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APPENDIX 20-C CONSTRUCTION NOISE ASSESSMENT



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20-C.1 CONSTRUCTION NOISE ASSESSMENT

The significance criteria for the construction noise assessment are based on 'The ABC Method' from BS 5228-1:2009+A1:2014. An extract describing this method is provided below.

Example Method 1 – The ABC Method

Table 20C.1 shows an example of the threshold of **potential** significant effect at dwellings when the **total site** noise level rounded to the nearest decibel, exceeds the listed value. The table can be used as follows: for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the site noise level. If the site noise level exceeds the appropriate category value, then a significance effect is deemed to occur.

Table 20C.1: Example threshold of significant effect at dwellings

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value, in Decibels (dB)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23.00-07.00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

Notes:

1. A **potential significant** effect is **indicated** if the site L_{AeqT} noise level, exceeds the threshold level for the Category appropriate to the ambient noise level.
2. If the ambient noise level exceeds the **Category C** threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a **potential** significant effect is **indicated** if the total L_{Aeq} noise level for the period increases by more than 3 dB due to **site noise**.
3. Applied to residential receptors only.

A). Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
 B). Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
 C). Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
 D). 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

(Source: BS 5228-1:2009+A1:2014, Page 119)

Table 20C.2 presents the derived daytime threshold values based on the measured noise levels presented. It is considered that these are representative of the prevailing noise levels within the vicinity of the nearest sensitive receptors (SRs) to the Site.

Table 20C-2: Construction daytime threshold categories (BS 5228 ABC method)

SR Description	Prevailing Daytime Noise Level dB L_{Aeq} (free-field)	BS 5228: Threshold Value
SR A) Doonies Rare Breed Farm	50-54	65
SR B) Girdleness Lighthouse SRs	47	65
SR C) Balnagask Residential Area	51-65	65 ^[1]
Note: [1]. Threshold level based on lower measured daytime noise level. Higher measured level is near to St Fitticks Road.		

Calculations have not been undertaken for the evening or night-time as it is assumed that evening and night-time construction work would only be undertaken under exceptional circumstances and not without prior approval. Exceptional circumstances may include concreting operations where the pumping of concrete to foundations has to be a continuous process which may require operations outside the daytime period.

Generic calculations were undertaken using the data and procedures set out in BS 5228:2009+A1:2014 for the noisiest construction phases, to derive indicative noise levels at selected SRs over a 1 hour period. At all SR, the construction threshold levels, above which significant adverse effects may arise, is 65dB L_{Aeq} , based upon the guidance provided in BS 5228:2009+A1:2014.

A maximum worst case noise level over a one hour period was calculated, assuming that plant would be operating at the closest point to the nearest SRs in the absence of mitigation. In practice, noise levels would tend to be lower owing to greater separation distances and screening effects. They would also tend to reduce over a 10 hour working day owing to periods of plant inactivity.

Calculations were undertaken using the data and procedures set out in BS 5228:2009+A1:2014 for the noisiest construction phases, to derive indicative noise levels. Noise source data was supplemented with manufacturer's data and source data extracted from the Environmental Protection Department of Hong Kong's Technical Memorandum on noise from Construction Work, where this was not available within BS5228.

The highest noise levels during construction of the proposed development are likely to be associated with plant used during dredging, excavation, piling, concreting, and pavement works. The calculations assume that plant would be operating at the closest point to the SR, which was inferred from the draft HRO.

The noisiest construction phases and associated noise levels are as follows:

- Dredging 88-94dB(A) at 10 m depending on type of dredger;
- Earthworks 84 dB(A) at 10 m;
- Breakwater 89dB (A) at 10 m;
- Vibro Piling 79 dB(A) at 10 m;
- Percussive Piling 91dB(A) at 10 m;

- Concreting 83 dB(A) at 10 m;
- Quay Construction (marine/on-shore) 86/87 dB(A) at 10 m;
- Pavement 81dB(A) at 10 m.

Table 20C.3 presents the significance of construction noise exceeding the threshold value of 65dB L_{Aeq} .

Table 20C.3: Significance of noise effect

Significance	Level Above Threshold Value dB(A)	Definition
Neutral	≤0	No effect
Slight adverse	>0 to 2.9	The effect is not of concern
Moderate adverse	3.0 to 4.9	The effect is undesirable but of limited concern
Large adverse	5.0 to 9.9	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration
Very large adverse	≥10	The effect gives rise to serious concern and it should be considered unacceptable

Table 20C.4 presents a breakdown of the construction noise levels at a distance of 10 metres used in the assessment of construction noise and Table 20.C.6 presents the predicted construction noise levels with and without mitigation together with the significance of these.

Table 20C.4: Breakdown of construction plant, on-times and noise levels

Phase/Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR [m]	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Dredging										
Nordic Giant (backhoe dredger)	Intersona (measured)	116	88	10	0	1	0	0	88	
Manu Pekka (backhoe dredger)	Intersona (measured)	119	91	10	0	1	0	0	91	
Access Roads to Breakwaters										
Excavation										
Tracked excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1	0	0	70	84
Tracked excavator (14t)	BS5228 Table C2 ref 7		70	10	0	1	0	0	70	
Wheeled backhoe loader (8t)	BS5228 Table C2 ref 8		68	10	0	1	0	0	68	
Hydraulic vibratory compactor (tracked excavator)	BS5228 Table C2 ref 42		78	10	0	1	0	0	78	
Dozer (11t)	BS5228 Table C2 ref 13		78	10	0	1	0	0	78	
Lorry (4-axle wagon)	BS5228 Table C2 ref 34		80	10	0	1	0	0	80	
Pavement Works										
Road planer	BS5228 Table C5 ref 7		82	10	0	0	-6	0	76	81
Spreading chip and fill	BS5228 Table C5 ref 12		77	10	0	0	-6	0	71	
Vibratory roller	BS5228 Table C5 ref 20		75	10	0	0	-6	0	69	
Asphalt paver (+ tipper lorry)	BS5228 Table C5 ref 30		75	10	0	0	-6	0	69	
Vibratory compactor (asphalt)	BS5228 Table C5 ref 29		82	10	0	0	-6	0	76	
Lorry (4-axle wagon)	BS5228 Table C2 ref 34		80	10	0	0	-6	0	74	

Table 20C.4: Breakdown of construction plant, on-times and noise levels continued

Phase/Plant	Source	LW	LAeq @10m	Distance From Boundary to NSR [m]	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq, 1h (dB)
Breakwater Construction										
Crane barge	CNP 061	104	76	10	0	1	0	0	76	89
Tug boat	CNP 221	110	82	10	0	1	0	0	82	
Vibratory hammer	BS P4/53	118	90	10	0	1	-3	0	87	
Tracked excavator	BS5228 Table C5 ref 18		80	10	0	1	0	0	80	
Dumper truck	BS5228 Table C2 ref 30		79	10	0	1	-3	0	76	
Long reach tracked excavator	BS5228 Table C7 ref 1		78	10	0	1	-3	0	75	
Piling										
Vibro piling	BS5228 Table D4 ref 104a)	110	82	10	0	1	-3	0	79	79
Percussive piling	BS5228 Table D4 ref 104a)	122	94	10	0	1	-3	0	91	91
Quay Construction-Marine										
Crane barge (diesel)	CNP 048	112	84	10	0	1	0	0	84	86
Tug boat	CNP 221	110	82	10	0	1	0	0	82	
Long reach tracked excavator	BS5228 Table C7 ref 1		78	10	0	1	-3	0	75	
Quay Construction On-Shore										
Concrete batching plant	Manufacturer's Data	111	83	10	0	1	0	0	83	87
Concrete mixer truck	BS5228 Table C4 ref 20		80	10	0	1	0	0	80	
Concrete mixer truck	BS5228 Table C4 ref 20		80	10	0	1	0	0	80	
Tracked mobile crane	BS5228 Table C4 ref 52		75	10	0	1	0	0	75	
Mobile telescopic crane	BS5228 Table C4 ref 39		77	10	0	1	0	0	77	

Table 20C.5 presents the distance from works to SRs used for calculation purpose of the different construction phases.

Table 20C.5: Shortest distance from works to SR (metres)

Ref	SR	Dredging	Access Road To Breakwaters Excavation	Access Road To Breakwaters Paving	Breakwater Construction	Vibro Piling	Percussive Piling	Quay Construction - Marine	Quay Construction - On-Shore
A	Doonies Rare Breed Farm	950	800	800	800	1200	1200	1200	1200
B	Girdle Ness Lighthouse NSRs	300	60	60	60	60	60	60	40
C	Balnagask NSRs	500	270	270	1000	440	440	500	500

Table 20C.6: Construction calculations and significance of effects

SR	Demolition/Construction Activity	Threshold Level (dB(A))	Predicted Site Noise Level (dB(A))	Significance of Effect	Predicted Site Noise Level With Mitigation (dB(A))	Significance of Residual Effect
SR A	Dredging	65	51	Negligible	51	Negligible
	Access Rd Excavation	65	46	Negligible	<50	Negligible
	Access Road Paving	65	43	Negligible	<50	Negligible
	Breakwaters	65	51	Negligible	<50	Negligible
	Vibro Piling	65	37	Negligible	<50	Negligible
	Percussive Piling	65	40	Negligible	<50	Negligible
	Quay Construction Marine	65	45	Negligible	<50	Negligible
	Quay Construction On-Shore	65	45	Negligible	<50	Negligible
SR B	Dredging	65	61	Negligible	61	Negligible
	Access Rd Excavation	65	68	Minor	58	Negligible
	Access Road Paving	65	66	Minor	56	Negligible
	Breakwaters	65	74	Major	64	Negligible
	Vibro Piling	65	63	Negligible	53	Negligible
	Percussive Piling	65	66	Minor	56	Negligible
	Quay Construction Marine	65	71	Major	61	Negligible
	Quay Construction On-Shore	65	75↓	Major	65	Negligible
SR C	Dredging	65	57	Negligible	57	Negligible
	Access Rd Excavation	65	55	Negligible	<50	Negligible
	Access Road Paving	65	53	Negligible	<50	Negligible
	Breakwaters	65	49	Negligible	<50	Negligible
	Vibro Piling	65	46	Negligible	<50	Negligible
	Percussive Piling	65	48	Negligible	<50	Negligible
	Quay Construction Marine	65	52	Negligible	<50	Negligible
	Quay Construction On-Shore	65	53	Negligible	<50	Negligible