nearest position in the closest car park to each receptor group.

7.1.9 The night-time sensitivity test results are presented in table 7-2.

Table 7- 2 Night-time $L_{Aeq,15min}$ sensitivity test for the potential effects of car alarms at residential receptor groups

Group	Alltwen Goch, south of the Park and Ride	Holyhead Road, north of the Park and Ride	London Road, north of the Park and Ride	A55, west of the Park and Ride	Minffordd Road area, south of the Park and Ride	Bryn Goleu, east of the Park and Ride	Llanfihangel-yn-Nhywyn
Car Source Level, $L_{Aeq,T}$ at 10m	69	69	69	69	69	69	69
Distance from Source to Receiver, m	305	340	375	610	535	185	720
Screening Attenuation, dB						-5	
Car Alarm Specific Level, $L_{Aeq,15min}$	39	38	38	33	34	39	32
Operational Assessment Specific Level, $L_{Aeq,T}$	39	33	34	33	31	33	31
Cumulative Specific Level, $L_{Aeq,T}$	42	39	39	36	36	40	35
Acoustic Feature Correction, dB (intermittency)	3	3	3	3	3	3	3
Acoustic Feature Correction, dB (tonality)	2	2	2	2	2	2	2
Cumulative Rating Level, $L_{Ar,Tr}$	47	44	44	41	41	45	40
Background Sound Level, $L_{A90,T}$	39	39	31	37	37	37	31
Excess of Rating over background, dB	8	5	13	4	4	8	9
Comment	Contextual assessment indicates that all specific sound levels fall below any of the absolute criteria and are below the lowest observed adverse effect level for night noise for protection of the public, including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise.						

7.1.10 The night-time sensitivity test for the occurrence of car alarms at the nearest position in the closest car park to each receptor group shows that the excess of rating over background increases due to the occurrence of a car alarm. However, the highest cumulative night-time specific level with the inclusion of car alarms is 42dB $L_{Aeq,T}$. This is below the WHO [RD2] absolute criteria given for sleep disturbance with a window open, as given in table F6-11.

7.1.11 As a worst case a car alarm has been considered to sound for 7.5 minutes over a night time period. Due to this, and due to the atypical nature of the car alarm events, it is also likely that the annual average L_{night} with the inclusion of infrequent car alarm events will remain below the lowest observed adverse effect level for night noise for protection of the public, including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise.

7.1.12 Consideration of the context of the assessment indicates that significant effects are unlikely when considered against both the WHO [RD2] guideline value for sleep disturbance and the WHO [RD2] guideline value for protection of the public from adverse health effects due to night noise. However, in order to maintain the precautionary approach of the sensitivity test consideration has been made against the WHO [RD2] guideline criteria for the indication of noise-induced awakenings. A 60dB $L_{Amax,F}$ level has been adopted to account for a minimum reduction a 15dB due to a partially open window.

7.1.13 The night-time $L_{Amax,F}$ assessment for the car alarm sensitivity test is presented in table 7-3.

Table 7- 3 Night-time $L_{Amax,F}$ sensitivity test for the potential effects of car alarms at residential receptor groups

Group	Alltwen Goch, south of the Park and Ride	Holyhead Road, north of the Park and Ride	London Road, north of the Park and Ride	A55, west of the Park and Ride	Minffordd Road area, south of the Park and Ride	Bryn Goleu, east of the Park and Ride	Llanfihangel-yn-Nhywyn
Car Alarm Maximum Level, $L_{Amax,F}$ at 10m	76	76	76	76	76	76	76
Distance from Source to Receiver, m	305	340	375	610	535	185	720
Screening Attenuation, dB						-5	
Car Alarm Maximum Level, $L_{Amax,F}$	46	45	45	40	41	46	39
Indication of Noise-Induced Awakenings, $L_{Amax,F}$	60	60	60	60	60	60	60
Excess of Maximum over Criteria, dB	-14	-15	-15	-20	-19	-14	-21

7.1.14 The assessment of $L_{Amax,F}$ levels indicates that maximum $L_{Amax,F}$ levels due to sounding car alarms at the nearest position in the closest car park to each receptor will fall at least 14dB below the 60dB WHO [RD2] criteria for noise-induced awakenings, and therefore noise-induced awakenings are unlikely.

8 References

Table 8- 1 Schedule of references

ID	Reference
RD1	British Standard Institution. 2014. *BS 4142:2014 Methods for rating and assessing industrial and commercial sound. British Standards Institution*
RD2	World Health Organization. 1999. *Guidelines for Community Noise*