

Figure 3.6A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 8

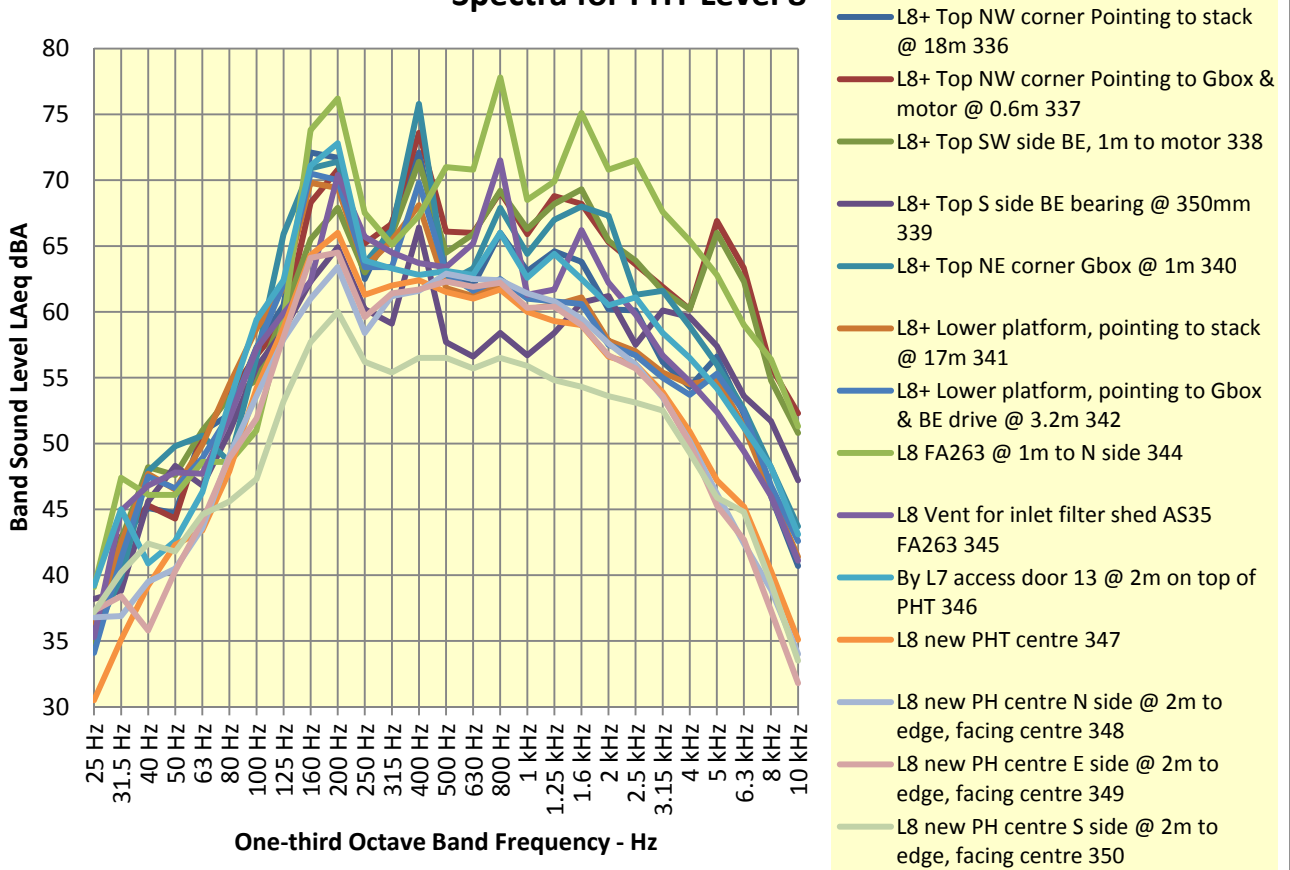


Figure 3.6: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 8

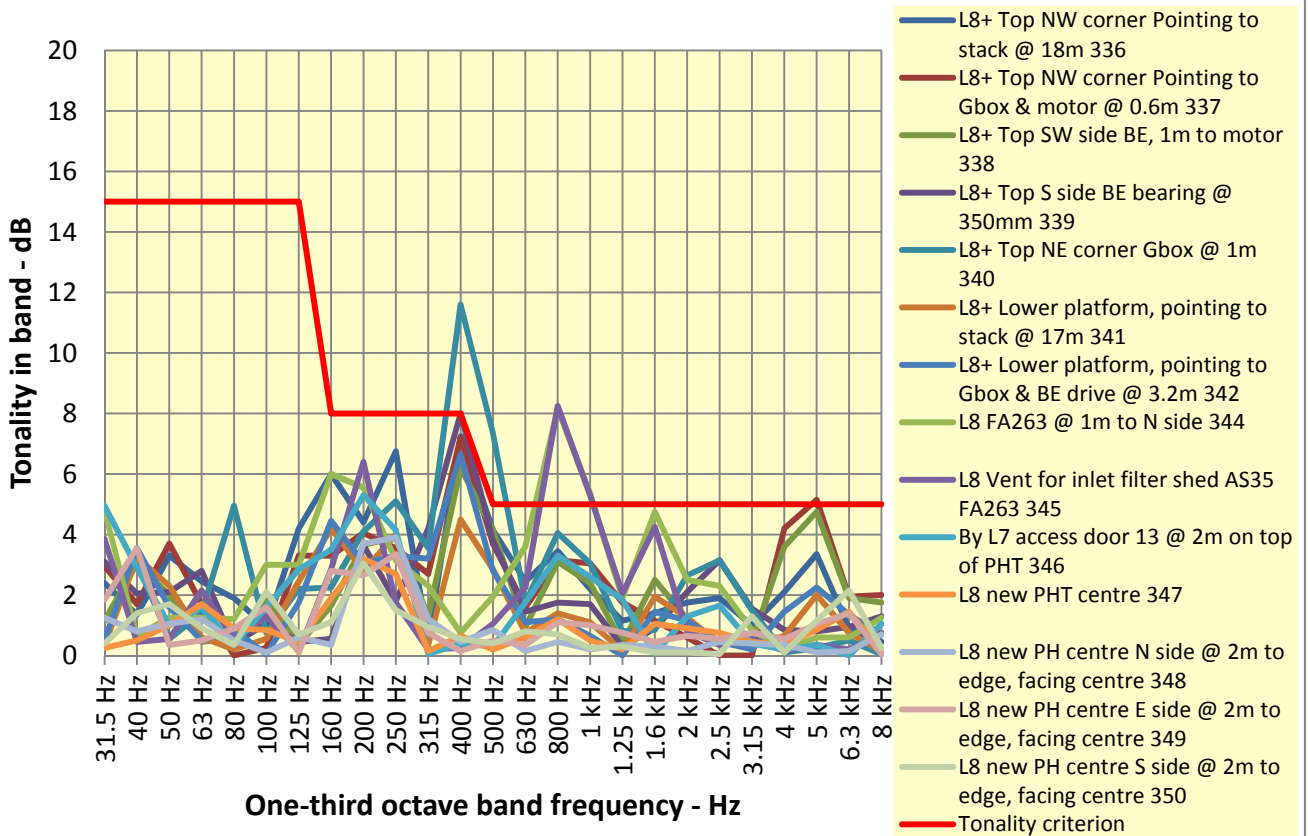


Figure 3.7A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 7

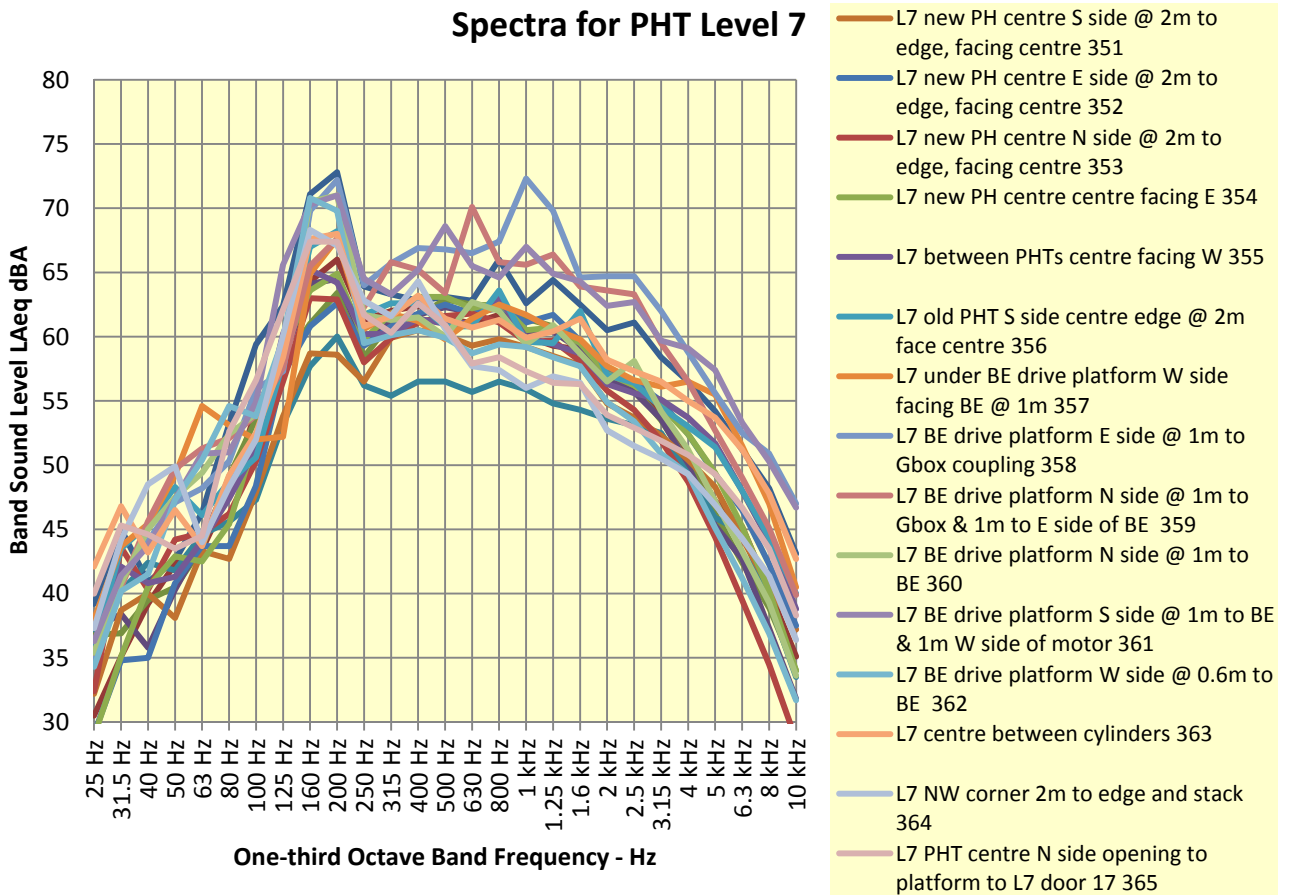


Figure 3.7: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 7

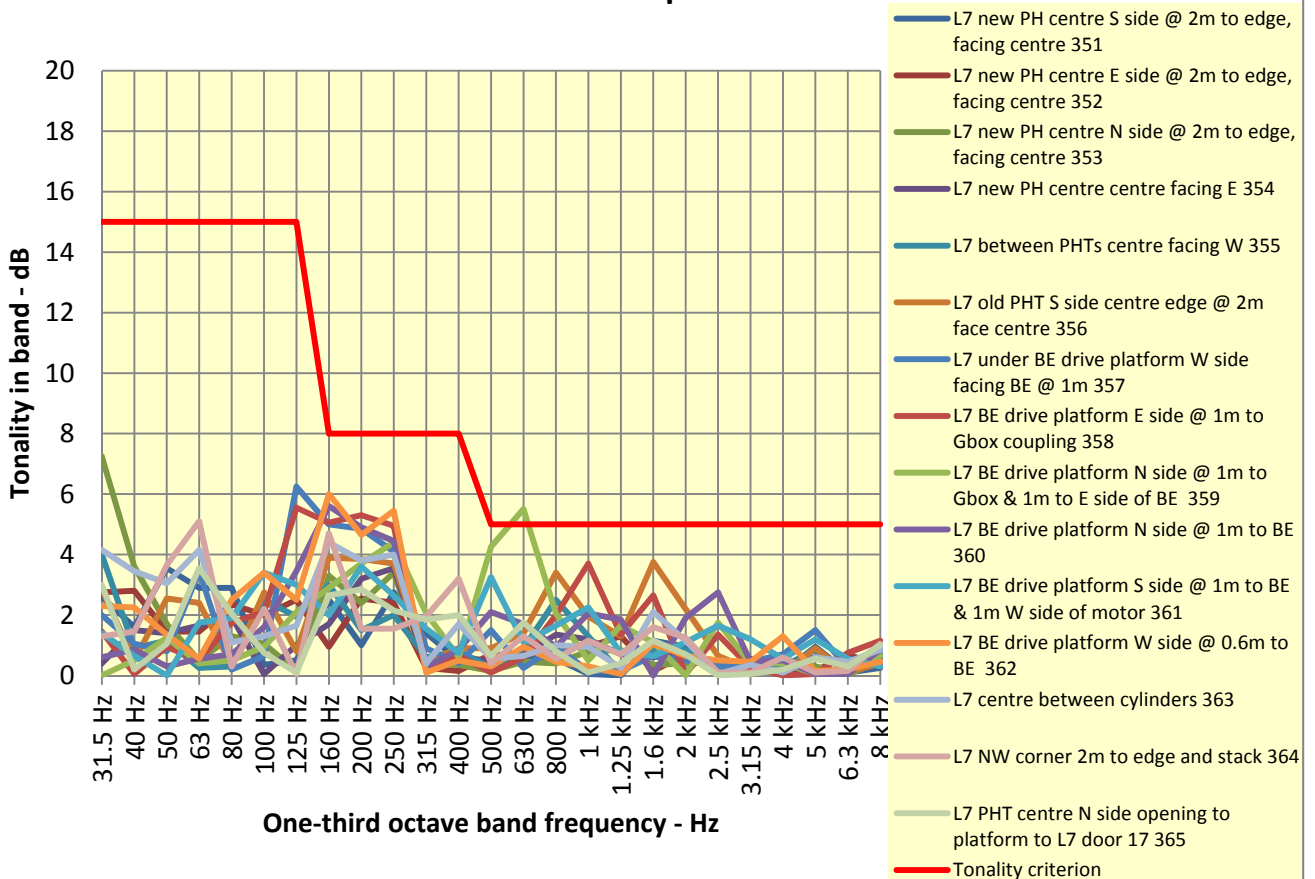


Figure 3.8A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 6 RM Silo Top

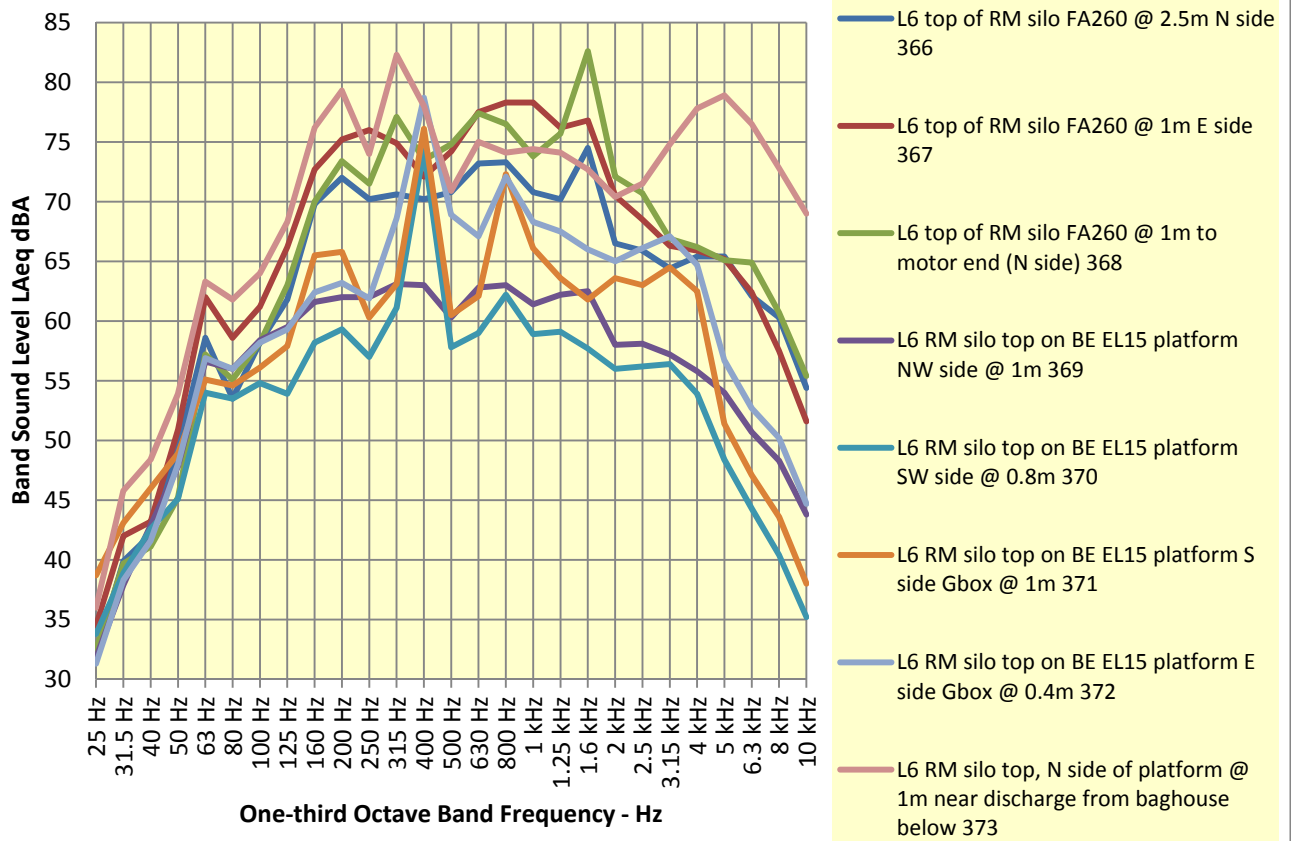


Figure 3.8: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 6 RM Silo Top

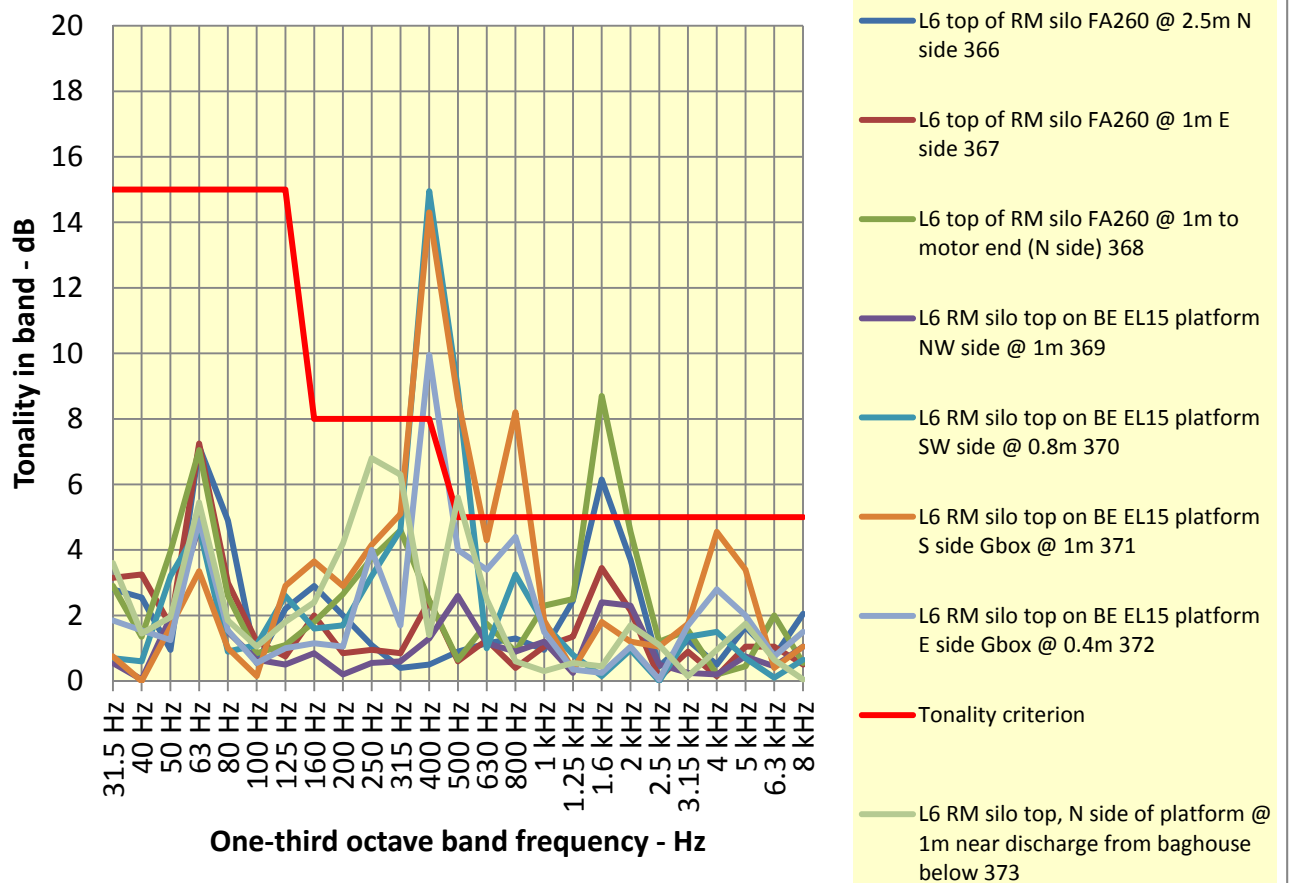


Figure 3.9A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 6

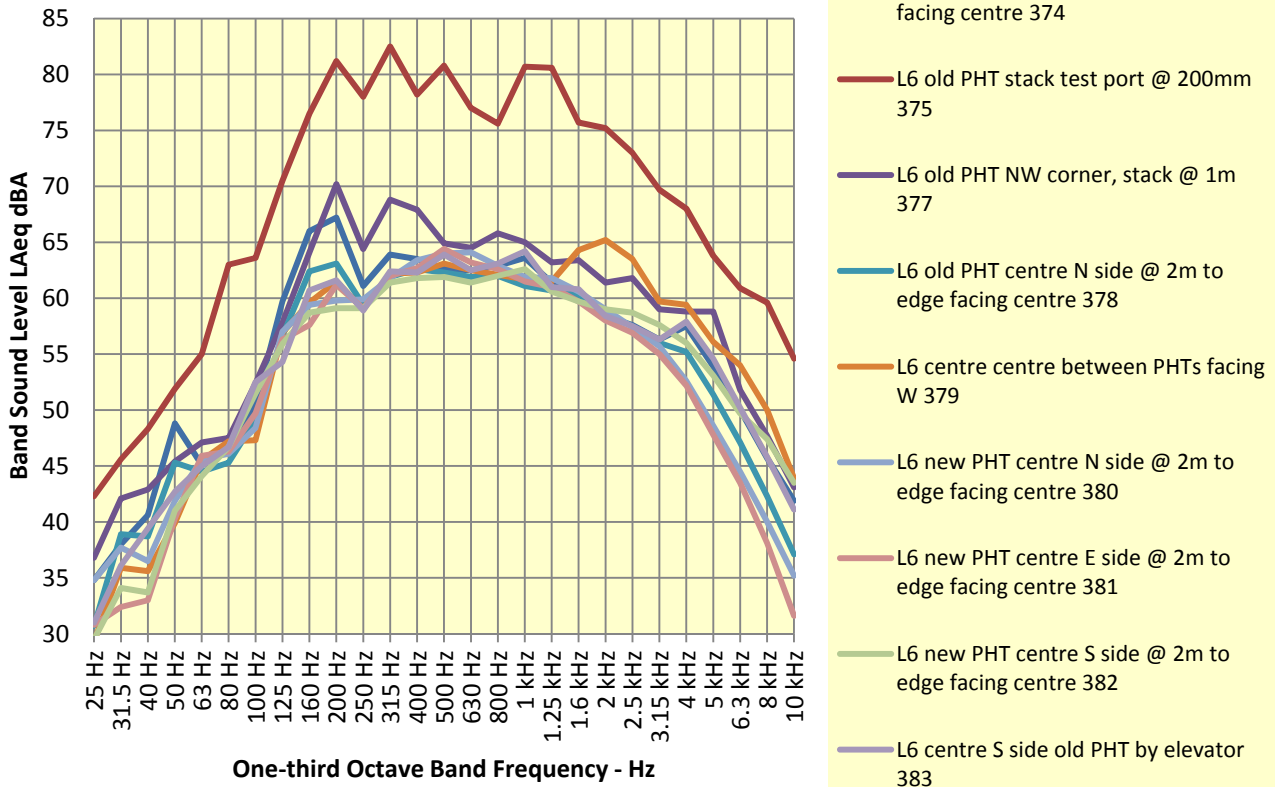


Figure 3.9: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 6

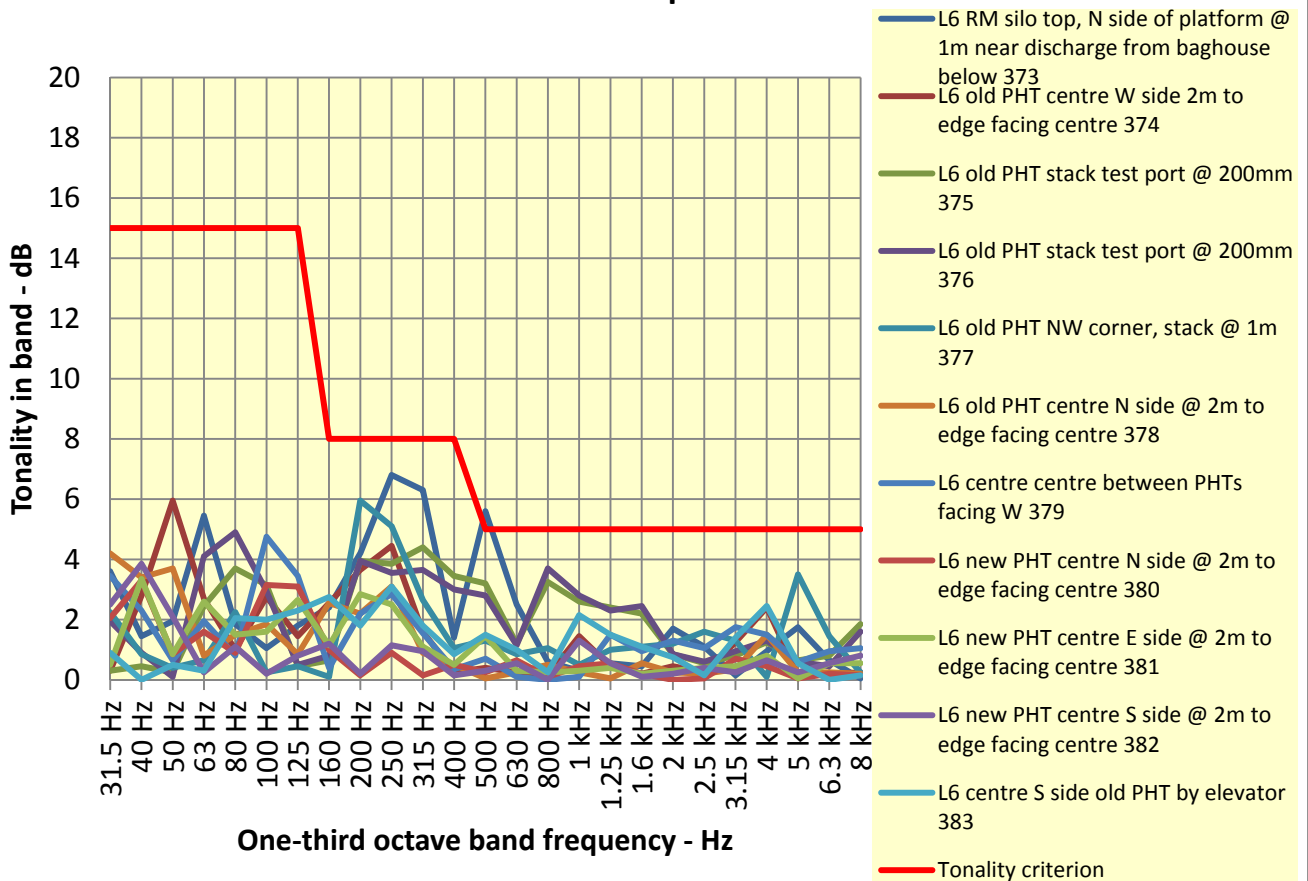


Figure 3.10A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 6 inside top RM Silo

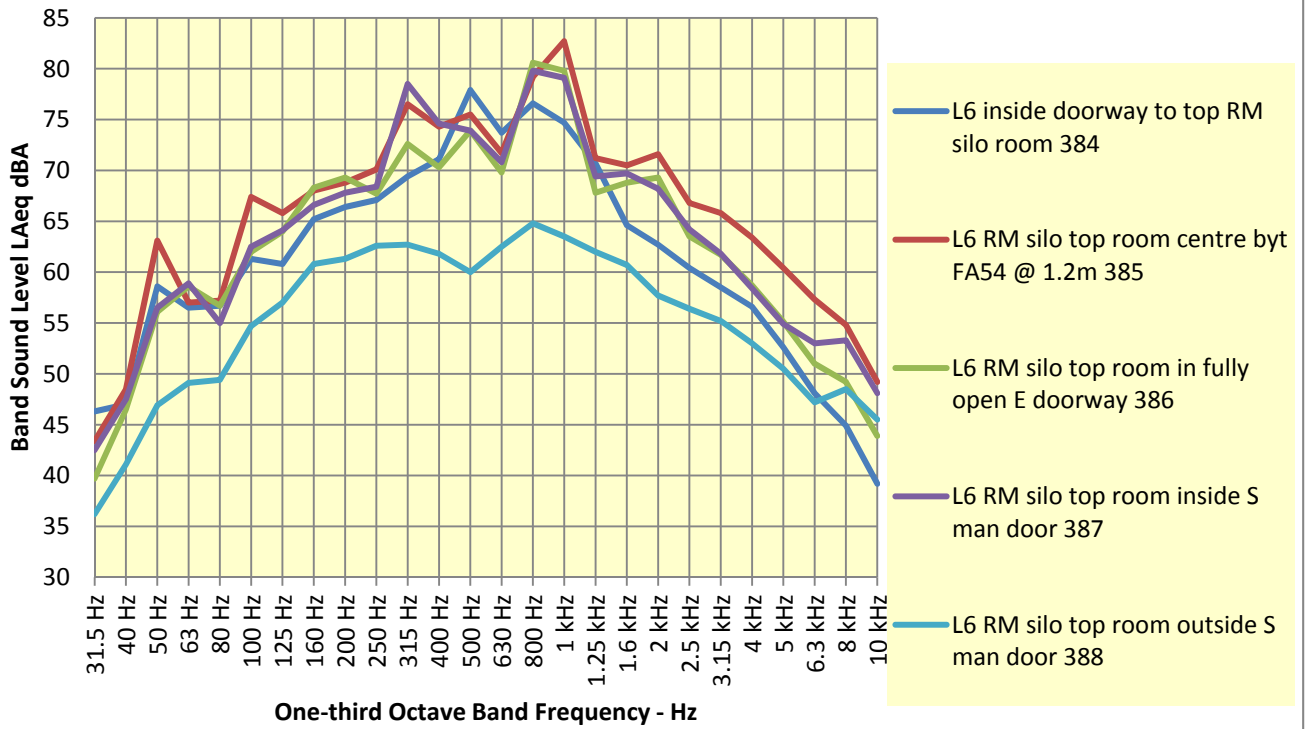


Figure 3.10: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 6 inside RM Silo top

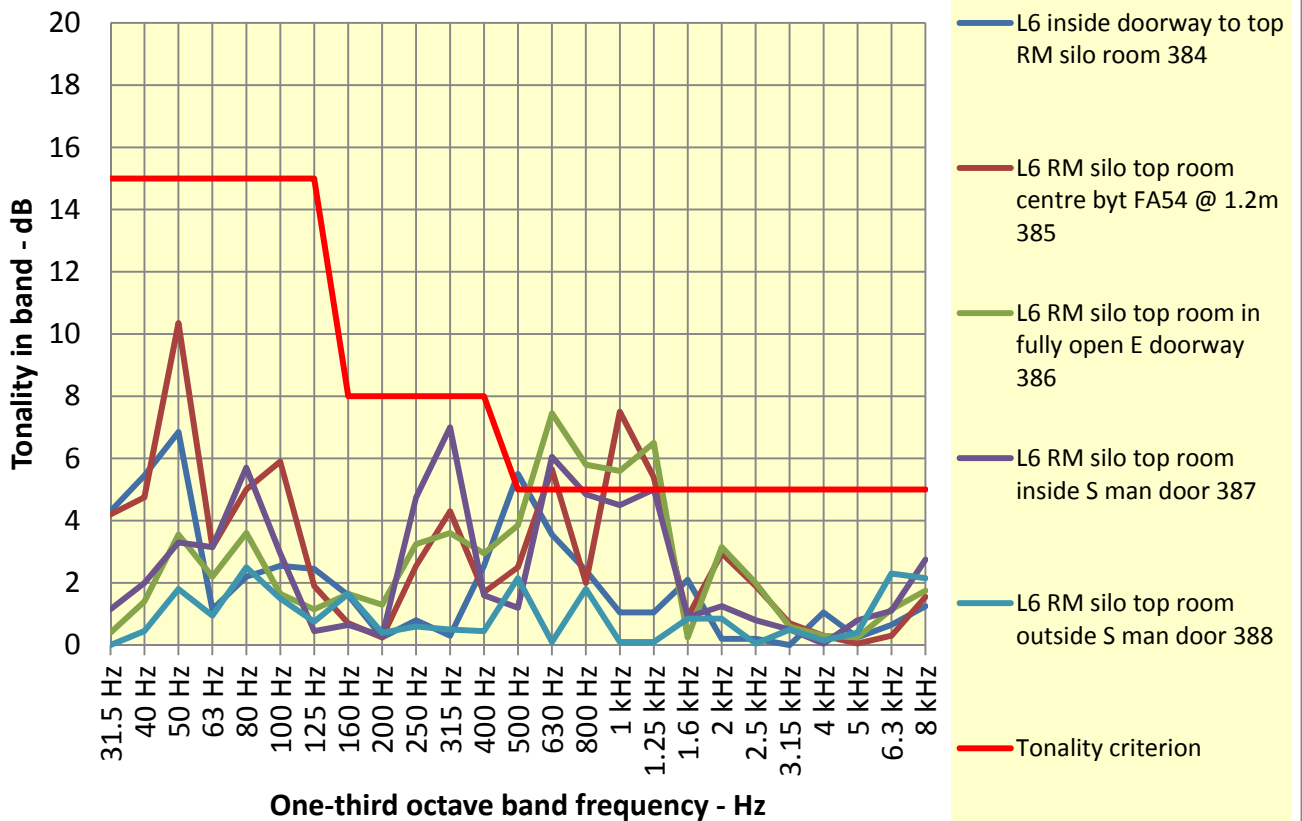


Figure 3.11A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 5

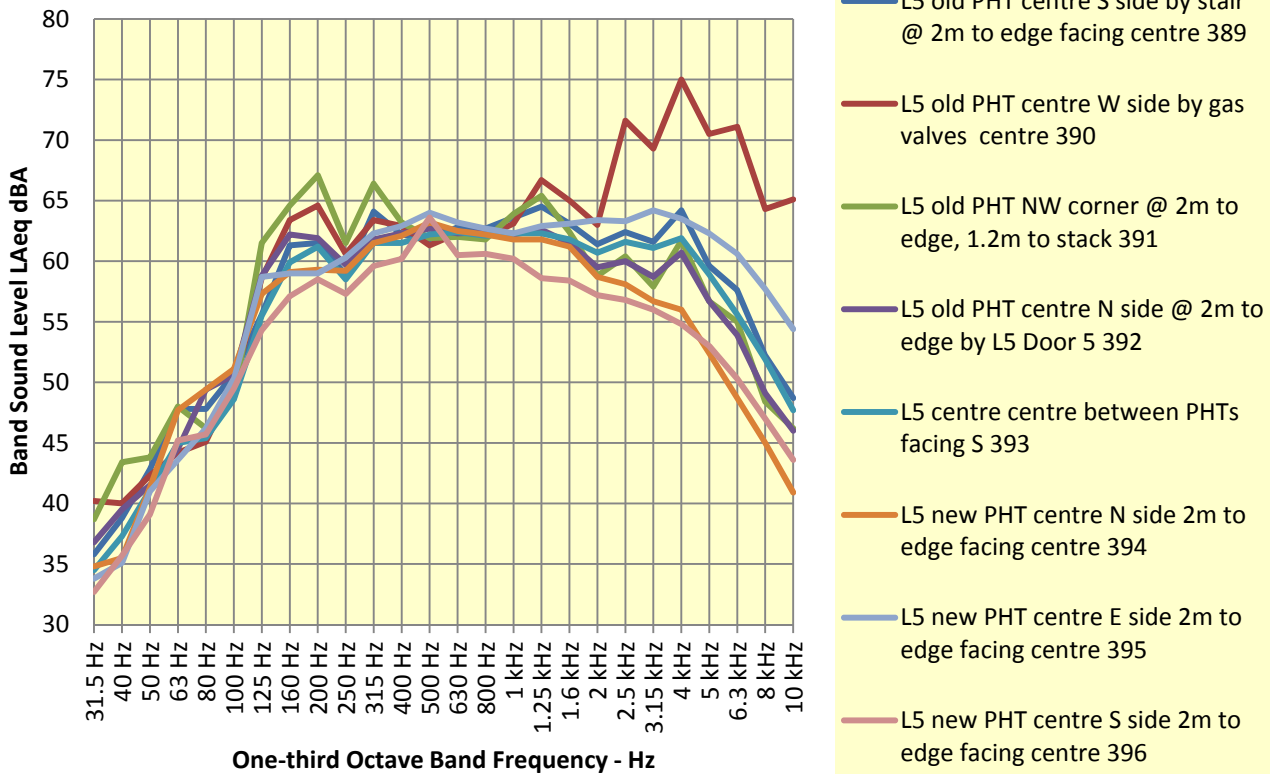


Figure 3.11: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 5

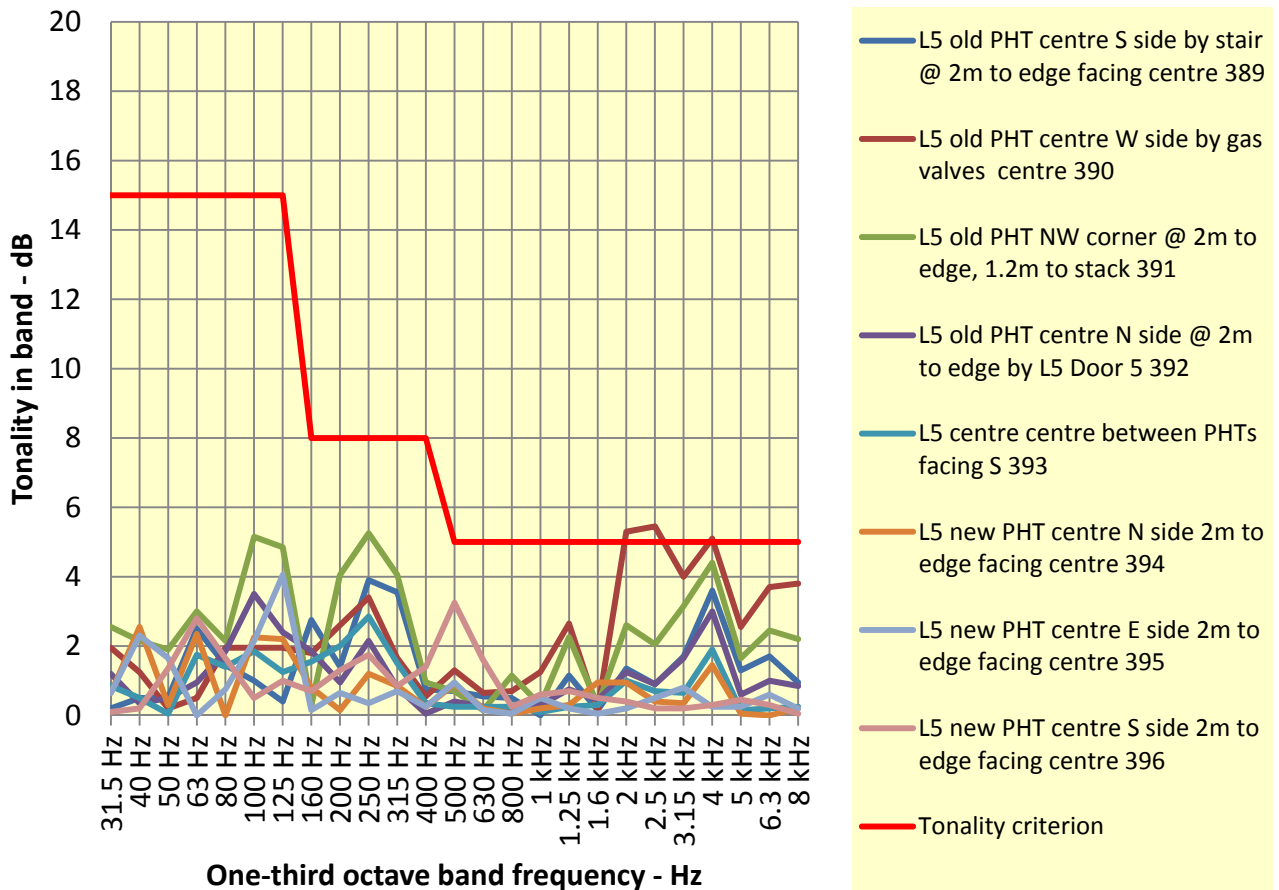


Figure 3.12A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 4

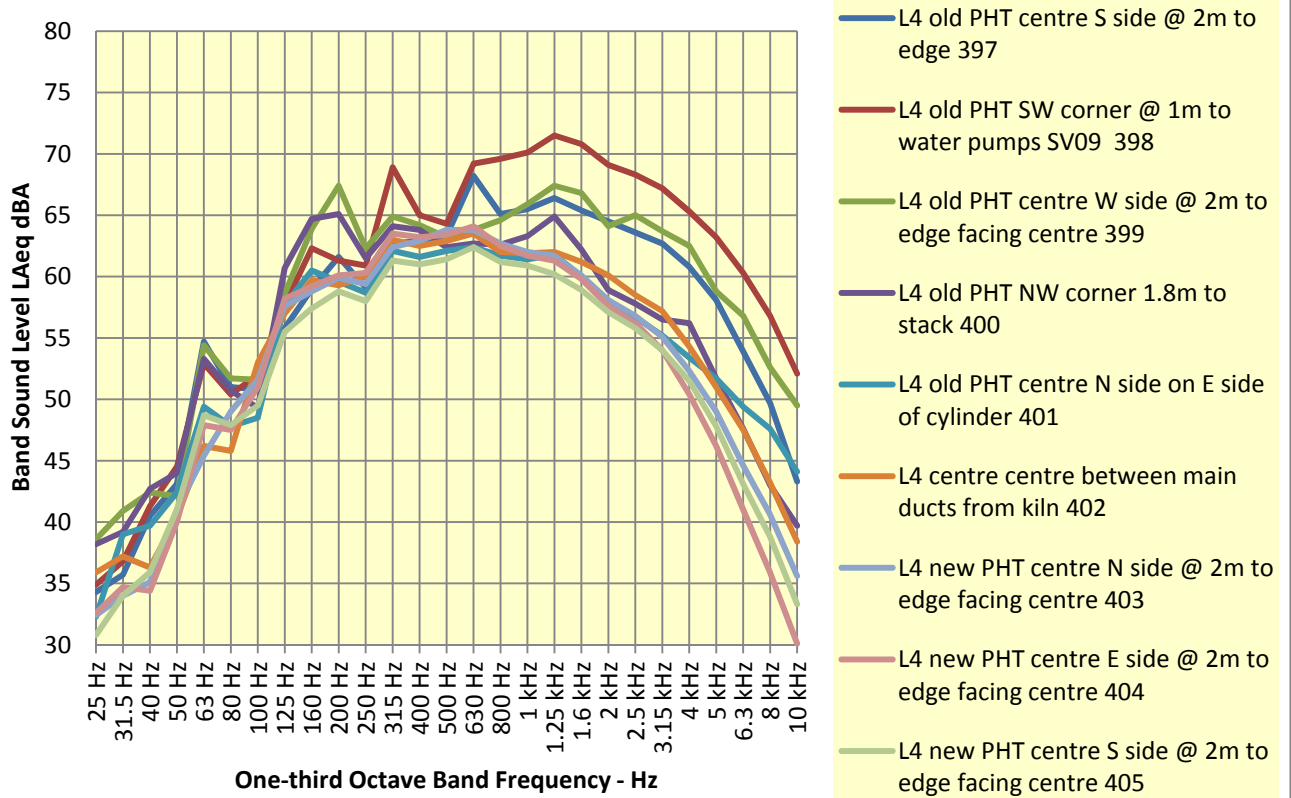


Figure 3.12: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 4

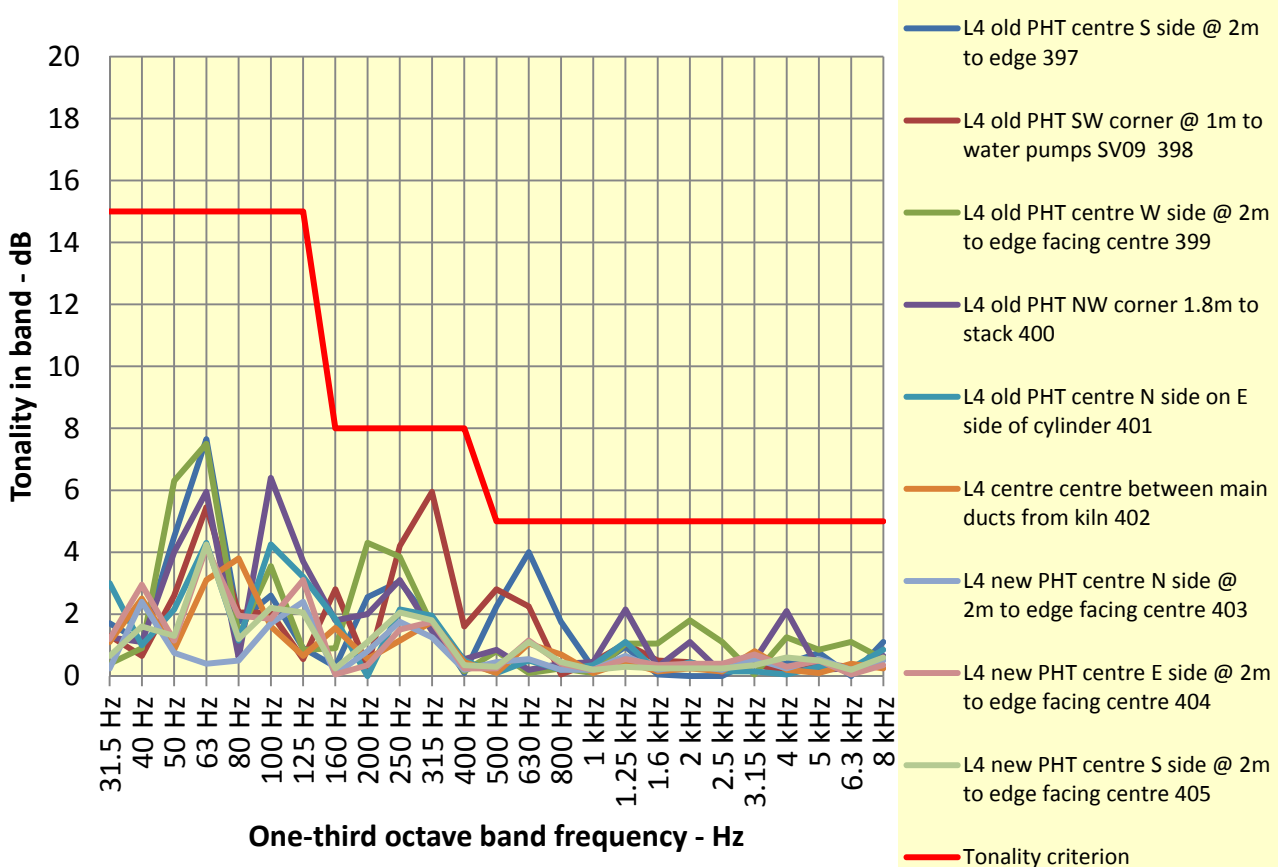


Figure 3.13A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 3 and on ESP facing PHT

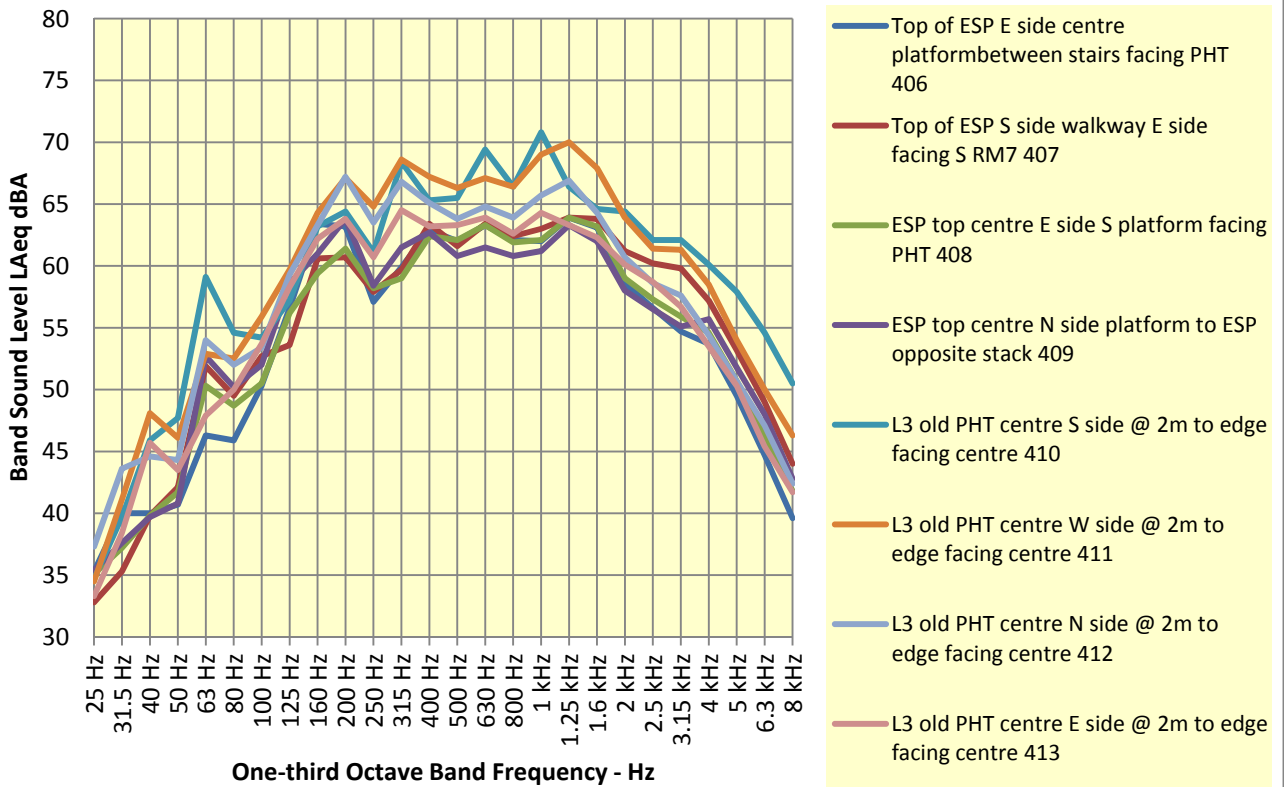


Figure 3.13: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 3 and ESP top East side

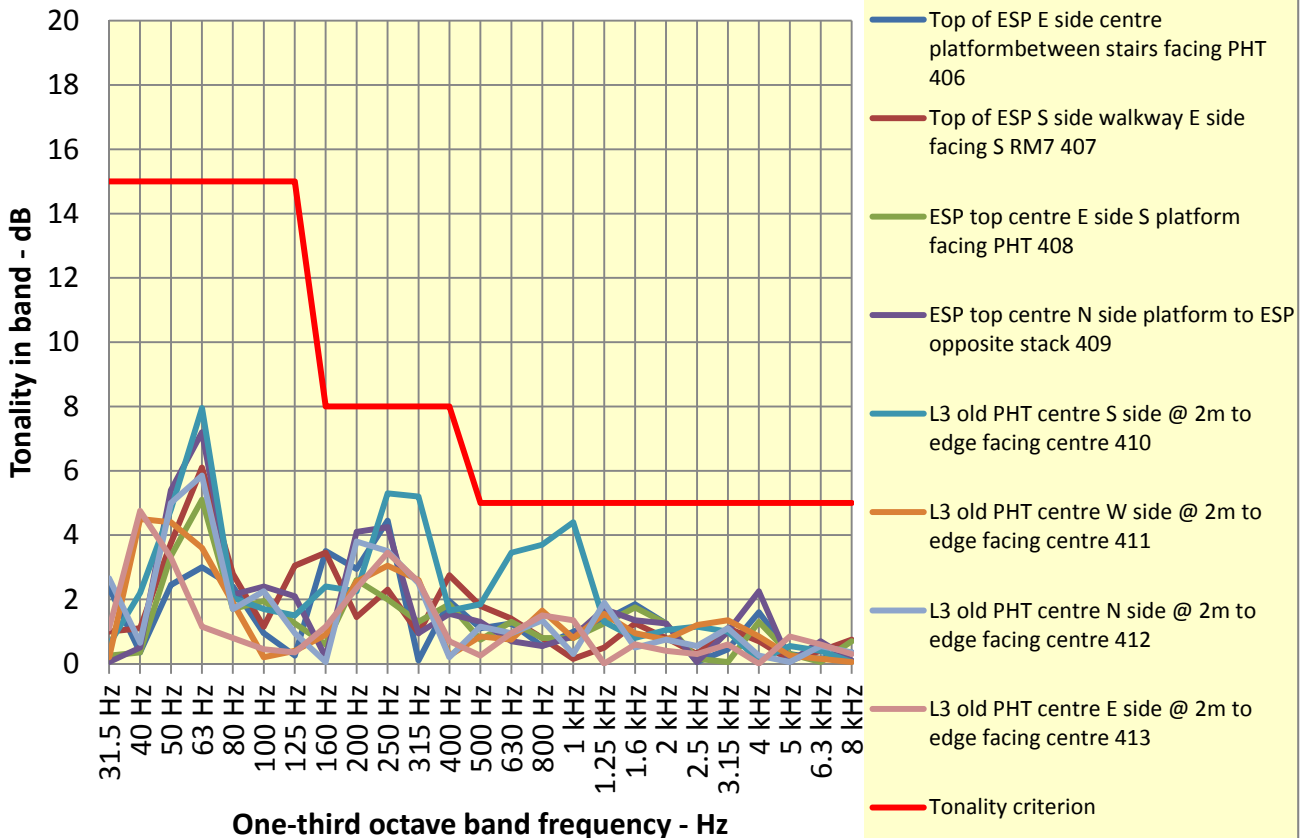


Figure 3.14A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 2.5 and 2.25

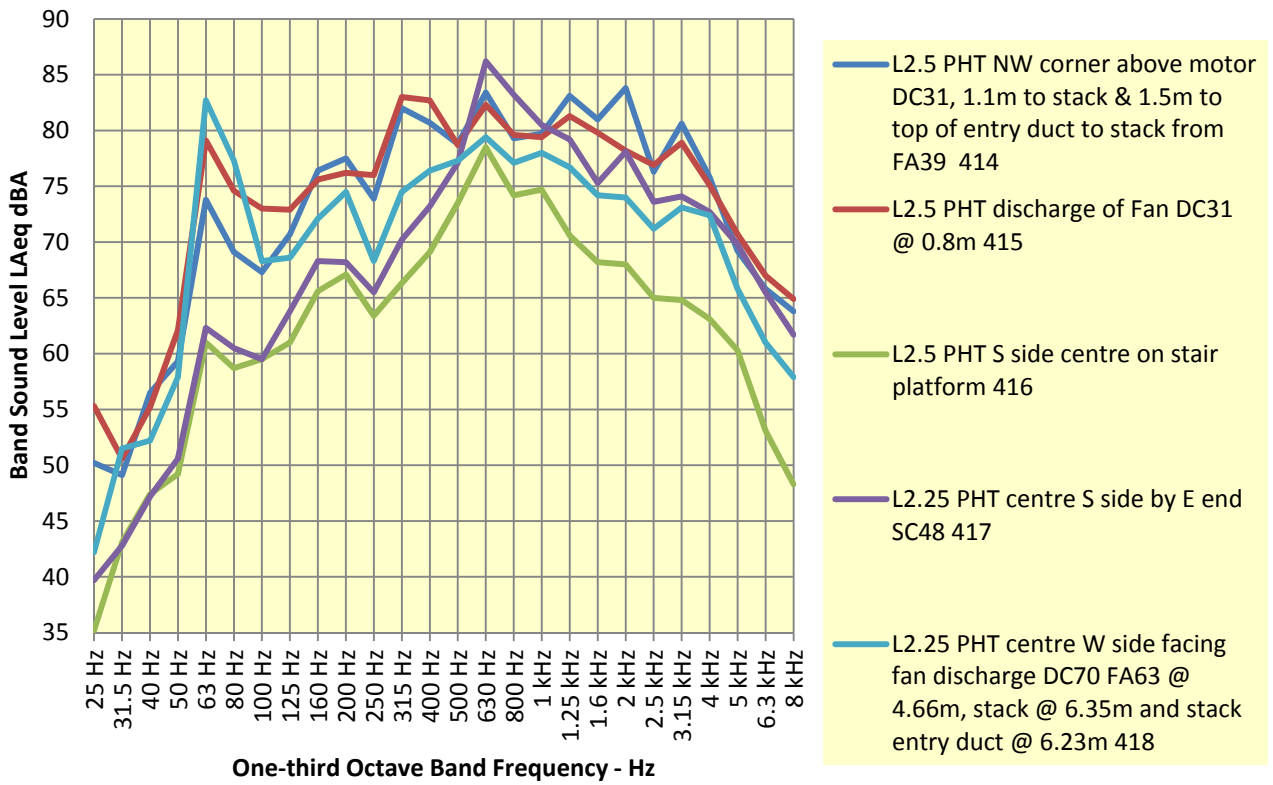


Figure 3.14: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 2.5 and 2.25

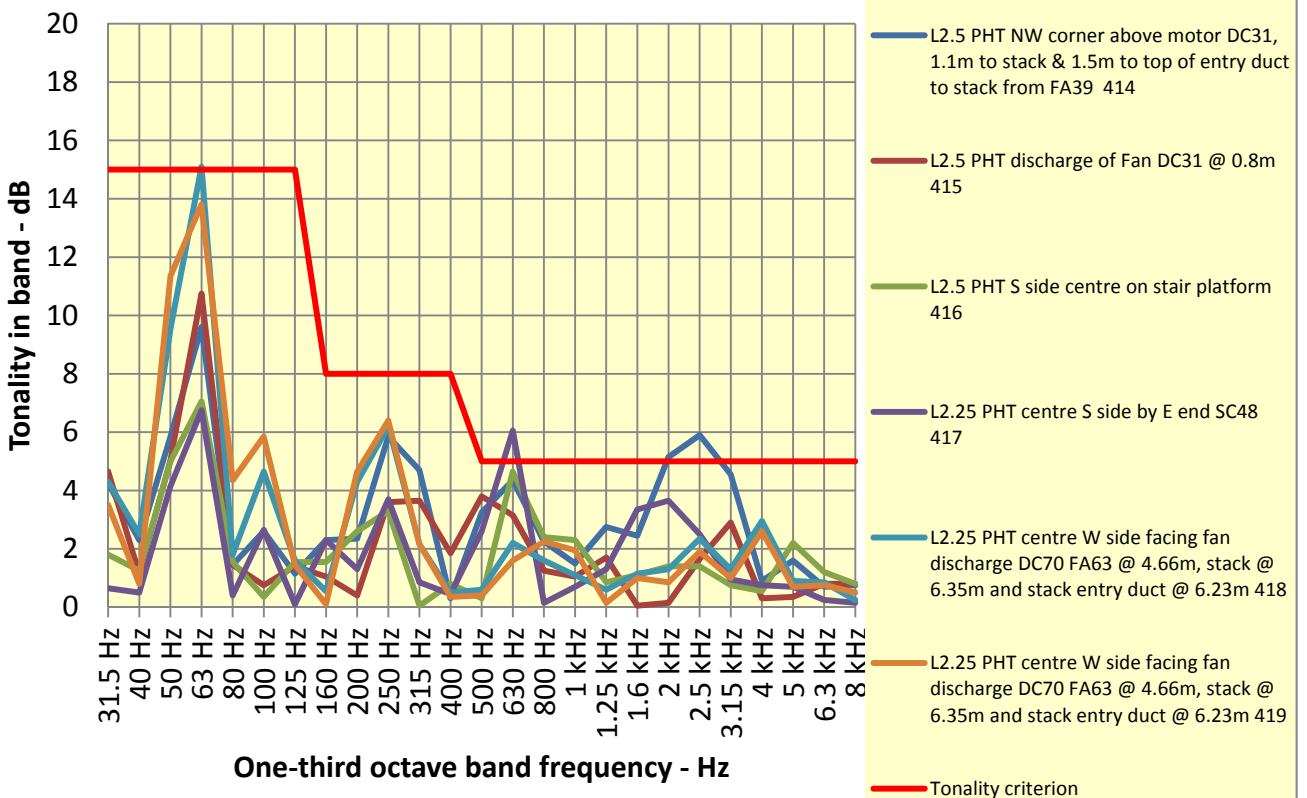


Figure 3.15A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Level 2 and 1

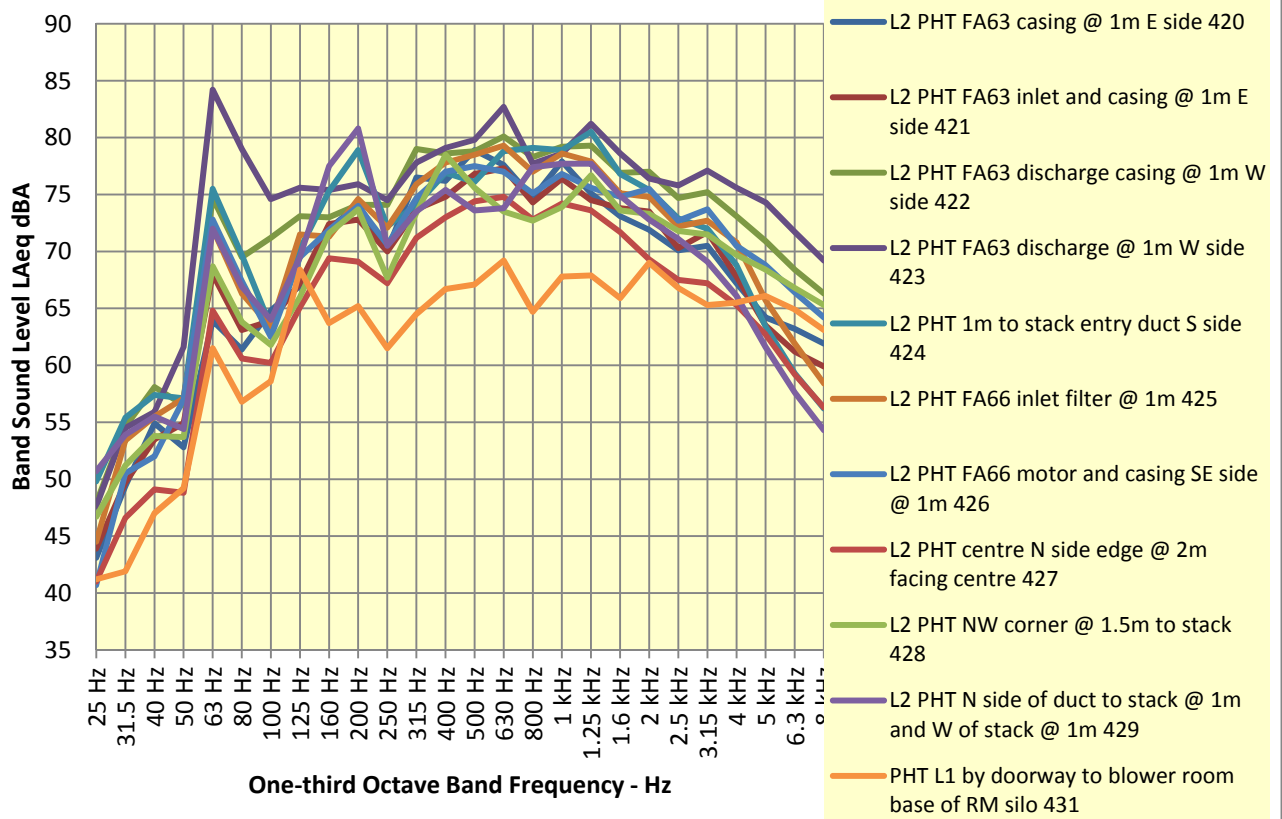


Figure 3.15: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT level 2 & 1

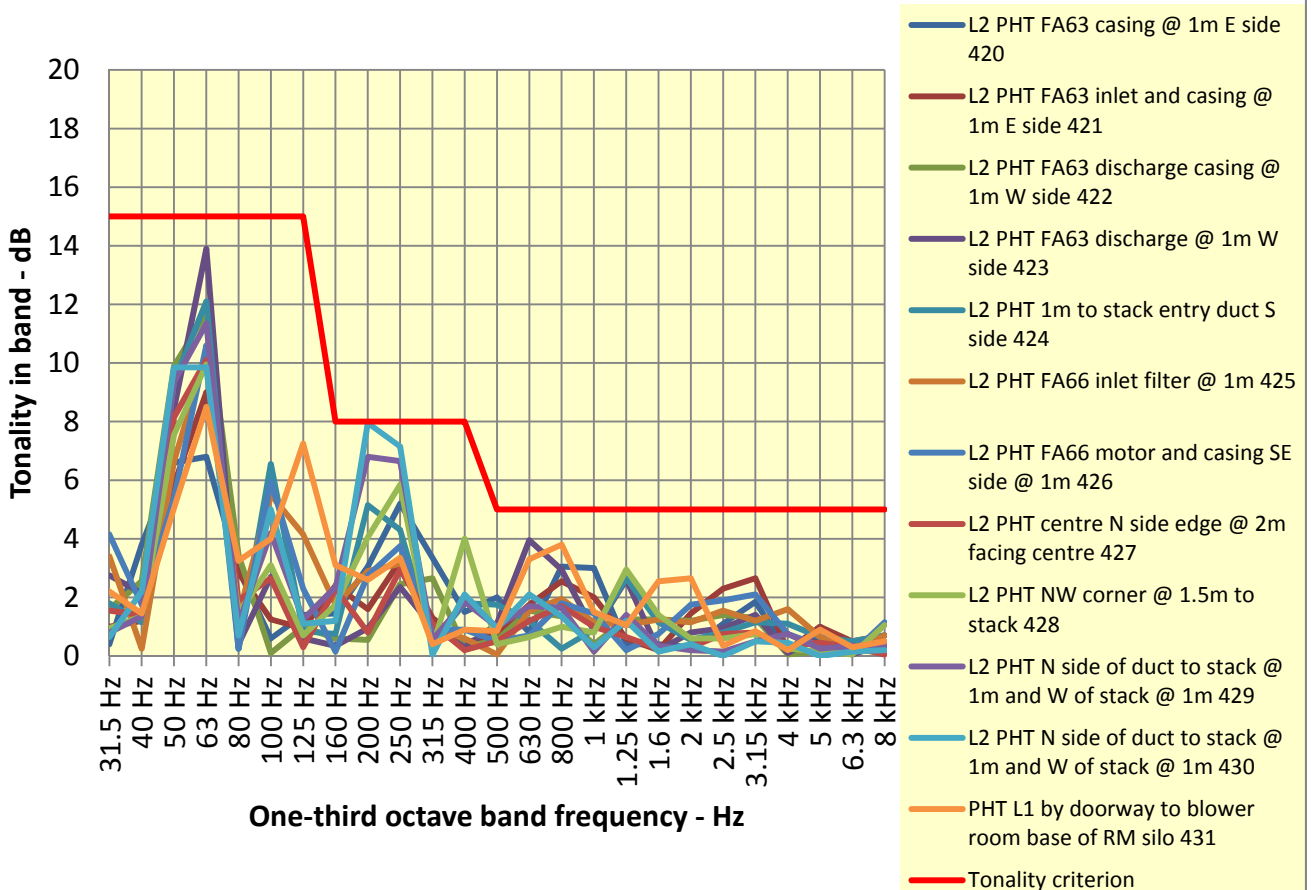


Figure 3.16A: Boral Cement Berrima - One-third Octave Band Spectra for PHT Fans FA38 & FA39

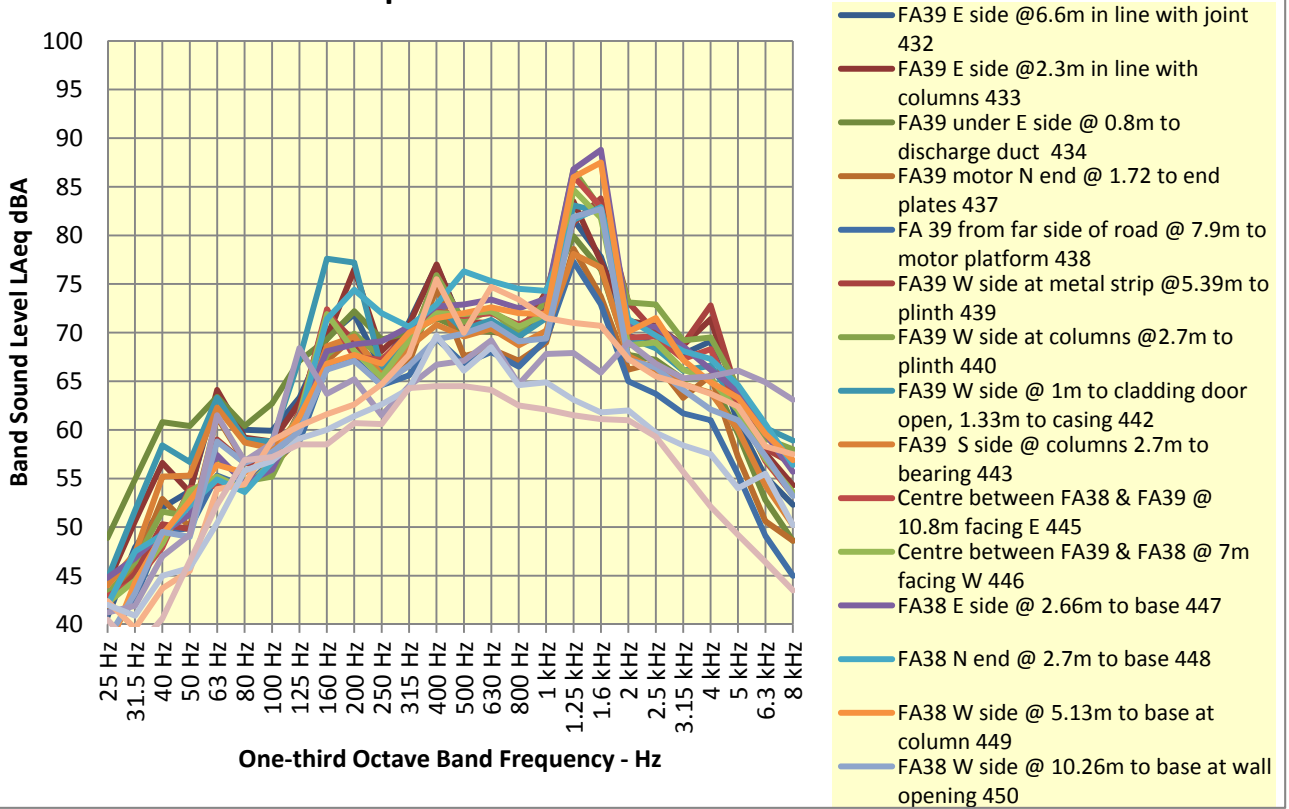


Figure 3.16: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for PHT FA38, FA39 & FA92

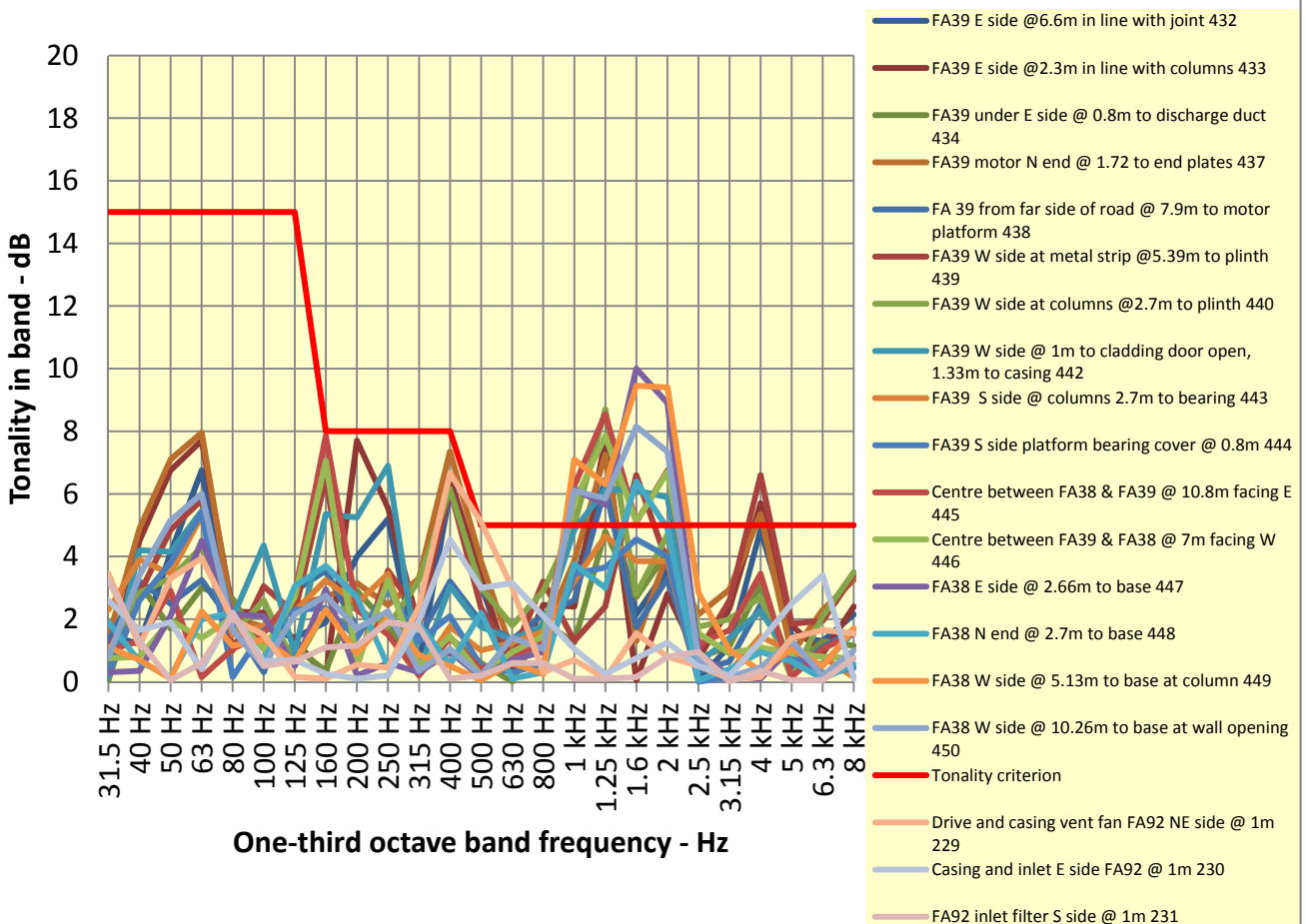


Figure 3.17A: Boral Cement Berrima - One-third Octave Band Spectra for RM7

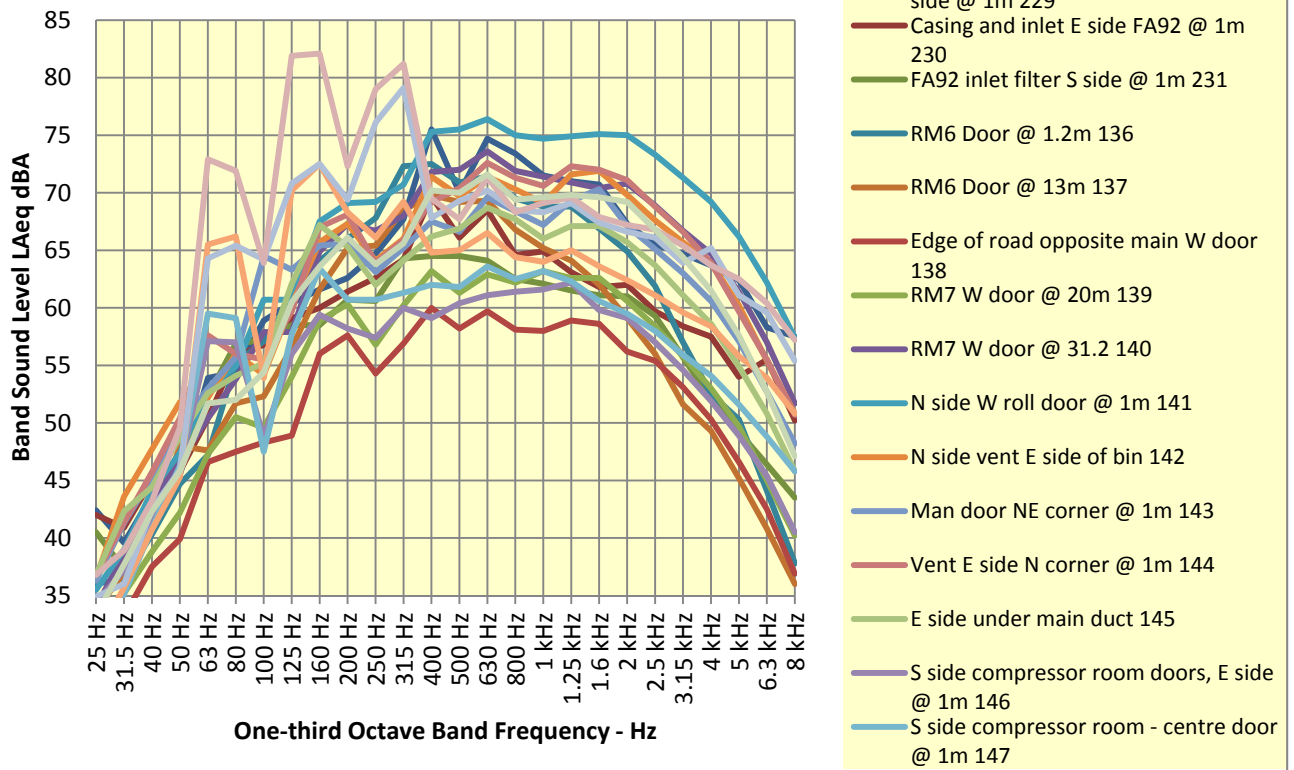


Figure 3.17: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for RM7

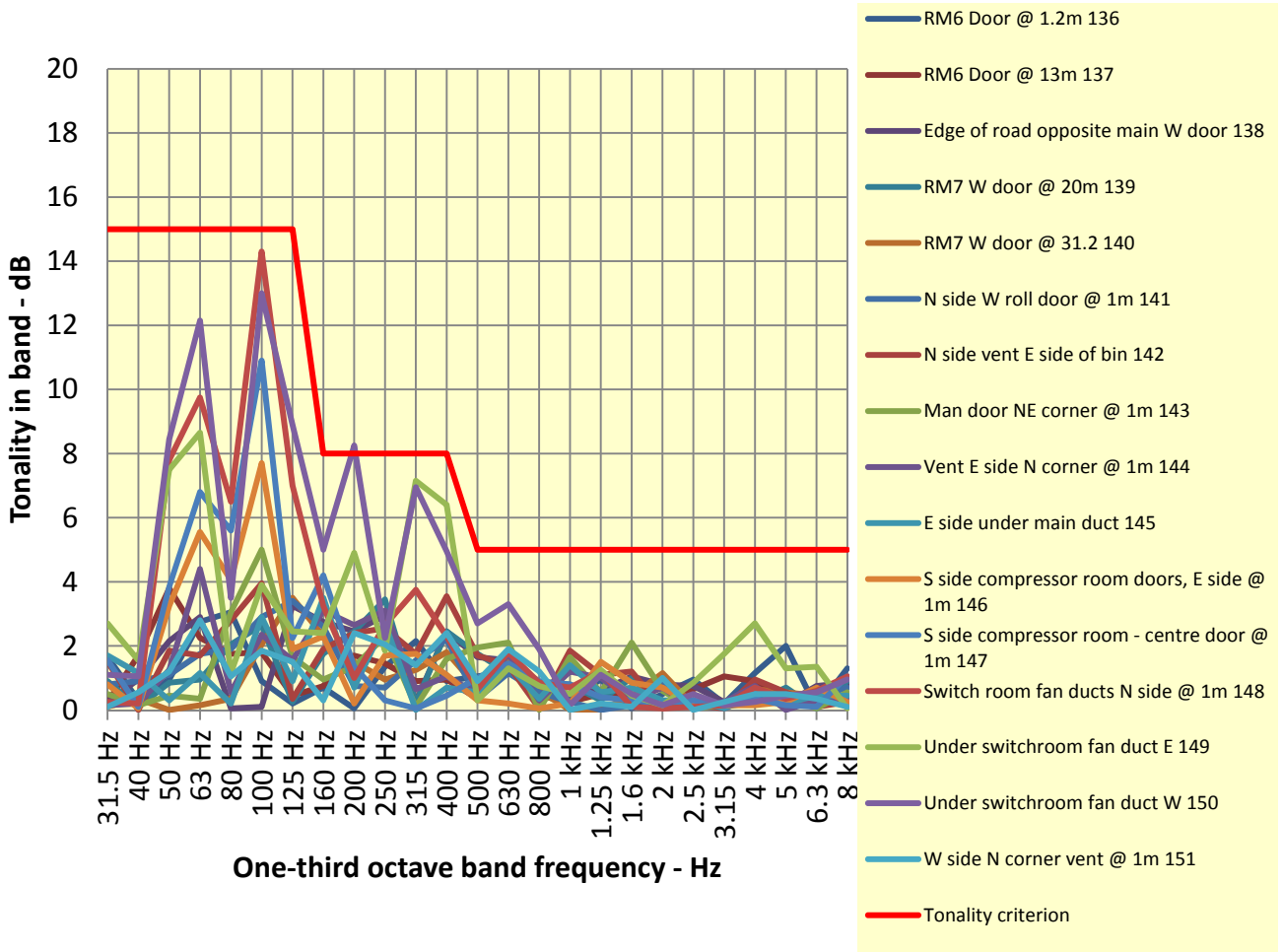


Figure 3.18A: Boral Cement Berrima - One-third Octave Band Spectra for RM7 Fans FA249 & FA250

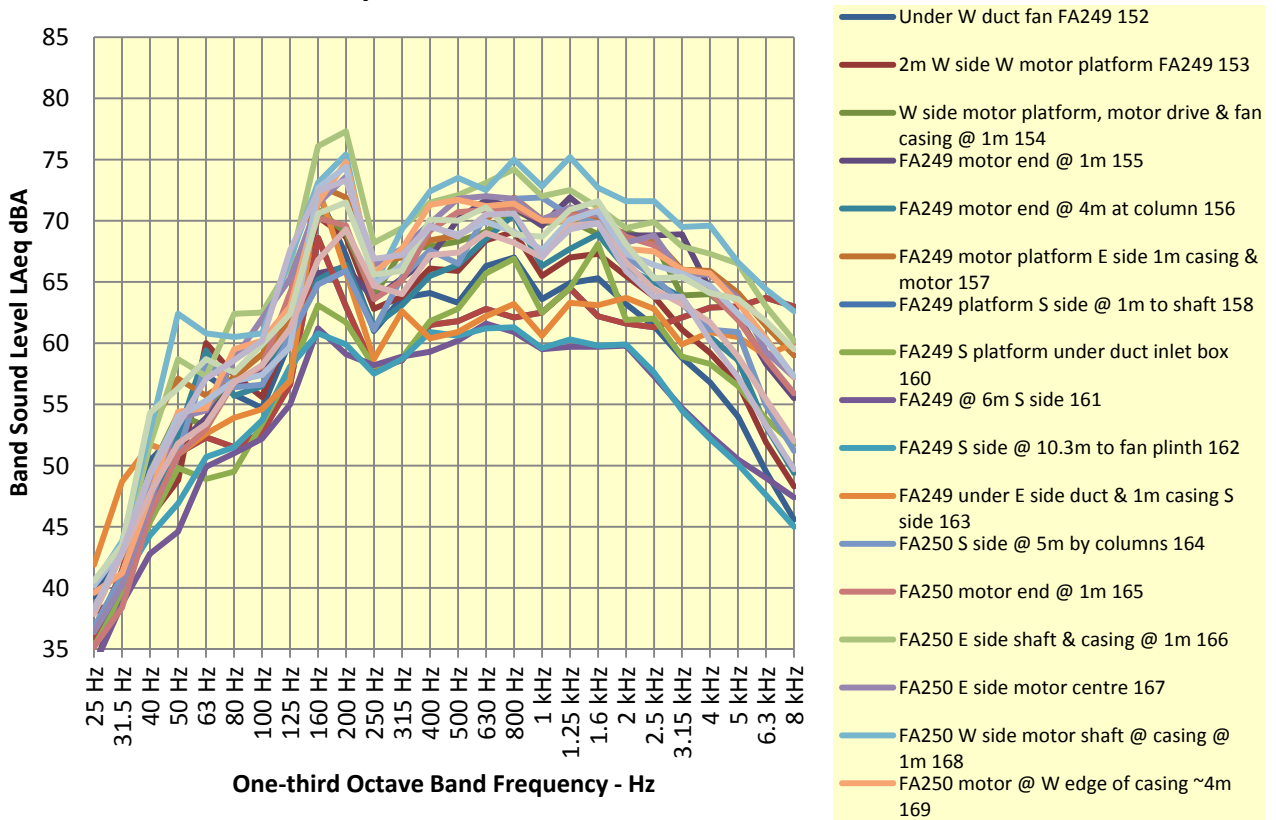


Figure 3.18: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for FA249 & FA250

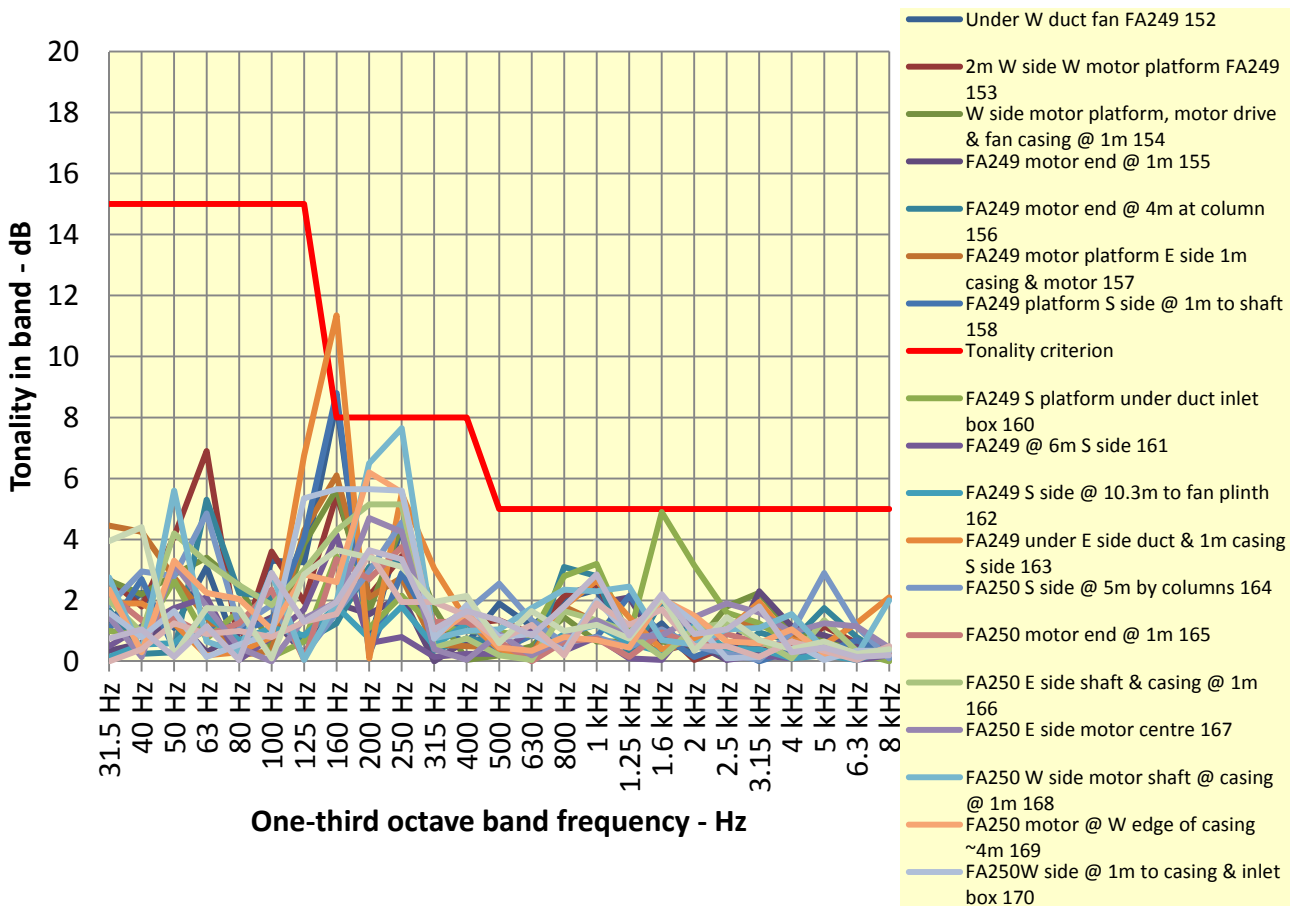


Figure 3.19A: Boral Cement Berrima - One-third Octave Band Spectra for RM7 Roof

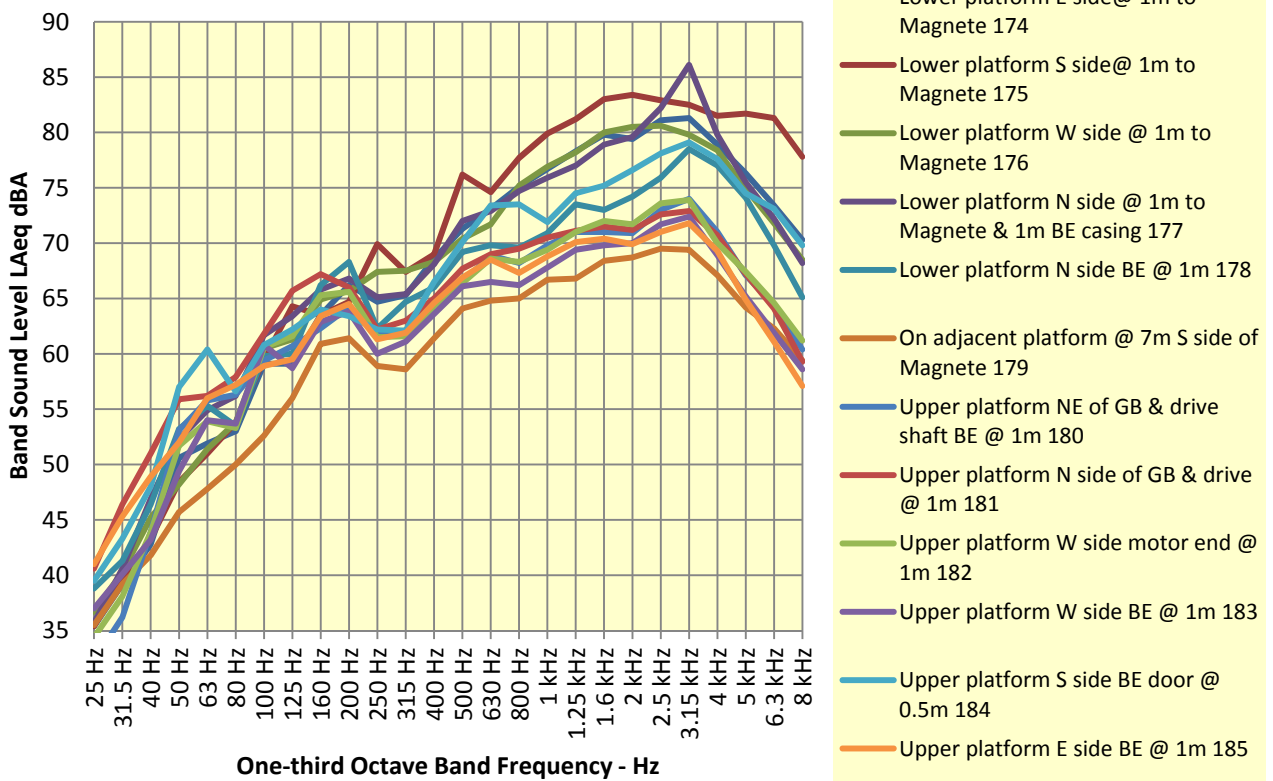


Figure 3.19: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for RM7 Roof

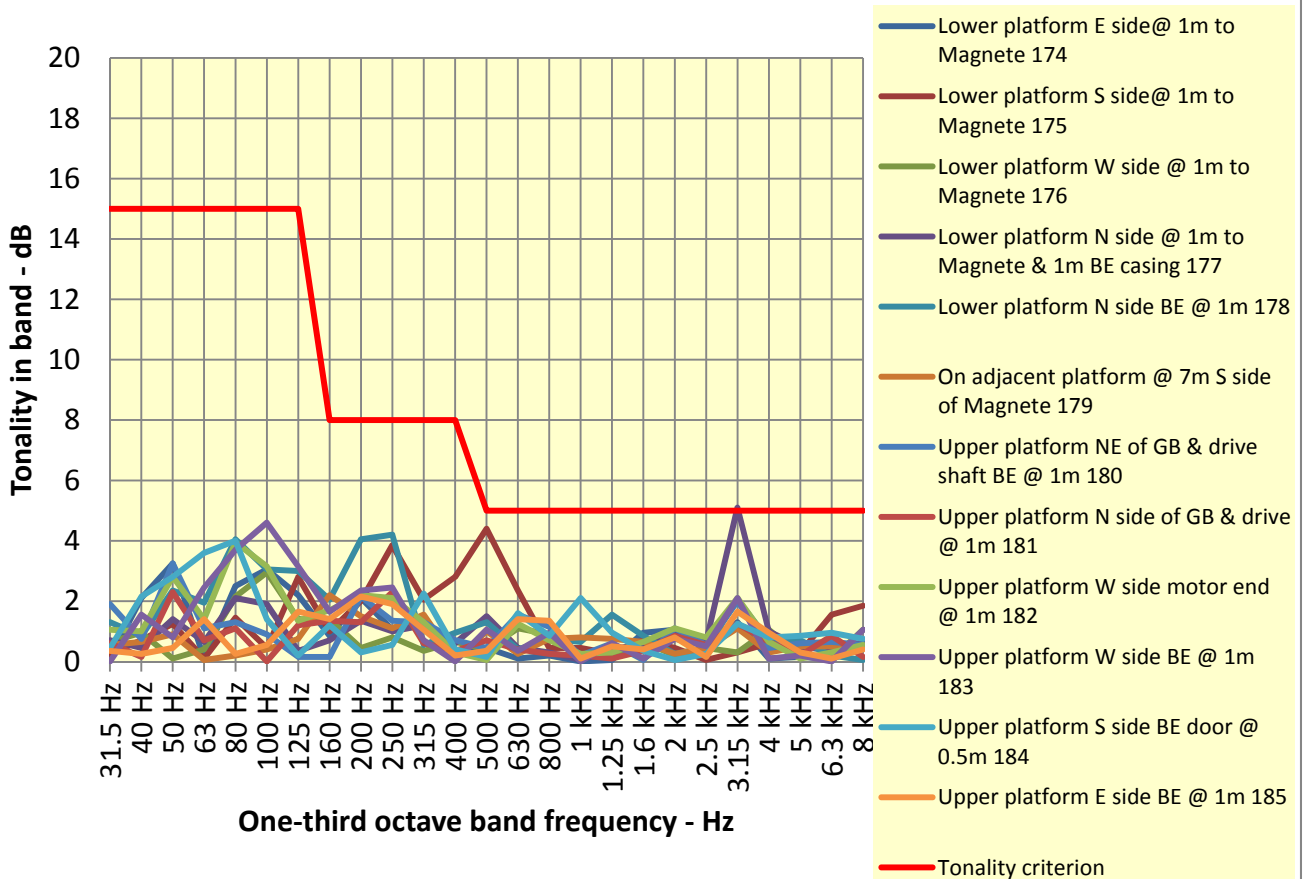


Figure 3.20A: Boral Cement Berrima - One-third Octave Band Spectra for RM7 FA250 Baghouse

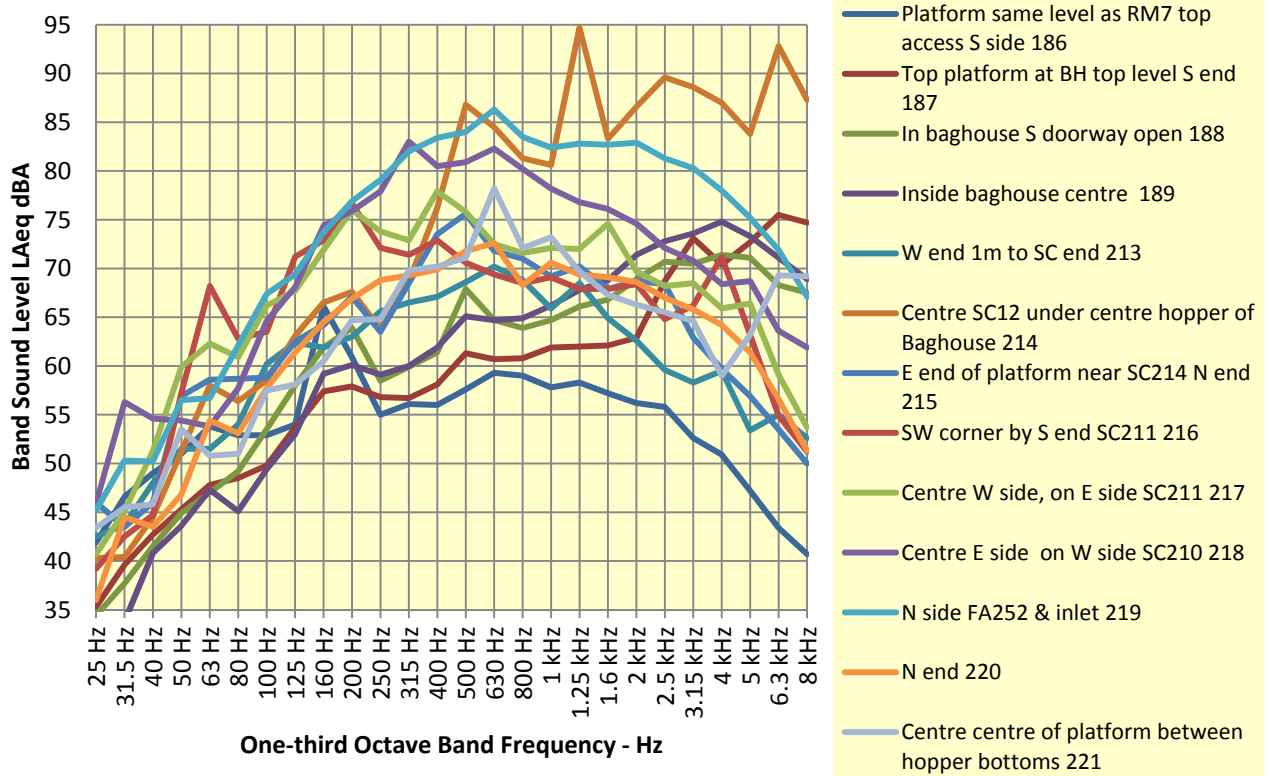


Figure 3.20: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for RM7 FA250 Baghouse

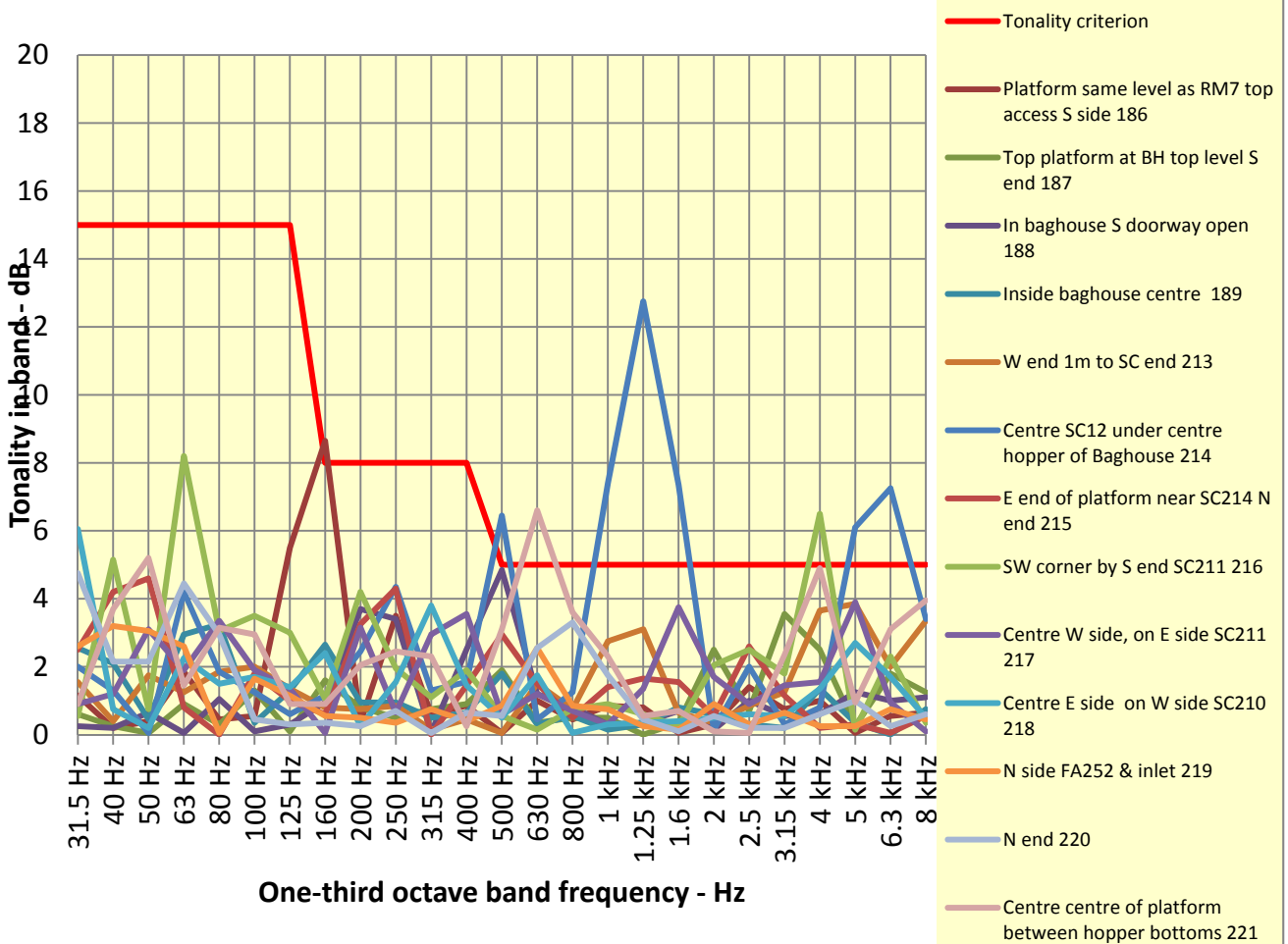


Figure 3.21A: Boral Cement Berrima - One-third Octave Band

Spectra for K6 southern side

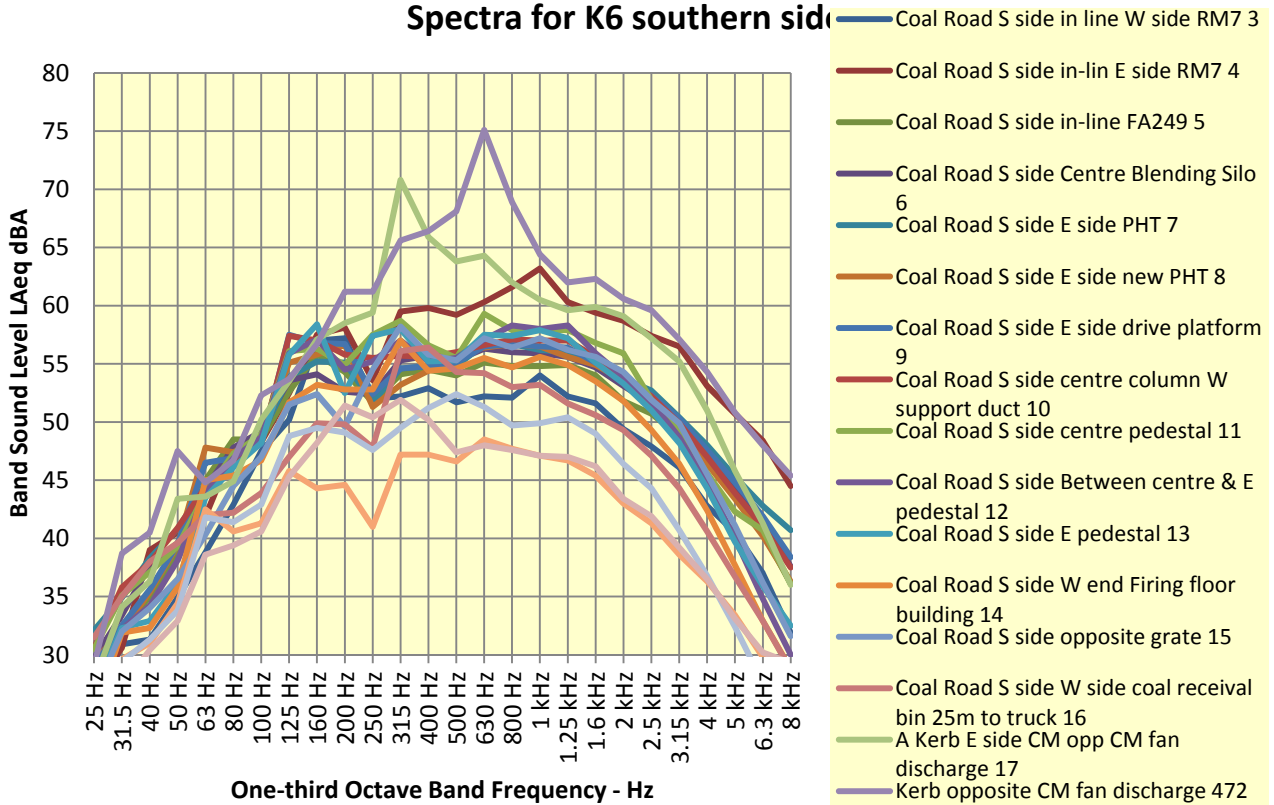


Figure 3.21: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 South side of Coal Road

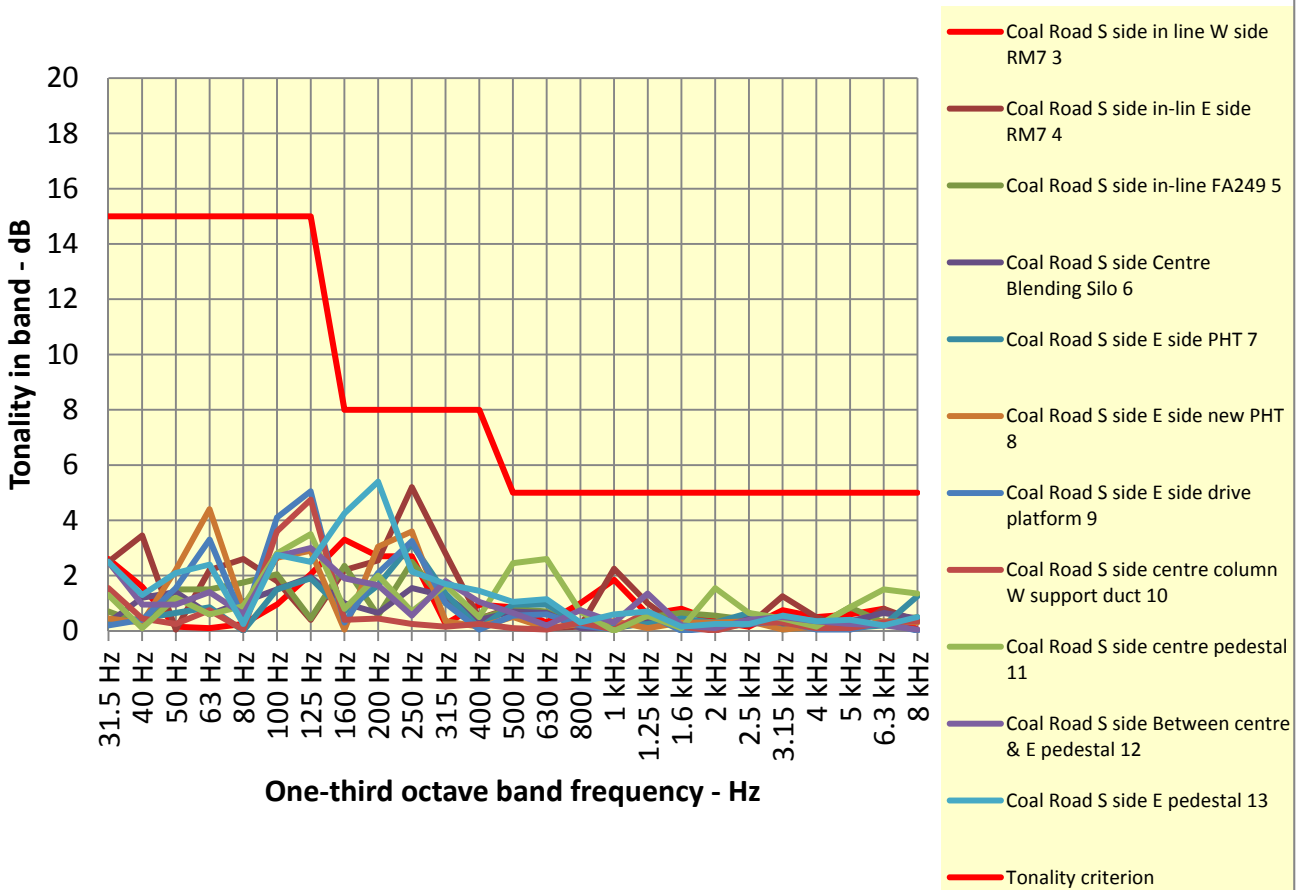


Figure 3.22A: Boral Cement Berrima - One-third Octave Band Spectra for K6 southern side of Coal Mill building

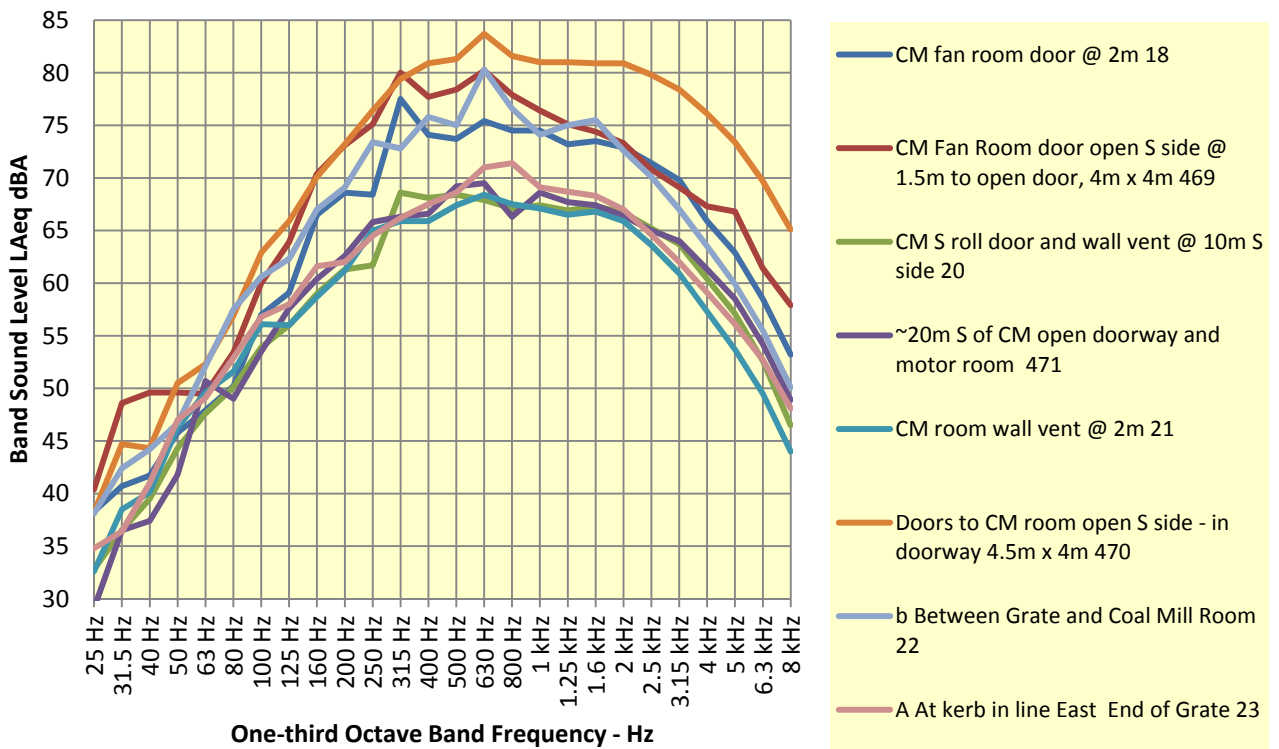


Figure 3.22: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 Southern side of Coal Mill building

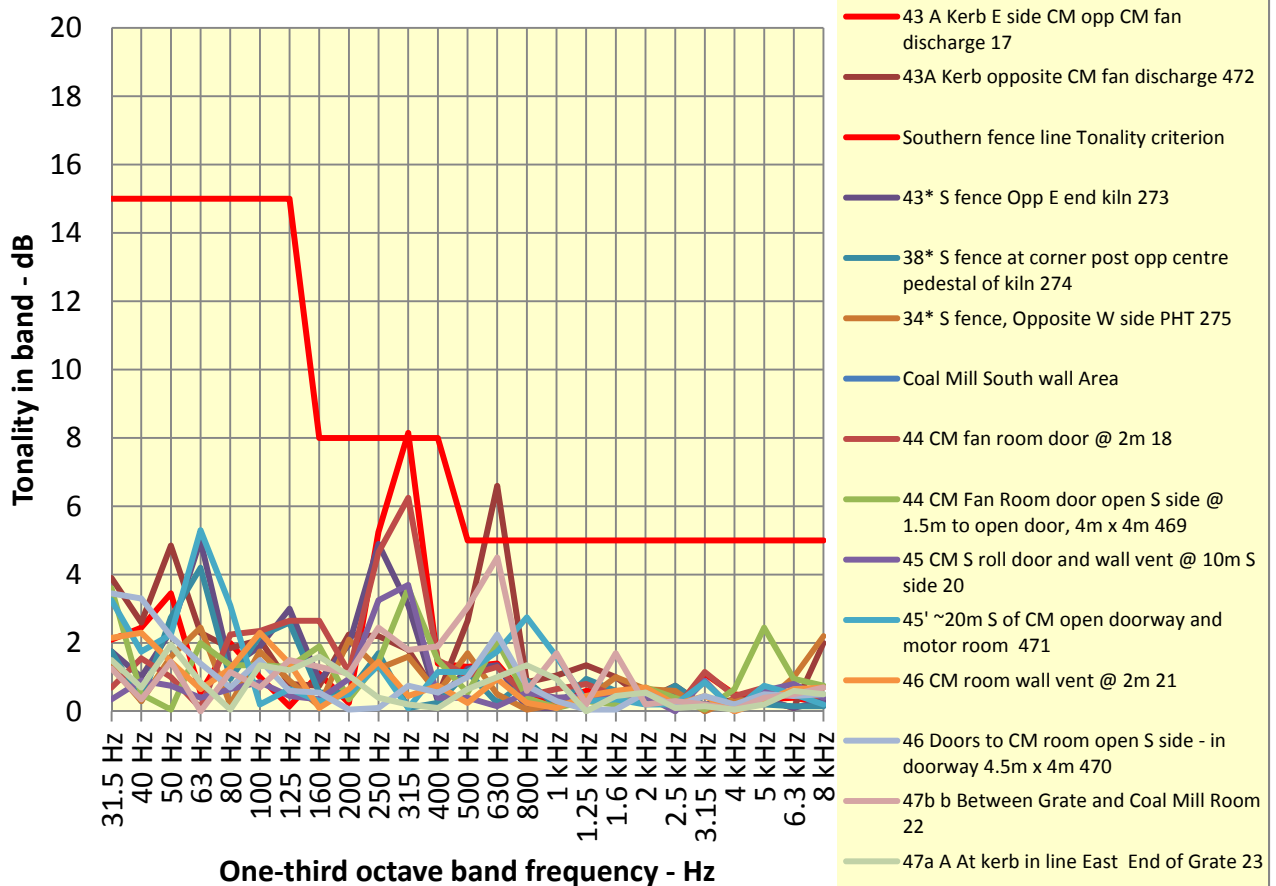


Figure 3.23A: Boral Cement Berrima - One-third Octave Band Spectra for K6 southern side of Kiln 6 at 13m

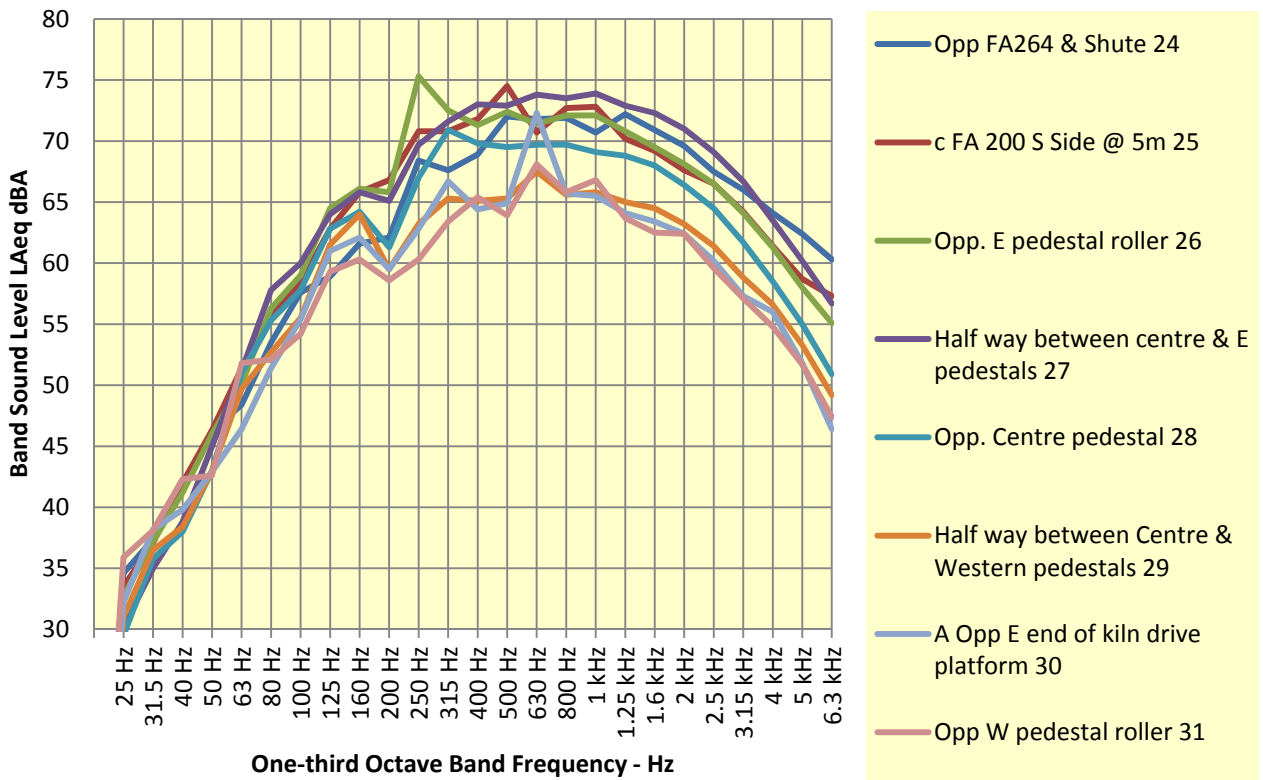


Figure 3.23: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 Southern side of Kiln at 13m distance

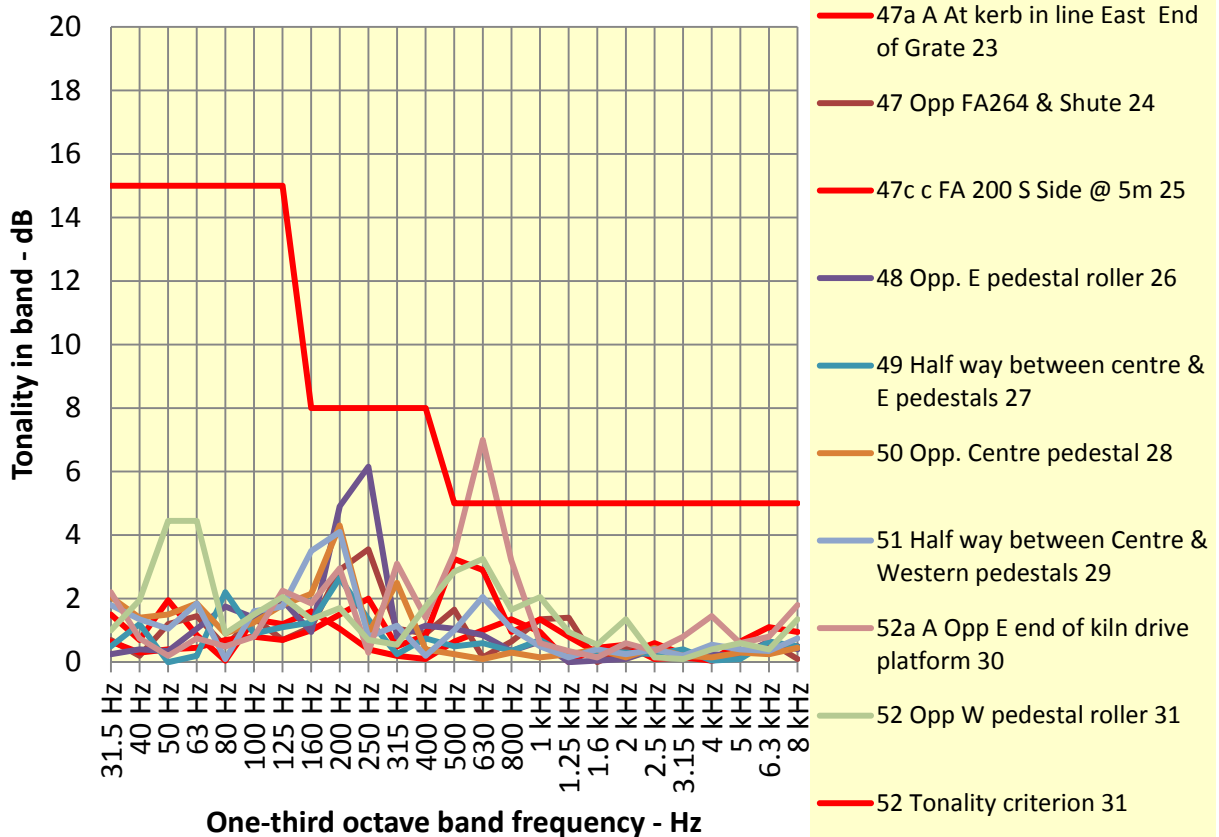


Figure 3.24A: Boral Cement Berrima - One-third Octave Band Spectra for K6 Kiln drive platform

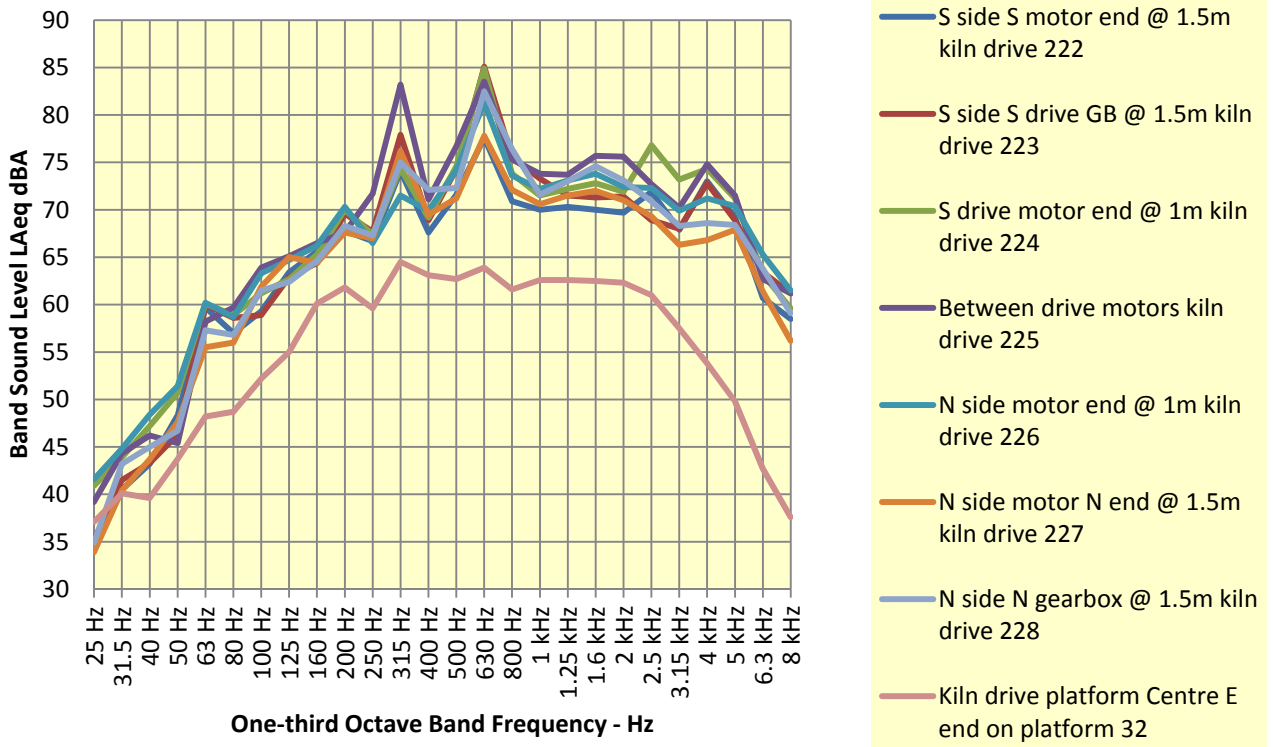


Figure 3.24: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 on Kiln Drive platform

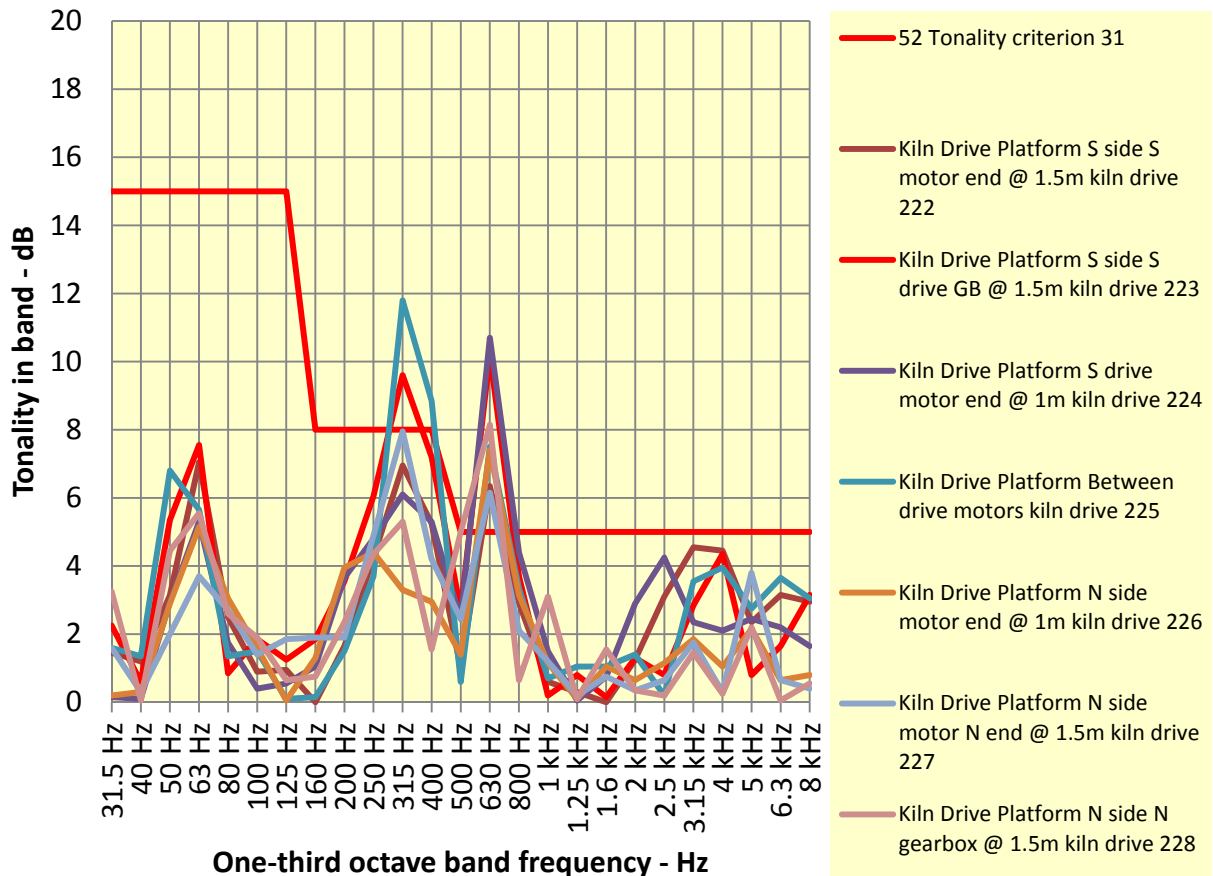


Figure 3.25A: Boral Cement Berrima - One-third Octave Band Spectra for K6 Kiln north side of road from RM6 to new PHT

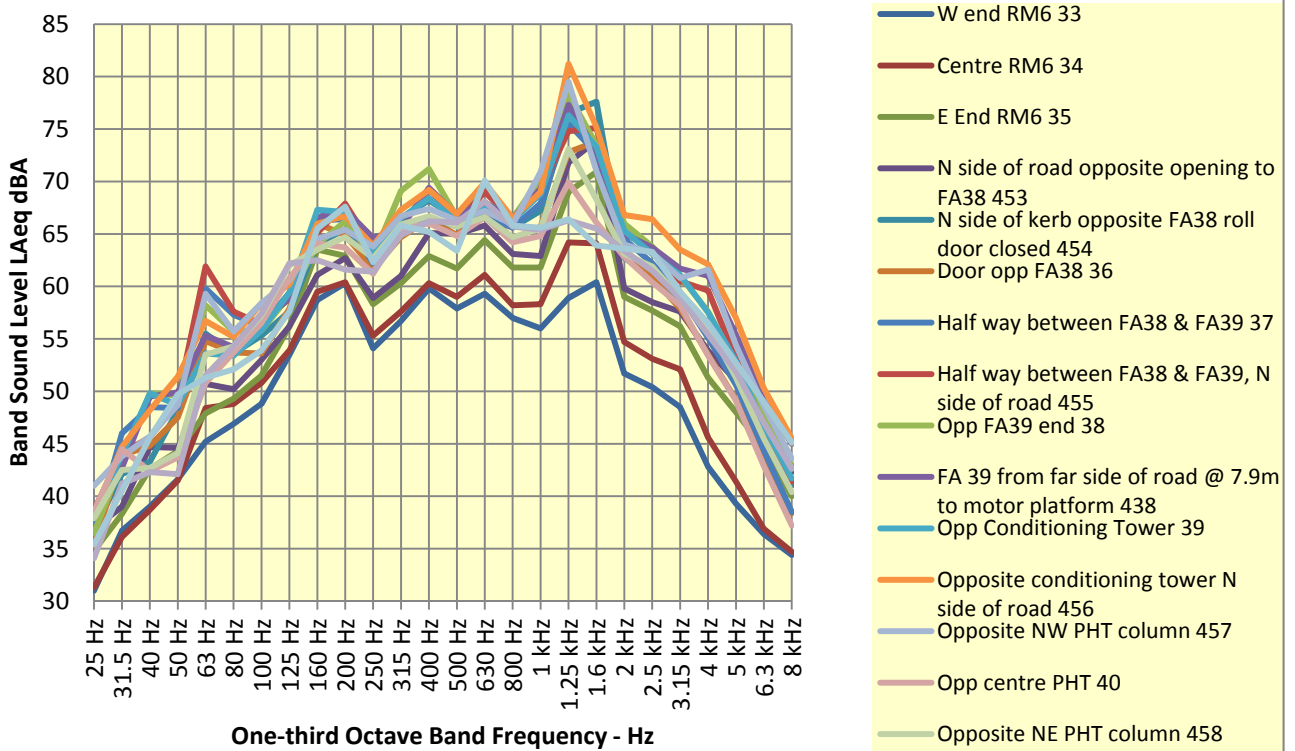


Figure 3.25: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 northern side at road kerb from RM6 to new PHT

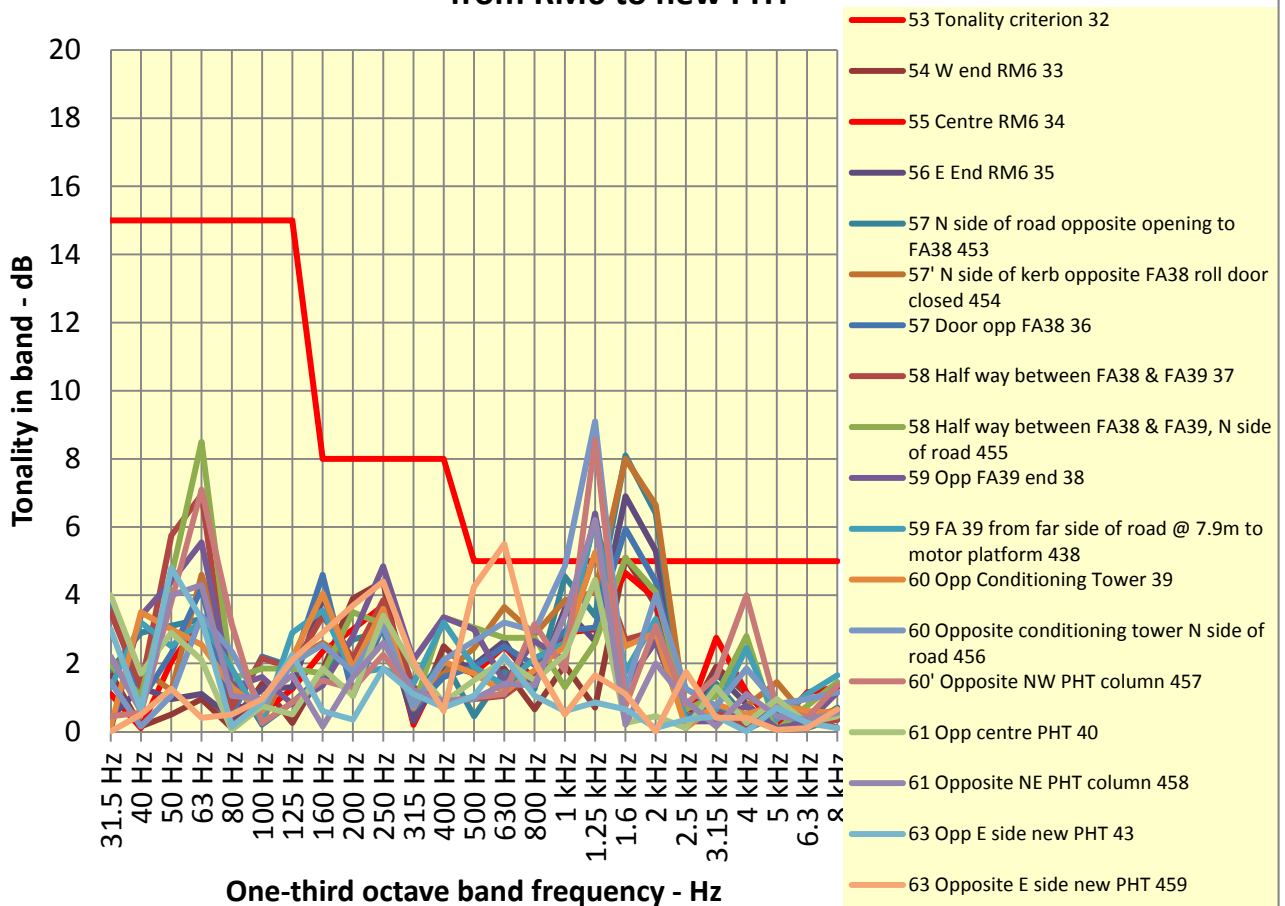


Figure 3.26A: Boral Cement Berrima - One-third Octave Band Spectra for K6 Kiln north side of road from drive platform to grate cooler fan courtyard

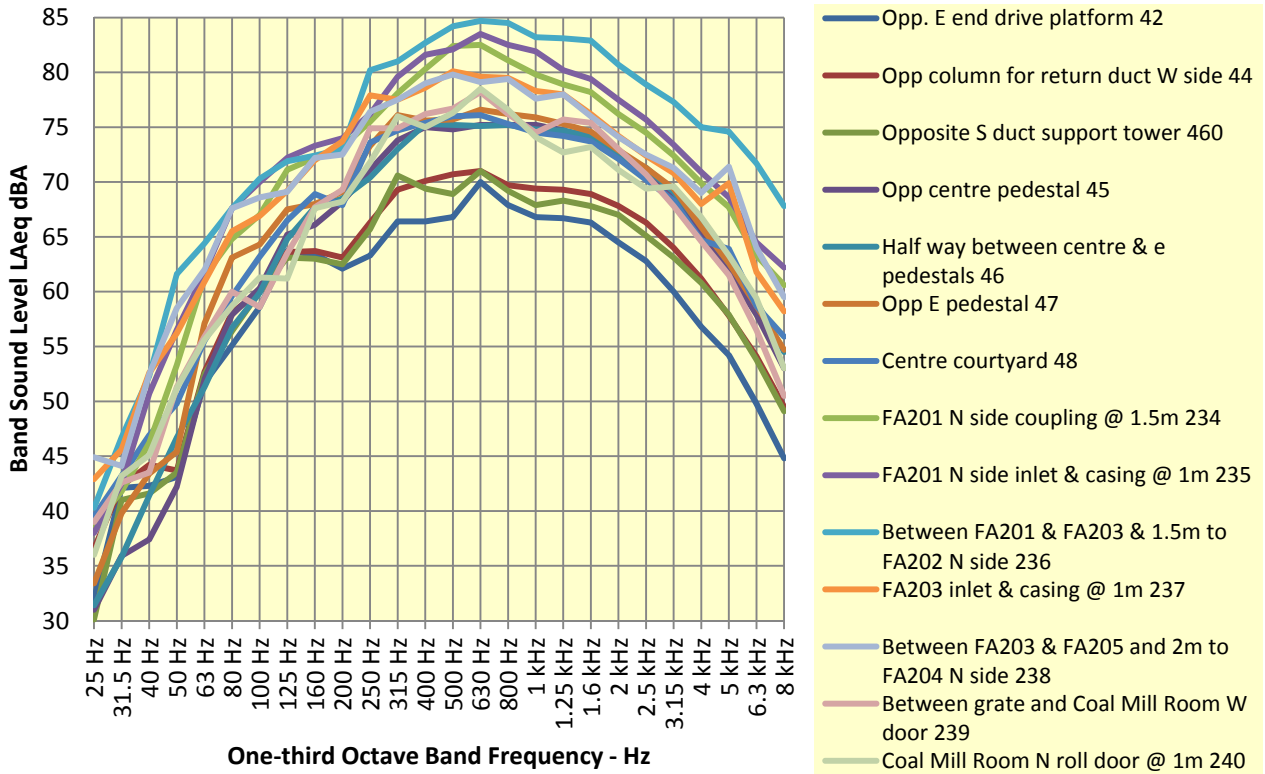


Figure 3.26: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 northern side from of road from drive platform to Grate cooler fan courtyard

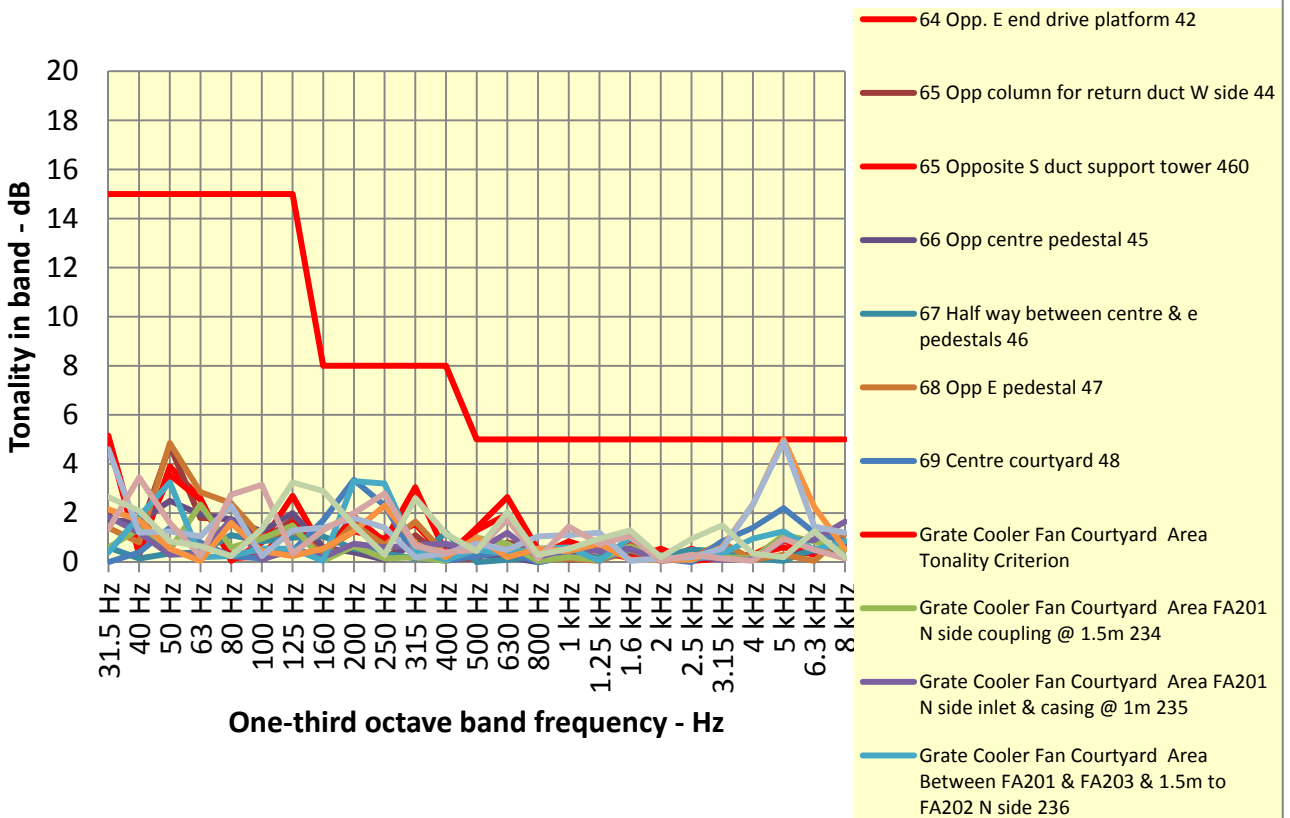


Figure 3.27A: Boral Cement Berrima - One-third Octave Band Spectra for K6 Kiln Firing Floor area

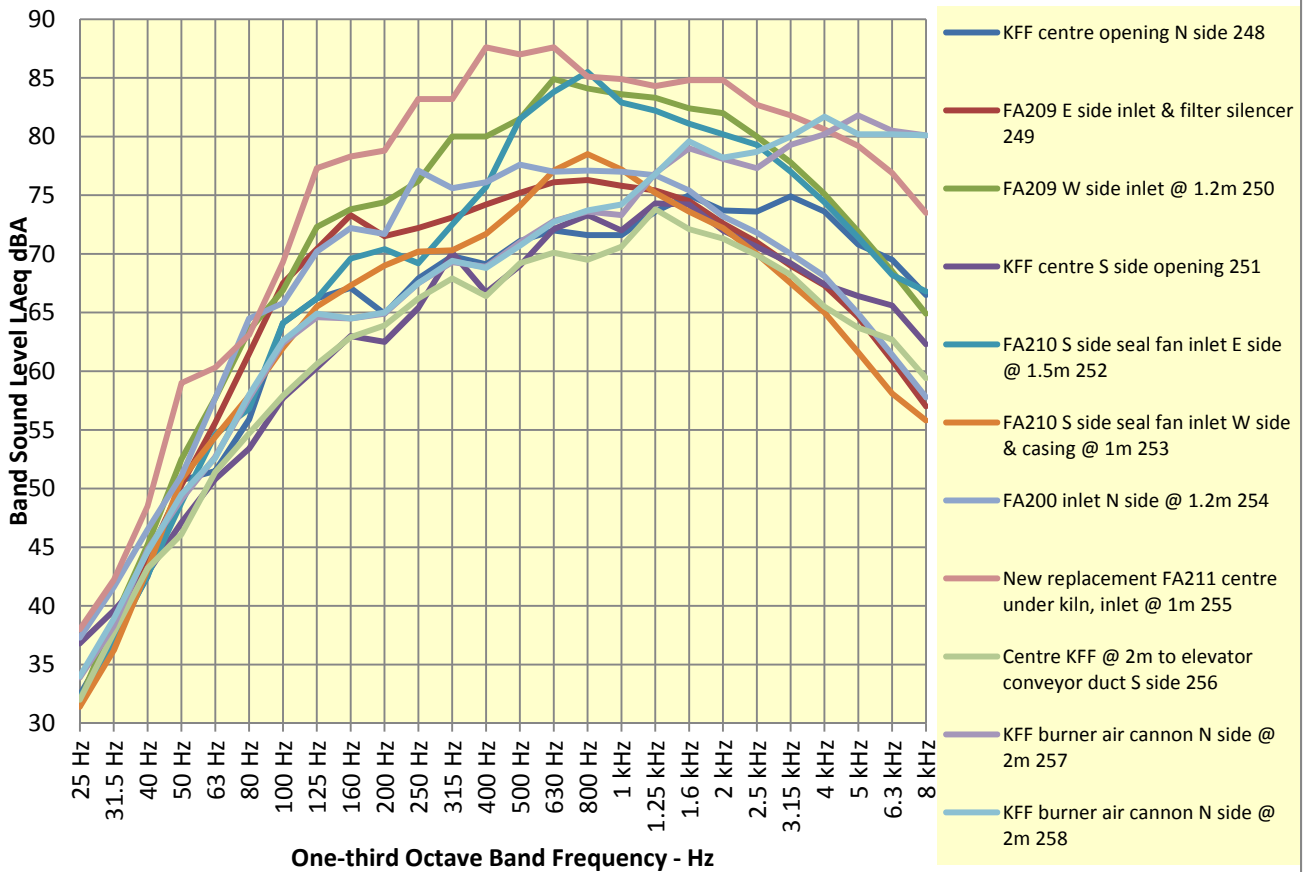


Figure 3.27: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 Kiln Firing Floor

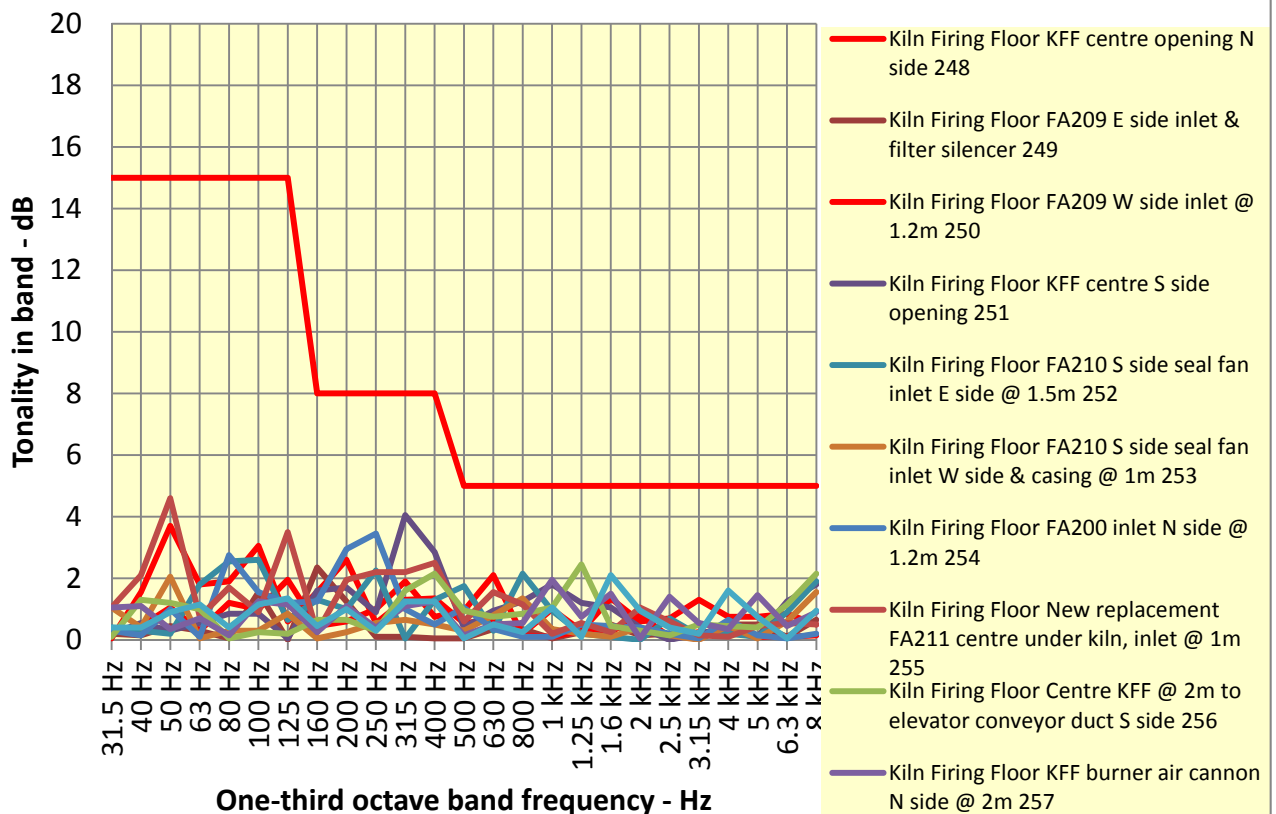


Figure 3.28A: Boral Cement Berrima - One-third Octave Band Spectra for K6 Radicon Cooler

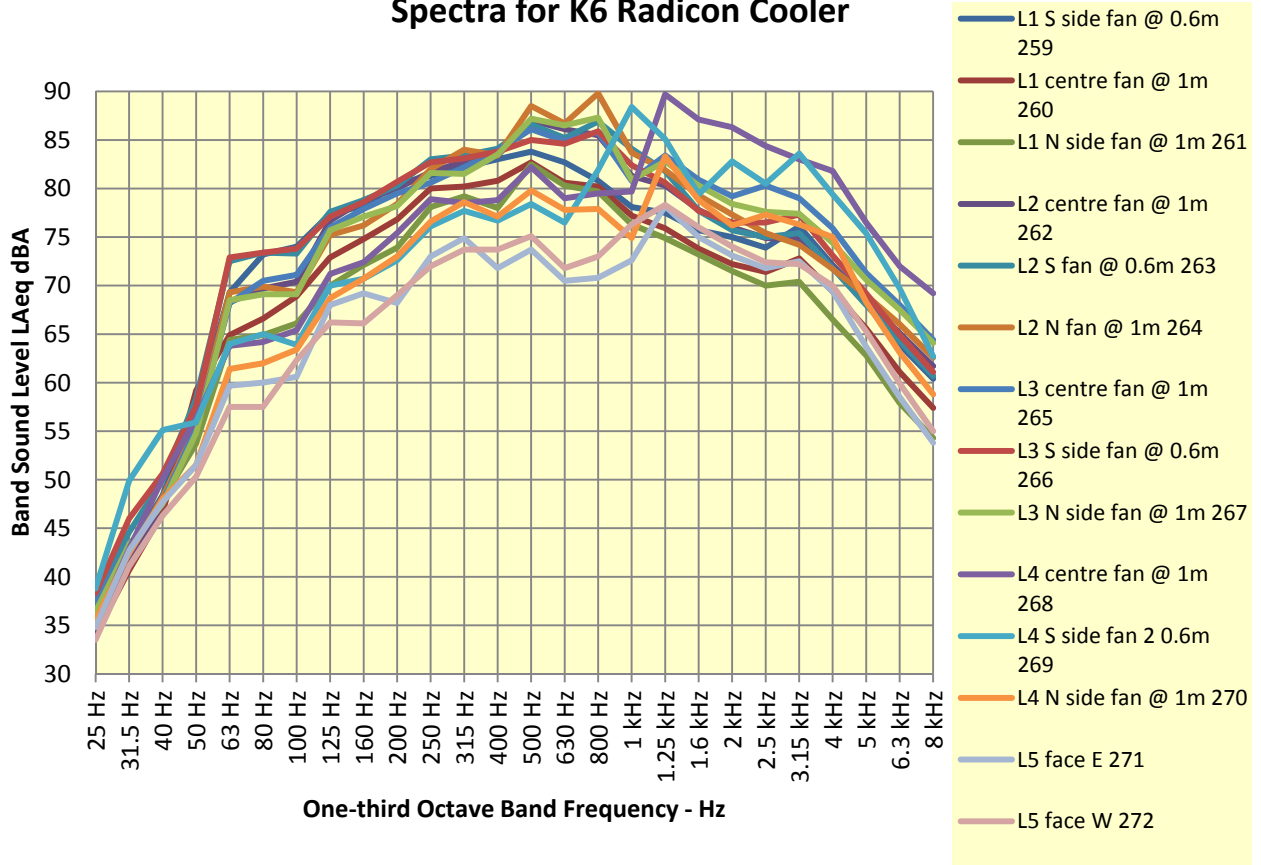


Figure 3.28: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 Radicon Cooler

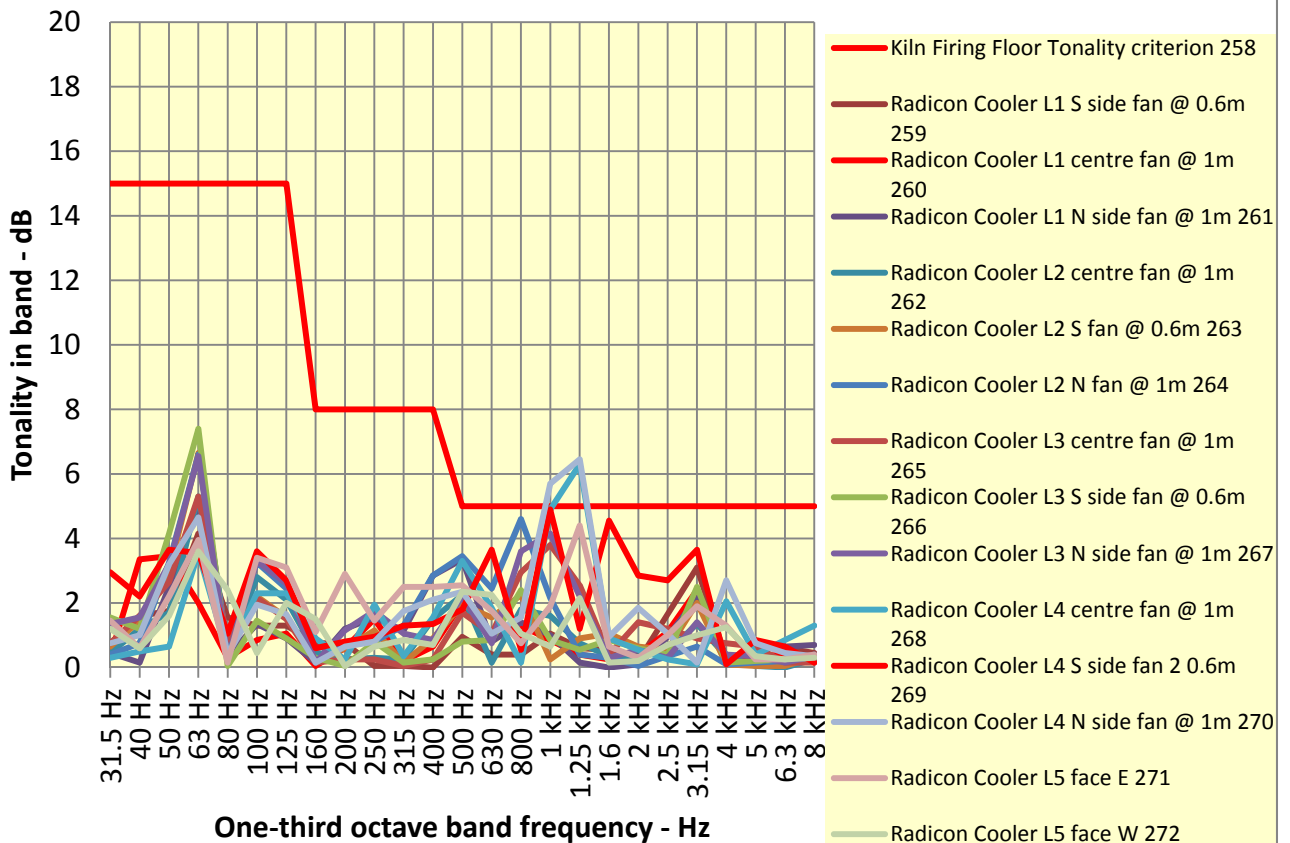


Figure 3.29A: Boral Cement Berrima - One-third Octave Band Spectra for FA215

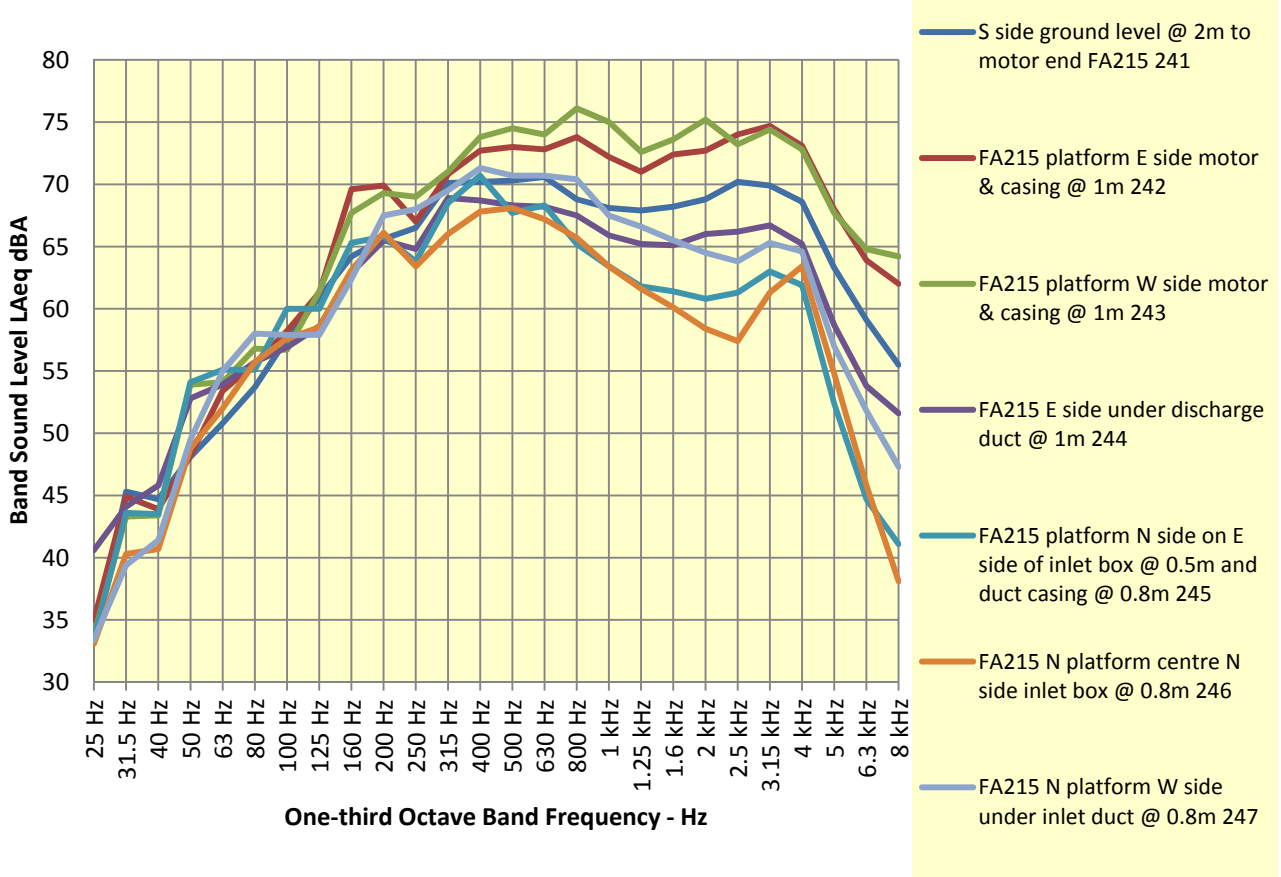


Figure 3.29: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Kiln 6 Radicon Cooler Baggouse fan FA250

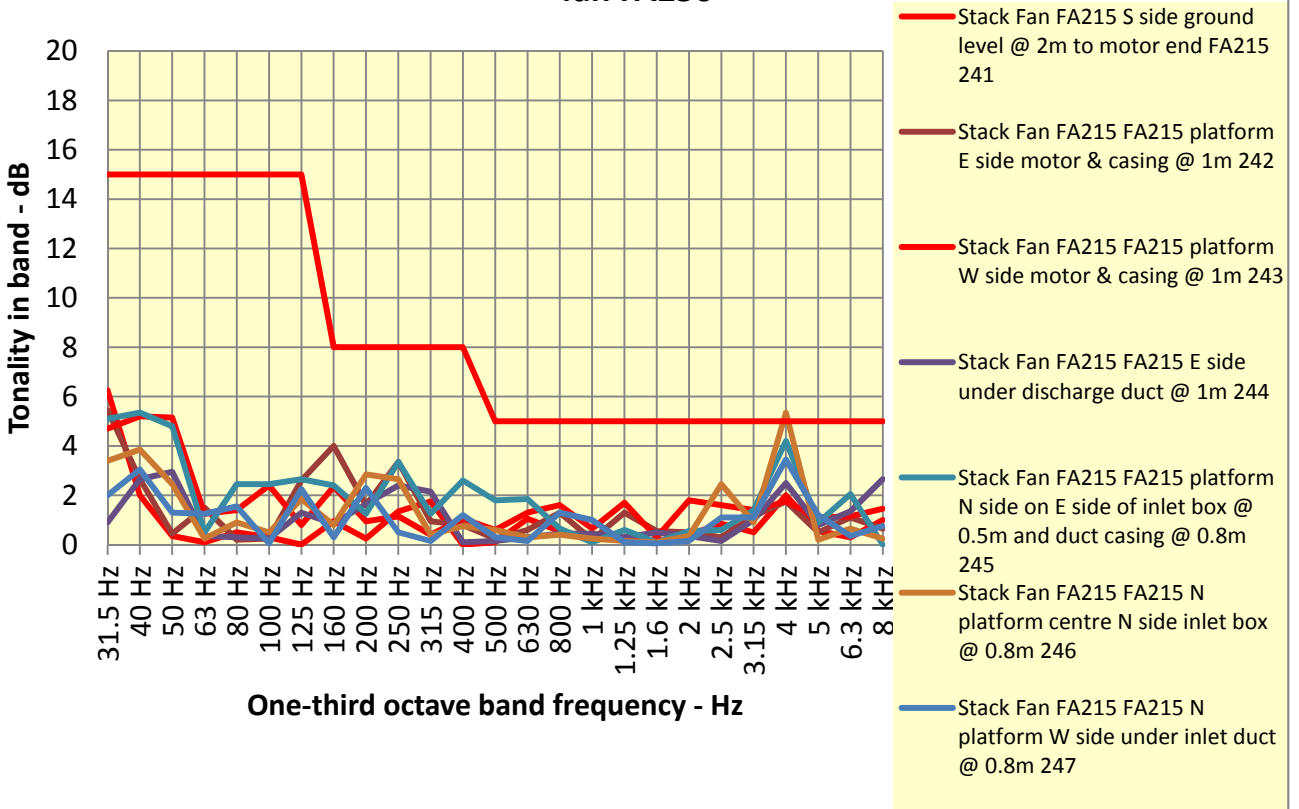


Figure 3.30A: Boral Cement Berrima - One-third Octave Band Spectra for Control building Roof

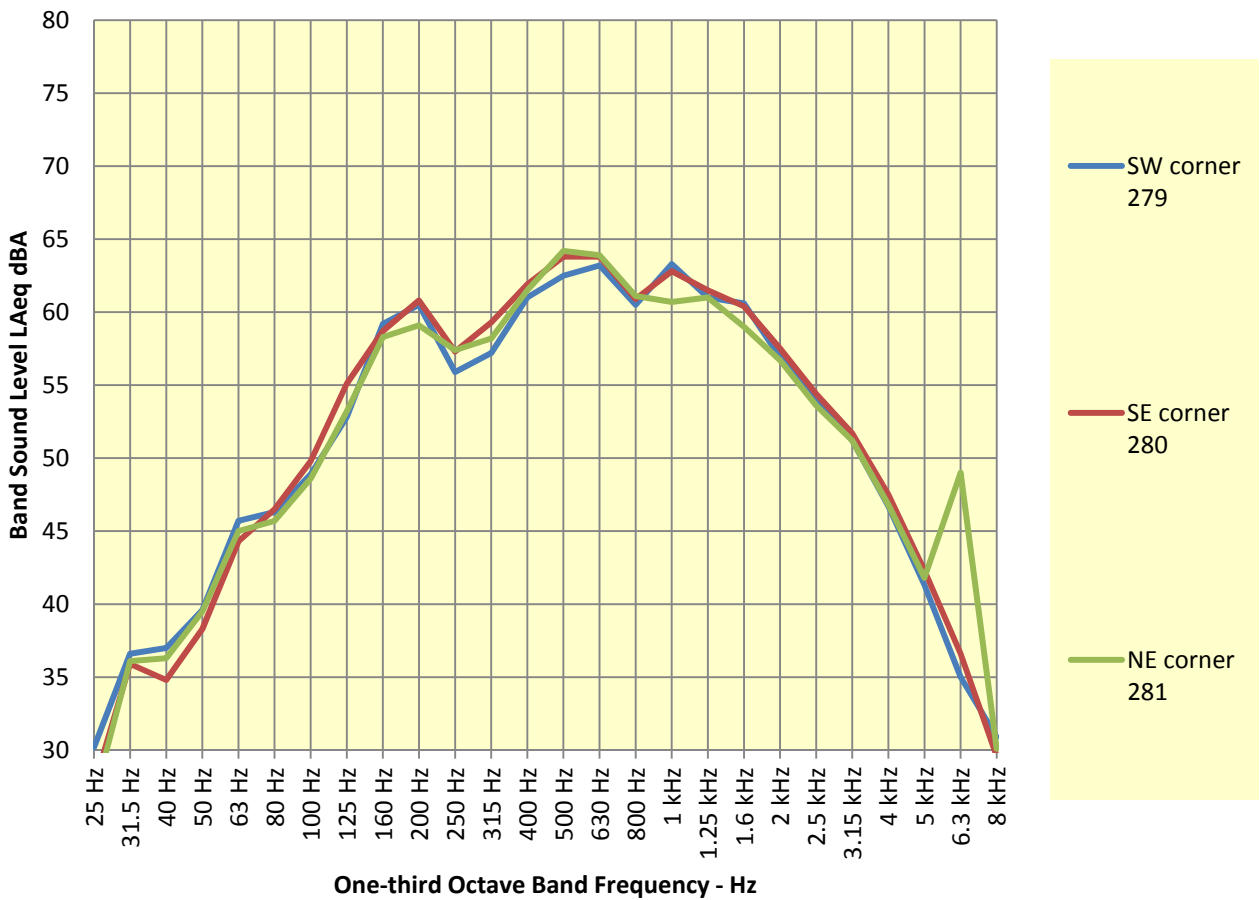


Figure 3.30: Boral Cement Berrima Annual Noise 2017 - Tonality of One-third octave band spectra for Control Building Roof

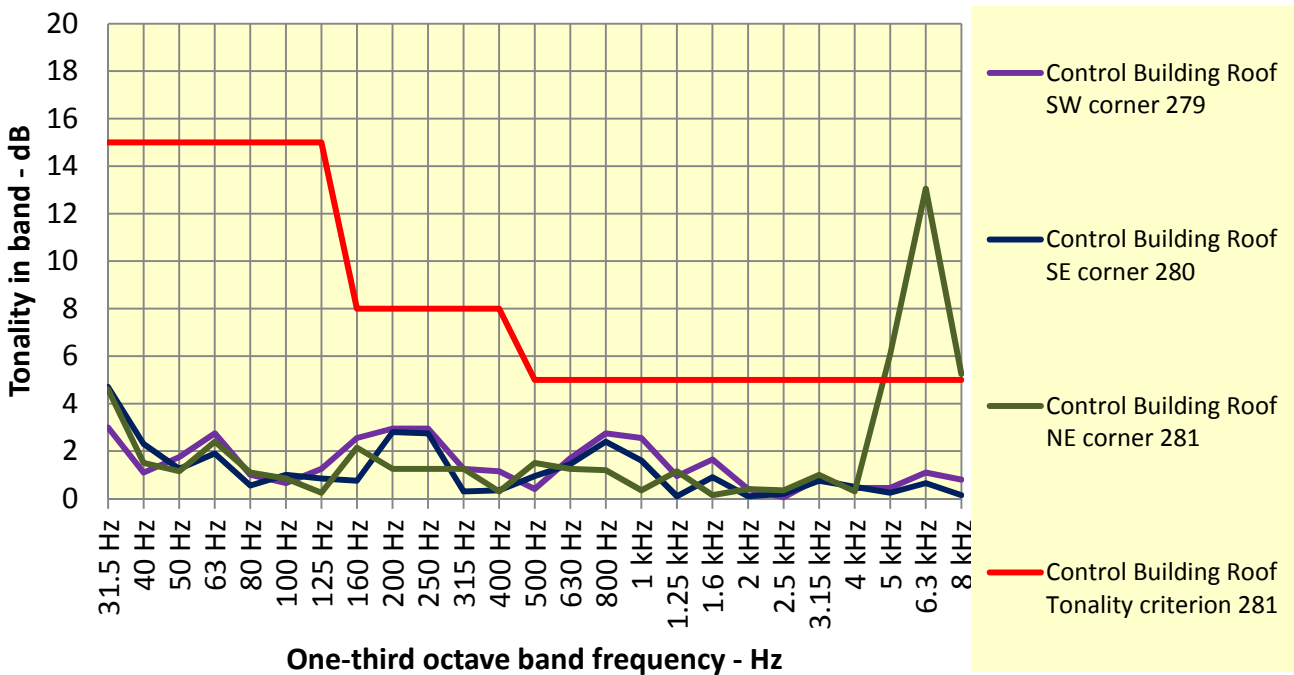


Table 3.6A: Boral Cement Berrima Annual Noise Survey 2017

Site measurement LAeq Spectral data for CM7 and CM6 areas

Number	Location	File	Date	A-weighted LAeq dBA in One-third Octave Band frequency Hz																										
				25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
A	Top of stairs	49	19/09/2017	32	44	40	42	49	50	52	55	58	58	57	60	64	64	62	61	61	61	59	57	55	51	48	43	40	35	29
C	Top of stairs S	50	19/09/2017	29	44	39	41	48	50	51	54	57	58	57	61	65	64	62	62	61	61	60	58	56	53	48	43	37	31	25
J'	Edge of concrete opp, J.	51	19/09/2017	32	43	39	43	46	49	54	58	61	60	59	62	64	64	65	65	63	61	60	58	55	52	48	42	36	30	26
J	Vents N of baghouse	52	19/09/2017	33	48	43	45	50	53	57	62	68	64	64	68	67	68	69	67	65	62	62	59	56	52	47	42	36	31	27
J"	under baghouse & 1m to wall vent	53	19/09/2017	37	44	46	47	51	57	59	66	70	66	65	71	69	69	70	68	68	65	65	61	59	53	48	45	38	34	29
J	Vents N of baghouse	54	19/09/2017	44	44	41	48	45	49	57	62	65	64	63	68	67	68	68	66	69	65	64	62	59	56	53	52	49	45	40
I	Vent S of door @ 1m	55	19/09/2017	33	44	42	45	48	53	58	61	63	64	66	66	68	69	68	67	65	64	63	62	60	55	51	45	39	33	28
H	W roller door @ 1m	56	19/09/2017	34	52	46	46	49	54	60	63	68	66	67	71	74	74	74	72	71	69	69	68	67	64	61	54	48	42	35
F	Wall vents N on W side @ 1m	57	19/09/2017	33	41	40	44	47	54	57	59	63	64	65	64	67	68	67	66	65	63	63	61	58	55	50	43	35	28	22
E'	Man door to compressor filter room @ 1m	59	19/09/2017	33	38	38	42	45	49	52	55	56	58	56	56	58	61	60	58	58	59	57	52	49	46	42	36	30	24	20
E	Compressor room door @ 1m	59	19/09/2017	33	38	38	42	45	49	52	55	56	58	56	56	58	61	60	58	58	59	57	52	49	46	42	36	30	24	20
L	N wall vent W side @ 1m	60	19/09/2017	31	37	35	41	43	46	49	60	56	59	62	60	62	64	61	59	60	58	55	53	50	48	45	40	36	30	23
M	Between wall vents @ 1m to wall	61	19/09/2017	29	35	37	40	42	44	48	54	56	56	56	56	60	64	63	58	59	57	54	52	50	49	45	40	34	28	22
N	Wall vents N wall E side @ 1m	62	19/09/2017	29	33	36	40	46	48	50	56	58	58	60	61	60	63	62	60	60	59	57	54	51	49	47	41	37	31	26
O	Line E side of Comp House 13.5m to control point	63	19/09/2017	37	33	37	41	44	48	49	54	57	59	59	58	61	65	64	61	61	59	57	55	53	51	48	42	37	31	25
K	Line level with G centre of compressor house	64	19/09/2017	34	36	36	41	44	47	49	54	57	58	58	58	62	68	67	62	62	60	58	57	55	53	50	44	39	33	26
G	Line N side of transfer house 13.5m to it, in-line W edge CM7	65	19/09/2017	31	37	37	41	45	46	48	54	56	58	58	58	64	67	67	61	62	60	58	57	56	53	50	44	40	34	32
D	At corner N of Admin	66	19/09/2017	29	37	35	40	47	47	49	51	54	55	54	58	61	65	61	61	62	59	57	54	52	49	46	39	34	26	20
P	1m N roll door CM7	68	19/09/2017	36	40	41	44	47	55	59	61	65	66	66	67	71	72	72	72	71	69	67	66	64	62	57	51	44	37	37
T	Kerb Opp W wall CM5	102	19/09/2017	33	42	40	41	48	48	53	57	61	62	59	63	64	64	64	63	63	63	62	60	57	54	50	45	39	34	30
S	Kerb opp E side CM7 tower	103	19/09/2017	34	49	44	42	49	49	52	56	61	62	62	67	65	65	65	63	63	64	62	60	58	55	50	45	38	30	21
S'	Kerb Opp W wall CM7	104	19/09/2017	35	49	44	41	47	48	52	57	61	61	59	63	65	67	63	64	63	63	62	59	58	55	50	45	40	34	26
R	corner SW of CM7	106	19/09/2017	34	50	44	42	51	50	51	55	60	60	63	74	67	63	63	63	63	63	61	58	56	53	49	43	39	33	28
TS3	TS3 L3 11.7m to FA34 discharge	217	19/09/2017	61.8	64.2	64.3	69	73.9	75	74.3	73.8	72.7	74.1	72.4	71.5	71	70.7	72.7	70.1	69.1	70.6	71.9	68.2	65.6	64.8	64.5	62.5	59.2	57.1	54.8
	TS3 N side L1 opening to N	276	19/09/2017	24.7	33.2	39.5	45	41	45.1	48.1	53.3	54.9	55.4	57.9	58.2	61.4	63.5	64.5	63.3	63.8	63.5	60.3	57.9	56	55.3	51.8	49	47.6	42.7	37.5
	TS3 Platform L3 facing CM5 fan	277	19/09/2017	31.5	36.7	39.1	43.4	44.7	48.1	53.1	58.8	59.1	60.2	61.6	61.4	63.4	65.5	65.3	63.1	62.3	61.8	60.2	58.8	58	57.2	54.5	50.7	47	41.4	36.8
(CM6)	Platform opposite CM6 W wall fans	278	19/09/2017	31.7	34.5	37.5	41.7	48.2	49.3	50.6	54.5	59.8	59.9	59.1	61.6	62.1	63	63.2	62	60.9	60.9	58.7	55.8	53.5	55.8	53.8	52.4	49	45.6	41.5
CM7 Inside	Inside centre Compressor room	282	19/09/2017	26.1	33	36.7	42.5	45.2	52.6	59.8	67.6	65.1	65.5	63.4	63.1	65.6	64.9	66.1	67.8	68.8	69.9	71.2	74.6	79.2	78.8	82.8	81.7	82.5	78.1	71
	Inside W roll door Compressor room	283	19/09/2017	29.4	32.2	36.5	41.7	46.2	52.1	59	67.1	64.4	64.8	64.2	64.9	66.7	68.3	68.7	70.8	73.5	74.4	76.7	79.1	83.5	83.2	86.5	85.8	86	82.4	76.6
	H* Inside main W roll door @ 1m	284	19/09/2017	36.3	51.1	48.3	53.3	56.7	59.7	64.6	72.3	77.7	80.2	80	82.8	84.4	87.9	86.2	85.5	84.3	83.8	83	82.3	82.4	81	78.3	73.3	67.5	61.1	53.9
	F* Inside NW corner	285	19/09/2017	38.5	50.6	47.8	51.2	49.4	55.8	63.8	68	74.5	77.9	78.6	78.4	80.9	84.4	84.1	83.7	83	81.8	79.5	78.7	77.5	74.6	71.3	65.7	59	52	44.4
	I* W side by hydraulics bench	286	19/09/2017	39.5	41.9	46.9	52.1	54.4	62.6	70.2	73.8	76.9	79.8	80.8	81.4	84.4	85.6	86.1	84.7	84.1	83.2	82	81.9	84	79.4	78	72.3	66	59.9	53.7
	J* inside vents	287	19/09/2017	39.6	56.2	50.5	52.2	52.3	57.5	63.6	70	75	75.8	76.3	82.8	81.2	81.5	82	80.9	83.4	79.1	78.1	77.7	77.5	74.7	72.4	68.2	60.1	53.3	48
	J'* SW corner by vents at baghouse	288	19/09/2017	39	53.6	50.2	50	52	56.1	63.9	68.8	72	73.7	75	76.9	78.1	80.1	80	78.4	78.6	76.9	76	74.7	74	71	68.6	65.1	57.4	50.7	45.2
	N side centre mill 2m to wall	289	19/09/2017	35.4	46.4	44.6	48.6	52.3	63.4	69.7	71.6	75.6	77.8	79.1	79.7	81.8	84.8	85.1	85.7	85.2	84.5	82.2	81.9	79.8	76.1	72.7	67.1	60.9	54	46.6
	P* inside main N roll door	290	19/09/2017	33.3	42.7	43.9	51	54.4	64.4	64.4	70.1	75.9	78.3	78.2	79.8	82.8	85.4	86.8	84.9	84.5	83.3	82	81.3	80.7	78.3	75.5	70	63.6	57.4	56

Table 3.6A: Boral Cement Berrima Annual Noise Survey 2017

Site measurement LAeq Spectral data for CM7 and CM6 areas

Location		File	Date	A-weighted LAeq dBA in One-third Octave Band frequency Hz																										
Number	Description			25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
	Centre E side of mill at column line	291	19/09/2017	35.3	41.2	48.6	52.3	56.4	62.5	68.6	72.5	76.9	80.7	81.4	84	87.4	88.7	90.1	90.2	92	91.4	92	92	92.5	90.5	86.9	81.7	76.7	70.9	63.1
	Platform N end mill centre	292	19/09/2017	31.5	42.8	43.2	47.2	52.5	63.7	72	71.4	75.2	79	78.9	79.3	82	85.6	86.3	87	86.3	85.5	83.4	82.4	81.1	78.3	75.3	69.6	63.9	57.8	50.8
	Platform top of mill level by N wall & conveyor 701A	293	19/09/2017	35.7	44.5	43.6	48.6	55.7	61.3	66	69.6	75.5	76.4	78.5	77.9	79.8	82.2	82.8	83.3	82.5	81.5	80	79.1	78.2	75.4	71.9	66	59.8	54.9	51.9
	Top of mill centre platform	294	19/09/2017	37.5	46.7	45.7	50.3	60.4	67	68.1	72.9	76.2	78.3	79.5	80.7	81.3	82.6	83.6	83.1	82.9	82.2	81.4	81	80.4	78.2	74.9	69.5	63.5	57.8	52.4
	Bucket elevator S side on platform at mill top level	295	19/09/2017	37	44.4	46.8	50.6	56.1	62.3	66.3	69.7	73.5	75.6	78.4	78.1	78.6	79.9	80.8	79.8	78.9	77.8	76.8	75	73.5	71	67.7	64	58	51.4	46.3
	BE stairway at roof level	296	19/09/2017	39.4	48.9	45.5	48.5	54.1	59.2	64.6	67.7	72	76.5	77.6	78.3	79.1	79.6	81.1	80.8	80.8	81.4	80.5	78.7	77.3	74.6	70.7	65.3	58.9	51.6	44.6
	1st platform above roof level in BE tower W side	297	19/09/2017	34.9	46.9	44.2	48.4	53.1	57.9	62.4	65.7	70.8	73.5	74.6	75.8	74.6	75.9	76.4	75.3	75.2	74.3	73.2	71.7	70.5	67.6	63.9	59.5	53.7	48	41.8
	2nd platform in BE tower by fans FA703 & FA720, W side wall @ 1m	298	19/09/2017	37.1	48.7	44.2	46.4	50.6	57	61.8	62.6	68.3	70.8	70.7	74	72.2	72.3	72.5	71.7	71.2	70.5	70.2	68.3	67.1	65.4	62.6	59.8	55.4	52.1	44.3
	Between Fans FA703 on & FA720 off	299	19/09/2017	35.6	51.6	45	47.8	50	58	61.8	64.7	66.1	70.4	70.7	72.4	73.4	73	73.8	73	72.8	73.1	73	70.9	69.5	67.2	65.1	62.8	61.3	59.2	54.9
	At crossway to CM5 level, N side at transfer to conveyor	300	19/09/2017	34.8	40.2	41.9	47.3	53.4	60.2	63.1	65.1	66.7	69.2	69.1	71.5	71.7	71.3	71.4	71	70	69.9	69.1	67.6	66.9	65.9	63.1	61.5	57.4	53.7	44.5
	At crossway to CM5 level, W side by wall @ 1m, BE @ 1.8m	301	19/09/2017	37	44.5	43.2	47.5	51.3	56.8	60.1	62.9	67.3	69.6	69.7	72.2	71.5	71.5	71.6	70.4	70	70.4	69.7	69.4	69	69.9	68.9	65.4	60.3	56.5	48.4
	At W end crossway to CM5 by vent in S wall	302	19/09/2017	35.3	41.1	41.7	47.4	54.2	57.6	59.5	61.1	64.9	64.4	64.7	66	66	66.6	67.2	66.2	65	65.5	64.2	62.6	60.8	59.6	57.3	54.3	49.4	44.9	35.2
	Top level BE tower W side NW corner	303	19/09/2017	36	46.2	43.3	47.2	49.3	56	59	63.6	66.2	69.7	69.2	69.7	69.8	69.9	70.7	71.3	71	72.3	70.6	70.1	70	70.9	69.4	69.1	65.8	63.2	53.3
	Top level BE tower S side BE @ 0.8m	304	19/09/2017	39.9	44.6	46.3	50.3	51.9	58.9	62.4	62.5	62.9	68.3	67.9	68	70.2	68.4	69.7	70.4	70.1	70.1	69.8	69.2	67.8	68.9	70.5	68.6	64.8	61.9	52.9
	Top level BE tower E side by drive motor end @ 0.8m	305	19/09/2017	33.3	46.7	43	52.3	52.2	60	63.6	63.6	65.9	67.6	68.2	70.6	77.2	70.8	71.8	72.5	73.7	75	72	71.1	70.5	70.2	67.4	67.1	63.4	60.8	51.2
	Crossway to CM5 E end by opening in floor	306	19/09/2017	34	40.8	42.8	50.6	54.3	55.5	59	62.2	65.7	69	68.6	67.4	66.9	64.7	64.3	62.9	62	61.6	61.4	59.6	57.1	54.1	52.2	49.8	44	40.8	39.6
	Main baghouse SE corner top, 4m to E wall	307	19/09/2017	36.2	47.1	43.2	46.8	51.5	56.4	60.9	66.5	71.6	76.4	75.3	75.8	75	75.7	76.3	75.7	75	74.6	73.8	72	70.8	68.1	65	65.1	64.2	60	59
	Base of main baghouse SW corner	308	19/09/2017	39.2	48.3	43.8	43.3	53.4	58.4	63	66.8	70.9	73.3	73.9	76.9	76.5	76.7	76.9	75.9	75.8	74.2	73.5	71	69.1	66.2	62.2	59.8	55.4	47.7	43.3
	Main mill motor fan platform NE side, motor & casing @ 1m	309	19/09/2017	37	51.2	49.2	55.8	58.8	61.7	66.7	66.2	72.1	75.3	75	76.3	78.7	79	80.7	79.4	78.6	78.6	77.8	76	74.7	72.9	70.7	73.8	71.2	63.8	60.6
	SW side of mill motor fan @ 2m to casing inlet & discharge ducts	310	19/09/2017	40.4	56.6	50.4	53.3	62.8	58.5	63.1	66.9	71.4	73.9	73.2	73.8	75.4	75.9	76.8	76.4	75.4	75.2	75.1	72.7	71.2	69	67.1	66.2	62.8	55.6	51.4
	Mill drive motor fan motor drive end @ 1.5m	311	19/09/2017	37.3	54.8	49.9	59.7	59.3	65	65.2	68.2	72.8	76.3	76.5	84.7	83.1	83.5	86.1	83.9	83.3	80.5	80.8	77.8	76.7	76.4	72.6	74.8	66.6	62.1	61.3
CM5 area	L1 Larox Valve @ 1.2m	465	6/10/2017	37.1	34.2	38.2	45.4	52.6	50.5	53.4	57.9	61	64.1	59.9	62.9	69.6	77.9	76.2	73.6	73	82.6	75.5	78.2	80.2	79.5	76.8	75.1	73.9	70.8	68.4
	DC702 by duct through N wall, @ 1m to motor & casing	466	6/10/2017	41.4	37.3	40.5	50.1	52.2	53.1	54.6	58.3	60.3	63.3	60.2	61.5	63.7	64.6	67	63.6	66.1	66	62.8	61.5	59.8	57.4	54.6	52.2	49.3	46.6	42.9
	FA34 motor & casing S side @ 1m	467	6/10/2017	33.8	36.6	38.9	51.2	61.8	57.9	59.4	66.1	69	72.9	69.2	68.8	70.4	68.4	67.2	66.4	67.2	66.1	66	66.7	63.7	64.5	68.8	61.2	53.8	50.1	45.3
	FA502 @ 1m to motor & casing & discharge	468	6/10/2017	35.5	39.2	46.4	54.1	56.7	56.8	62.1	63.2	68	72.3	69.9	69.8	74.5	73.5	70.6	69.7	70	70.3	71.5	68.3	67	67.2	64	64.1	56.8	51.6	46.9

Table 3.6A: Boral Cement Berrima Annual Noise Survey 2017

Site measurement LAeq Spectral data for CM7 and CM6 areas

Location		File	Date	A-weighted LAeq dBA in One-third Octave Band frequency Hz																										
Number	Description			25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
CM6	W wall fan from far platform @ 7.3m to splitters, 5.8m to wall	461	6/10/2017	53.9	49	55	57.8	61.8	64.1	61.4	61.6	60.1	60.9	61.8	64.9	73.3	77.7	78.1	76.7	76	77.1	75.9	72.4	68.3	66.6	67.8	65.8	62.8	60.8	52.8
	W wall fan from close platform 2.9m to centre bottom of silencer at wall	462	6/10/2017	58	54.1	61.1	66.6	65.9	67.9	63.6	62.5	61.6	63.6	64.6	73.1	79.1	81.4	83.1	82.7	83.7	84.8	81.9	80.1	75	73.7	74.2	71.3	68.3	66.6	59.2
11	9.8m from S wall	84	19/09/2017	32	36	39	43	50	52	52	59	63	61	60	63	62	64	66	66	64	64	63	60	58	56	51	46	40	33	26
13	E side S roll door @ 1m	85	19/09/2017	30	35	38	41	45	47	49	54	58	60	58	60	59	61	63	63	63	62	62	59	57	55	53	48	42	37	28
14	CM6 E side centre door @ 1m	86	19/09/2017	30	35	38	42	46	49	51	54	58	59	59	61	60	61	61	62	63	62	63	60	61	62	60	53	48	42	33
15	2m from Clinker Building opp 13 & 14	87	19/09/2017	30	35	38	41	42	45	48	54	61	62	58	60	59	59	62	64	64	61	61	59	57	54	49	44	39	33	27
18	Door opp Comp Room @ 1m	88	19/09/2017	30	33	38	44	46	45	49	53	55	57	58	61	60	61	62	62	62	61	60	58	58	54	51	47	42	37	33
19	Clinker Building @ 2m opp 18	89	19/09/2017	26	32	39	42	43	44	48	53	56	56	59	62	60	61	62	63	64	63	62	60	59	57	53	49	45	41	36
20	Man door - open 100mm	90	19/09/2017	31	32	36	41	41	45	46	52	56	56	58	60	59	61	61	62	62	61	59	58	57	54	50	46	42	37	31
21	1m Outside vent fan filter	92	19/09/2017	28	31	31	40	43	45	48	52	55	58	56	58	58	59	60	60	61	59	57	54	52	49	44	40	36	29	22
22	E side N wall vent @ 1m	93	19/09/2017	32	33	34	38	38	43	47	49	55	54	57	58	59	61	62	60	60	60	58	56	56	52	49	47	41	36	30
23	Centre N wall vent @ 1m	94	19/09/2017	31	32	32	38	39	42	47	49	53	54	56	57	58	61	61	59	60	60	59	56	53	52	50	46	38	31	25
24	W side N wall vent @ 1m	95	19/09/2017	32	32	34	41	39	42	46	50	53	54	54	55	57	59	60	58	58	58	56	53	50	48	44	40	37	38	37
17	E roll door opp Mill	96	19/09/2017	33	32	35	41	45	48	51	54	58	60	62	65	67	71	71	70	70	71	71	70	70	68	65	64	61	57	53
16	E wall centre @ 2m	97	19/09/2017	36	39	41	43	46	48	51	54	57	59	59	60	61	62	62	63	63	64	62	61	59	56	52	50	45	40	36
25	11m N of CM6	98	19/09/2017	35	34	33	42	40	45	46	50	52	53	54	56	57	60	62	59	60	61	58	55	53	50	45	41	37	34	27
26	22.6m N of CM6	99	19/09/2017	27	33	33	37	41	47	48	50	52	53	53	55	57	59	62	58	58	60	57	54	51	48	44	41	37	31	25
11	9.8m from S wall	123	6/10/2017	31	35	38	42	51	52	53	58	61	61	60	62	63	63	67	70	70	65	65	64	66	61	60	54	46	40	31
13	E side S roll door @ 1m	124	6/10/2017	32	34	39	42	46	47	50	53	58	60	59	64	64	61	63	63	65	62	61	61	57	55	51	45	40	33	28
14	CM6 E side centre door @ 1m	125	6/10/2017	33	34	39	42	47	50	53	58	61	62	64	65	65	65	66	65	64	63	61	60	57	54	50	45	39	32	27
16	E wall centre @ 2m	126	6/10/2017	36	32	37	39	45	47	52	54	57	59	60	62	62	63	63	62	63	62	60	58	56	53	49	44	39	37	36
16	E wall centre @ 2m	127	6/10/2017	37	33	37	40	46	48	51	54	58	60	60	61	62	63	62	62	62	62	59	58	55	53	49	44	39	31	25
17	E roll door opp Mill	128	6/10/2017	37	33	39	43	47	49	53	58	60	61	65	68	71	70	70	69	70	71	68	66	63	59	56	51	47	41	36
18	Door opp Comp Room @ 1m	129	6/10/2017	32	31	37	41	46	47	50	56	62	58	61	63	62	64	68	62	70	74	65	65	69	65	63	59	54	50	44
20	Man door - open 100mm	130	6/10/2017	36	36	39	43	46	48	50	54	64	59	59	61	60	62	66	64	64	65	64	64	62	61	59	54	50	43	38
19	Clinker Building @ 2m opp 18	131	6/10/2017	33	31	37	42	45	46	50	53	57	58	59	63	62	61	63	63	64	67	61	59	60	57	53	50	44	39	33
15	2m from Clinker Building opp 13 & 14	132	6/10/2017	29	34	38	41	43	46	51	54	58	59	59	61	60	60	62	63	63	61	60	58	56	54	50	46	42	37	35
21	1m Outside vent fan filter	134	6/10/2017	43	33	38	44	44	47	52	55	57	56	59	62	64	64	63	65	60	59	56	54	51	47	44	41	42	31	23
22	E side N wall vent @ 1m	135	6/10/2017	44	35	39	44	44	48	52	55	58	62	63	66	67	67	66	65	63	63	60	57	53	49	47	42	38	34	32
23	Centre N wall vent @ 1m	136	6/10/2017	36	37	40	45	47	55	57	61	64	66	68	72	73	71	71	70	69	69	67	65	62	57	53	50	44	38	34
24	W side N wall vent @ 1m	137	6/10/2017	34	37	41	48	48	52	52	57	62	65	65	69	70	69	69	67	65	64	62	59	56	52	49	45	41	36	33
25	11m N of CM6	138	6/10/2017	31	31	36	40	42	47	49	53	54	56	59	62	60	60	60	59	59	58	57	54	51	47	43	40	35	30	27
26	22.6m N of CM6	139	6/10/2017	33	31	36	42	42	45	49	51	54	56	55	59	61	59	59	58	58	56	54	50	45	41	38	34	29	24	

Table 3.6: Boral Cement Berrima - 2017 Annual Noise Assessment - Site Sound Levels for CM7 Project and CM6

Comparison and difference with results for previous years for the same locations

Differences highlighted pink if greater than 3 dB

Area	Location	File No.	Date	Statistical Sound Level - LAeq dBA											Difference to 2016 = 2016 - 20XX dB								
				LAeq 2017	LA90 2017	LAeq 2016	LAeq 2015	LAeq 2014	LAeq 2013	LAeq 2012	LAeq 2011	LAeq 2010	LAeq 2009	LAeq 2006	2016	2015	2014	2013	2012	2011	2010	2009	2006
CM7	A Top of stairs	49	19/09/2017	72	71	72	73	73	72	71	73	69	70	70	0	-1	-1	0	1	-1	3	2	2
	C Top of stairs S	50	19/09/2017	72	72	72	73	71	71	71	71	70	72	72	0	0	1	1	2	1	2	0	0
	D At corner N of Admin	66	19/09/2017	71	0	72	72	72	70	69	68	67	73	73	-2	-2	-1	0	1	2	4	-2	-2
	E Compressor room door @ 1m	59	19/09/2017	69	69	71	72	74	73	74	75	76	76	75	-2	-3	-5	-4	-5	-6	-7	-7	-6
	E' Man door to compressor filter room@ 1m	59	19/09/2017	69	69	69	71	70	69	71	71	69	74	73	0	-1	-1	0	-2	-2	0	-5	-4
	F Wall vents N on W side @ 1m	57	19/09/2017	76	76	76	76	77	77	77	75	76	77	78	0	0	-1	-1	-1	1	0	-1	-2
	G - Line N side of transfer house 13.5m to it, in-line W edge CM7	65	19/09/2017	73	72	75	75	74	72	70	68	69	78	81	-2	-1	-1	1	4	6	4	-5	-8
	H W roller door @ 1m	56	19/09/2017	82	82	81	80	80	81	80	77	78	78	77	1	3	2	2	2	5	4	4	5
	I Vent S of door @ 1m	55	19/09/2017	77	77	77	78	78	79	79	87	78	78	85	0	-1	-1	-2	-2	-10	-1	-1	-8
	J Vents N of baghouse	52	19/09/2017	77	77	78	77	79	80	86	89	83	83	86	0	0	-2	-2	-9	-12	-6	-6	-9
	J' Edge of concrete opp, J.	54	19/09/2017	78	77																		
	J'' under baghouse & 1m to wall vent	51	19/09/2017	73	73	74	75	74	75	78	84	77	80	74	0	-1	-1	-2	-5	-11	-4	-7	-1
	K Line level with G centre of compressor house	53	19/09/2017	79	79	80	81	82	81						-1	-2	-3	-2					
	L N wall vent W side @ 1m	64	19/09/2017	74	72	72	74	72	71	72	68	69	78		1	0	1	3	1	6	5	-5	
	M Between wall vents @ 1m to wall	60	19/09/2017	71	71																		
	N Wall vents N wall E side @ 1m	61	19/09/2017	70	69	73	74	73	72	70	79	71	76	76	-3	-4	-3	-2	0	-9	-1	-6	-6
	O Line E side of Comp House 13.5m to control point	62	19/09/2017	71	70	71	71	71	69	69	67	70	76	75	-1	0	0	2	2	4	1	-5	-4
	P 1m N roll door CM7	63	19/09/2017	72	71	73	75	73	72	70	67	67	78		-2	-3	-1	0	2	5	5	-6	
	Transfer Station #TS3 Level 1 N side opening	68	19/09/2017	81	80	81	81	80	81	81	76	79	87		-1	-1	1	-1	-1	4	2	-7	
	TS3 Platform opp fan discharge	276	19/09/2017	73	72	71	71								2	1							
TS3 Platform opp fan discharge	277	19/09/2017	74	73	75	75	77	75	77	75	74			-1	-2	-3	-1	-3	-1	0			
R corner SW of CM7	464	6/10/2017	75	74	75	75	77	75	77	75	74			0	-1	-2	0	-2	0	1			
S' Kerb Opp W wall CM7	106	19/09/2017	77	76	76	75								1	2								
S Kerb opp E side CM7 tower	104	19/09/2017	74	74	74	74								0	0								
T Kerb Opp W wall CM5	103	19/09/2017	75	74	75	76								0	-2								
	102	19/09/2017	74	73	75	76								-1	-2								
CM6	11 9.8m from S wall	123	6/10/2017	77	76	78	76	78	77	79		77		-1	1	-1	0	-2		0			
	13 E side S roll door @ 1m	124	6/10/2017	73	73	75	80	81	82	82		83		-2	-7	-8	-9	-9		-10			
	14 CM6 E side centre door @ 1m	125	6/10/2017	75	75	76	74	75	77	74		74		-1	1	0	-3	1		1			
	15 2m from Clinker Building opp 13 & 14	132	6/10/2017	72	71	73	78	78	89	79					-1	-6	-7	-17	-7				
	16 E wall centre @ 2m	126	6/10/2017	72	72	73	74	75	80	74		77		-1	-1	-2	-7	-2		-5			
		127	6/10/2017	72	72							72											
	17 E roll door opp Mill	128	6/10/2017	80	79	82	74	75	78	77		75			-3	5	4	2	3		5		
	18 Door opp Comp Room @ 1m	129	6/10/2017	79	78	76	82	83	85	82		85			2	-4	-5	-7	-4		-6		
	19 Clinker Building @ 2m opp 18	131	6/10/2017	74	73	72	77	77	75	77		76			1	-3	-4	-1	-3		-2		
	20 Man door - open 100mm	130	6/10/2017	75	74	73	75	75	78	73		72			2	0	0	-4	2		3		
	21 1m Outside vent fan filter	134	6/10/2017	72	71	72	73	75	72	74		74			1	-1	-2	0	-2		-2		
	22 E side N wall vent @ 1m	135	6/10/2017	75	75	82	82	84	81	83		85			-7	-7	-9	-6	-8		-9		
	23 Centre N wall vent @ 1m	136	6/10/2017	80	80	83	84	86	84	85		86			-3	-3	-5	-3	-4		-5		
	24 W side N wall vent @ 1m	137	6/10/2017	78	77	80	78	81	81	81		83			-2	-1	-4	-3	-4		-6		
25 11m N of CM6	138	6/10/2017	70	69	74	74	75	74						-4	-4	-6	-4						
26 22.6m N of CM6	139	6/10/2017	69	68	80	71	72	74	75		77			-11	-3	-3	-5	-6		-9			
Door platform near CM6 W wall fan @ 5.7m	461	6/10/2017	86	84	87	85	84	88			81			-1	0	2	-2			5			

Figure 3.34A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill Western side locations

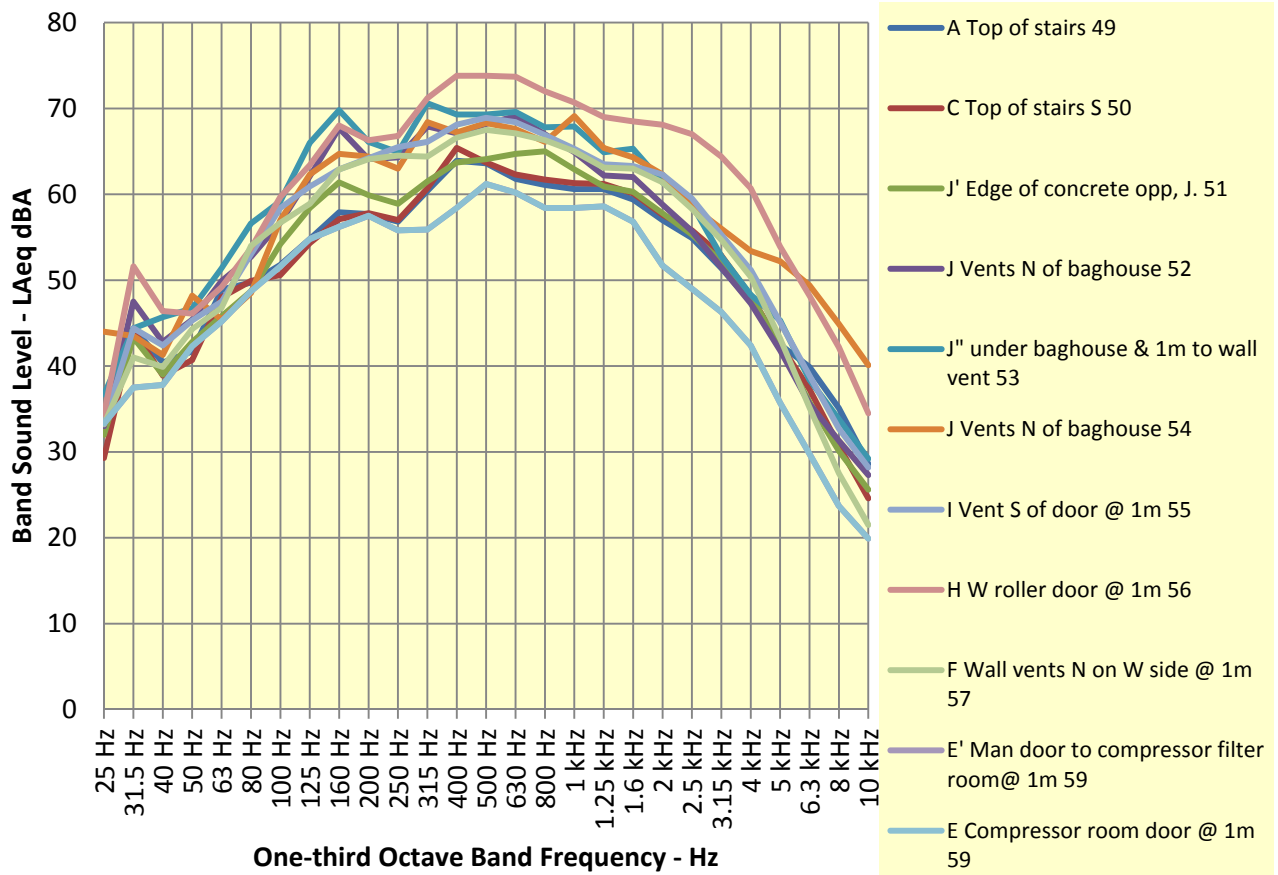


Figure 3.34: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill Western side locations

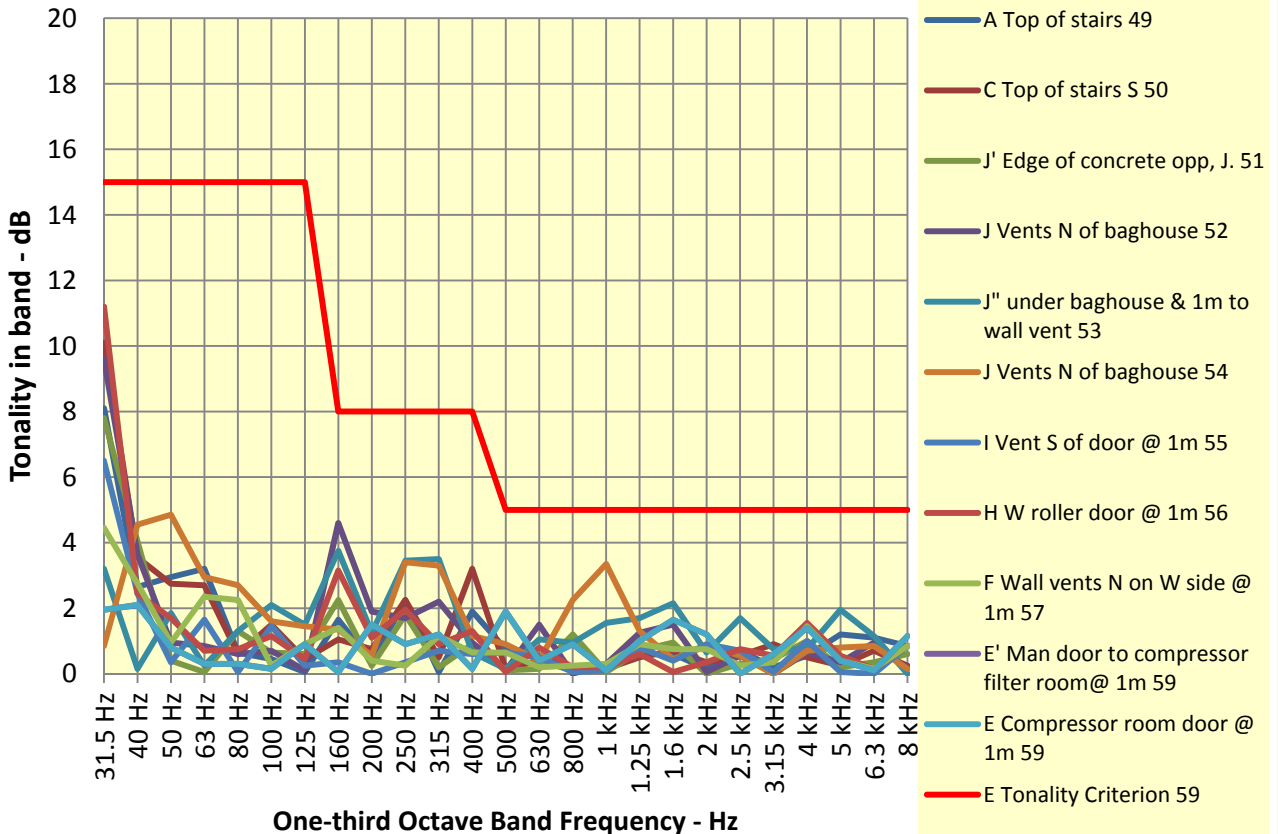


Figure 3.35A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill Northern side locations

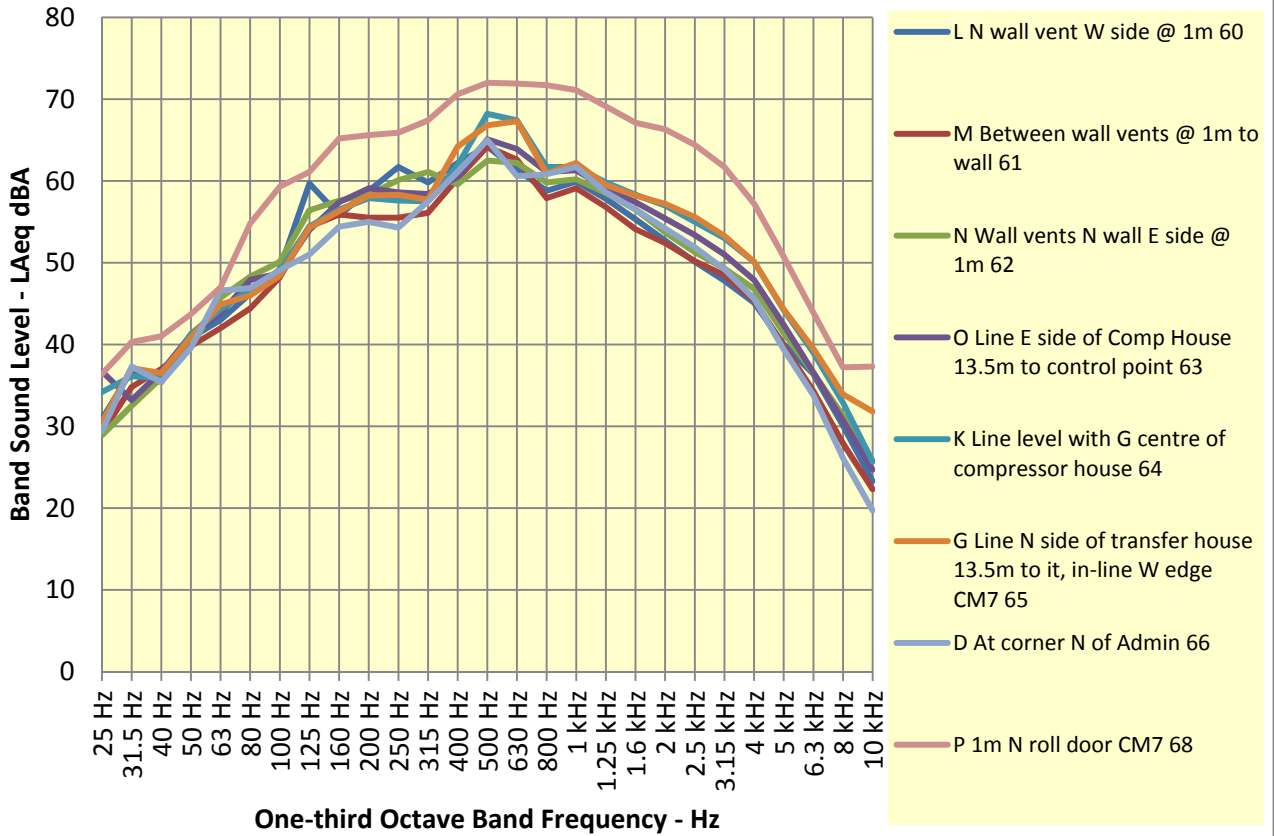


Figure 3.35: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill Northern side locations

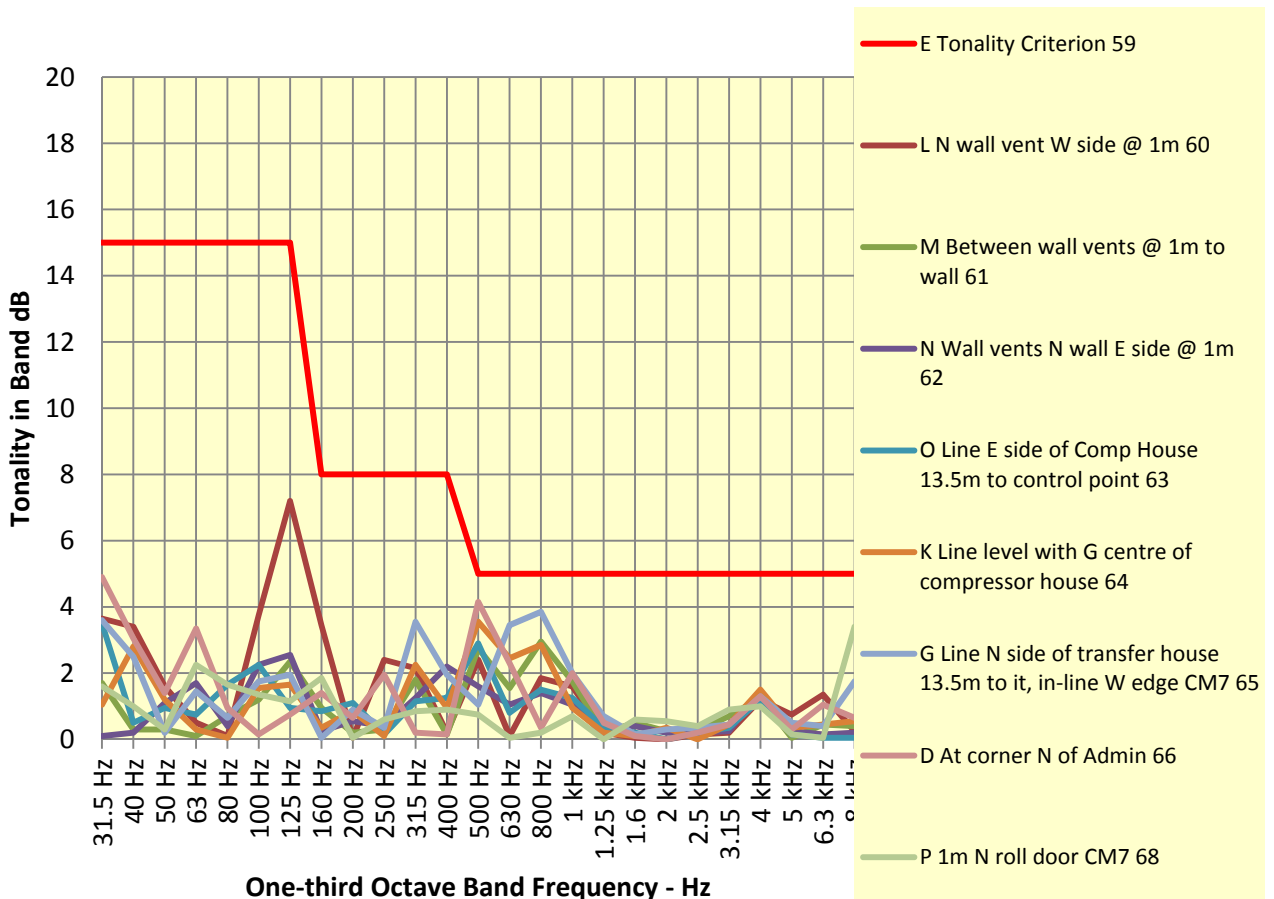


Figure 3.36A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill Southern side and TS3 locations

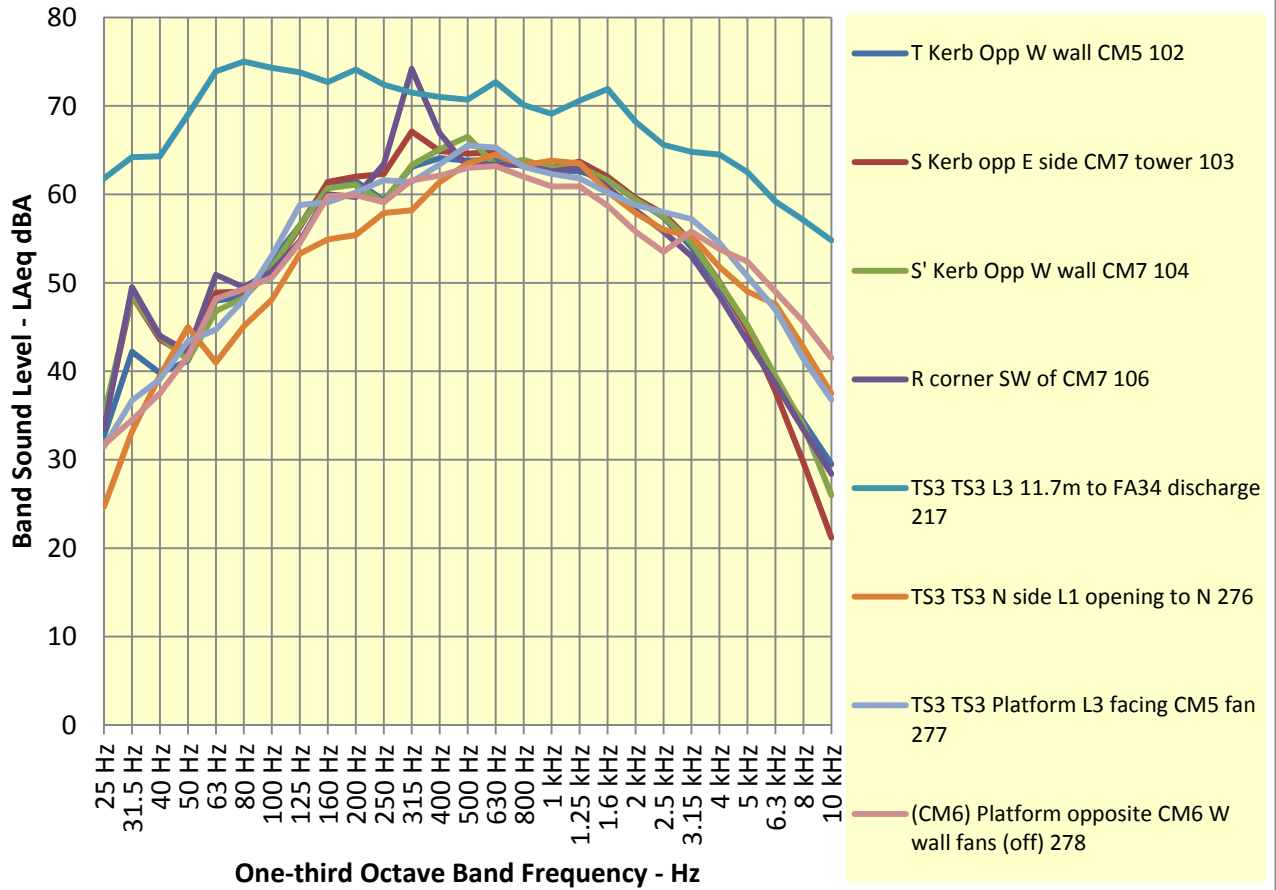


Figure 3.36: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill Southern side and TS3 locations

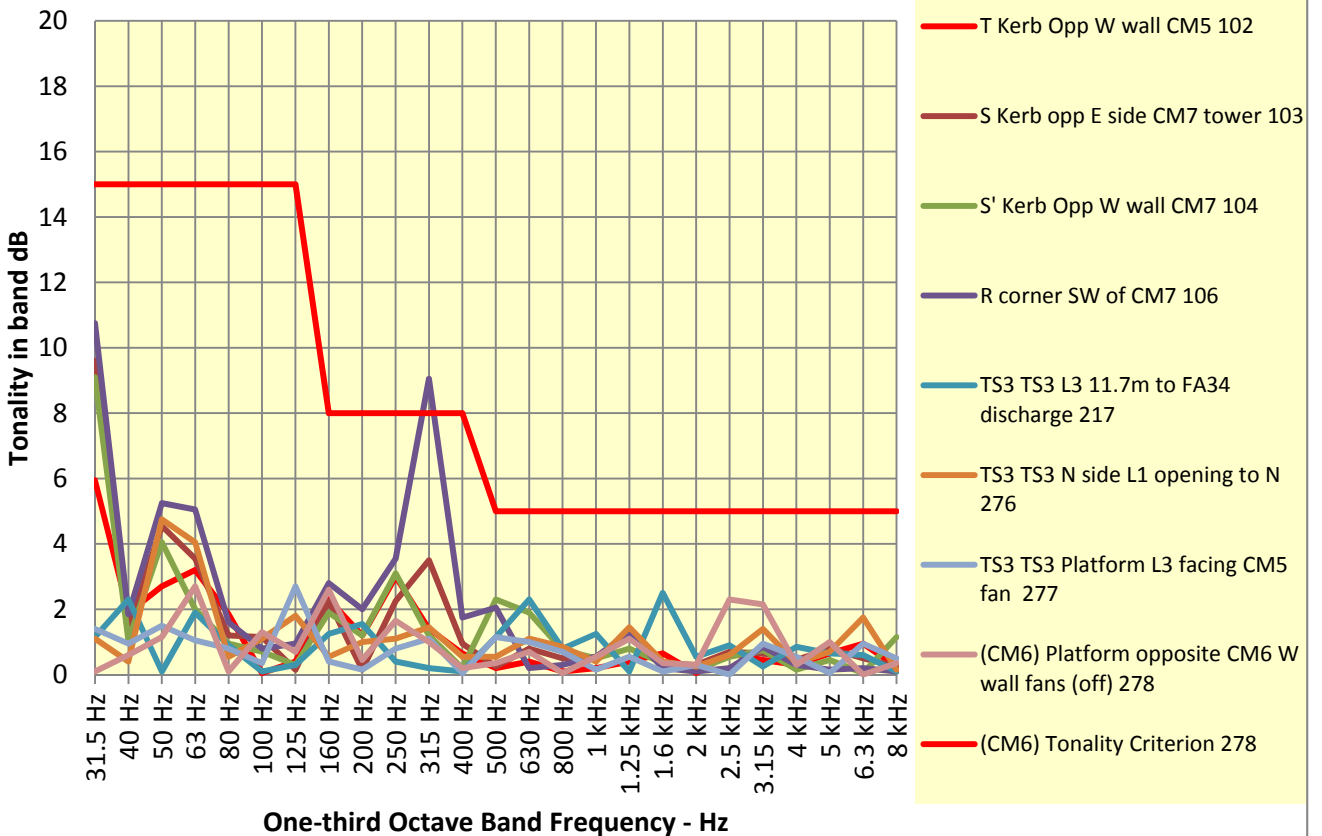


Figure 3.37A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill inside locations ground level

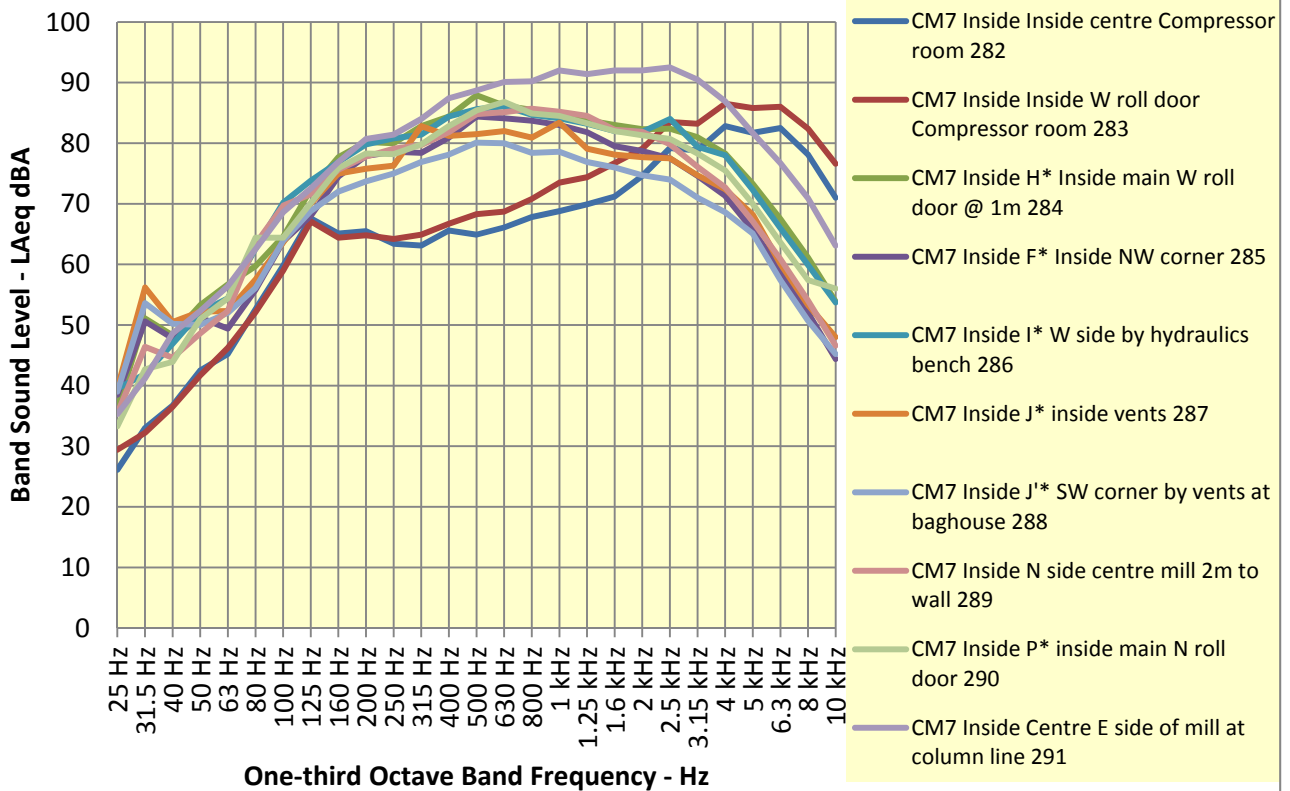


Figure 3.37: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill inside ground level locations

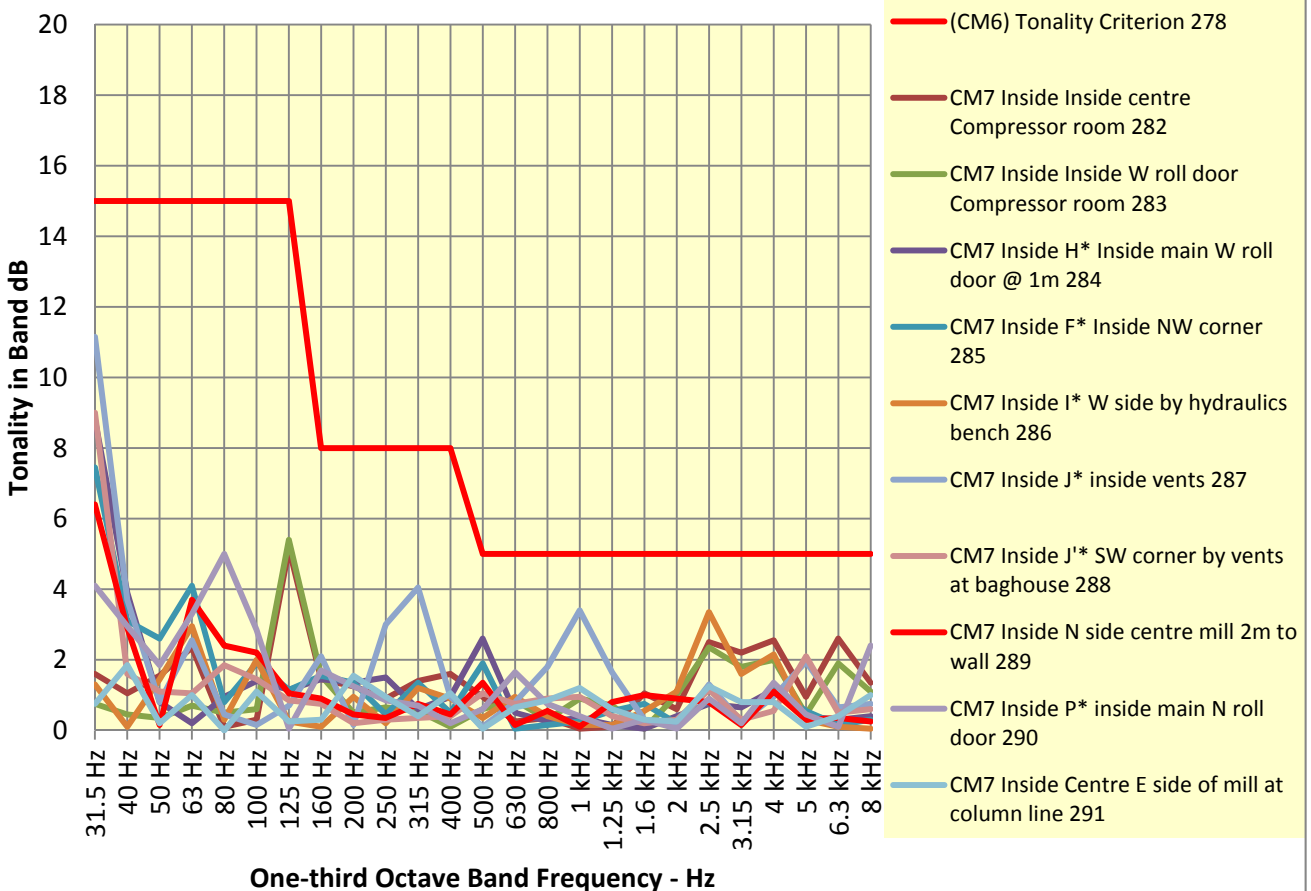


Figure 3.38A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill inside locations inside mill platform level locations

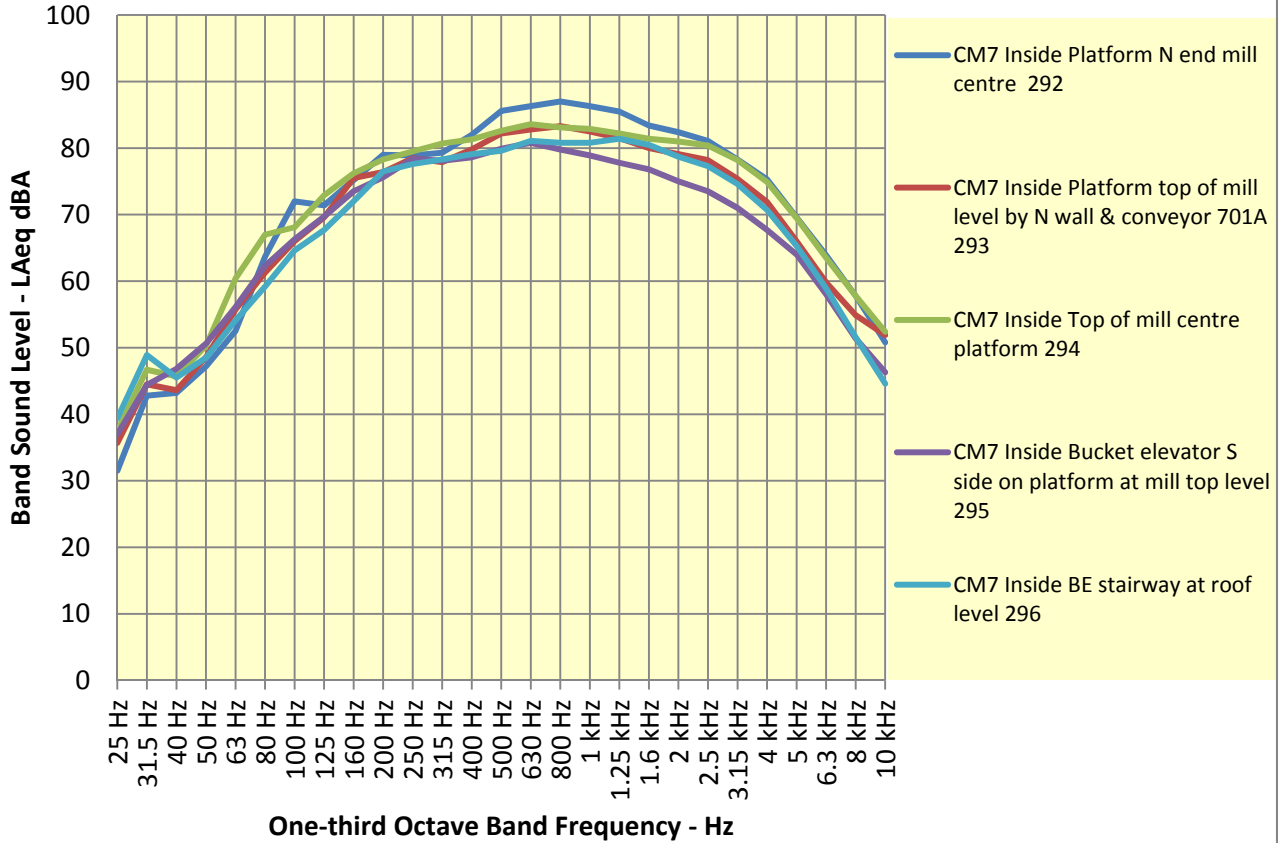
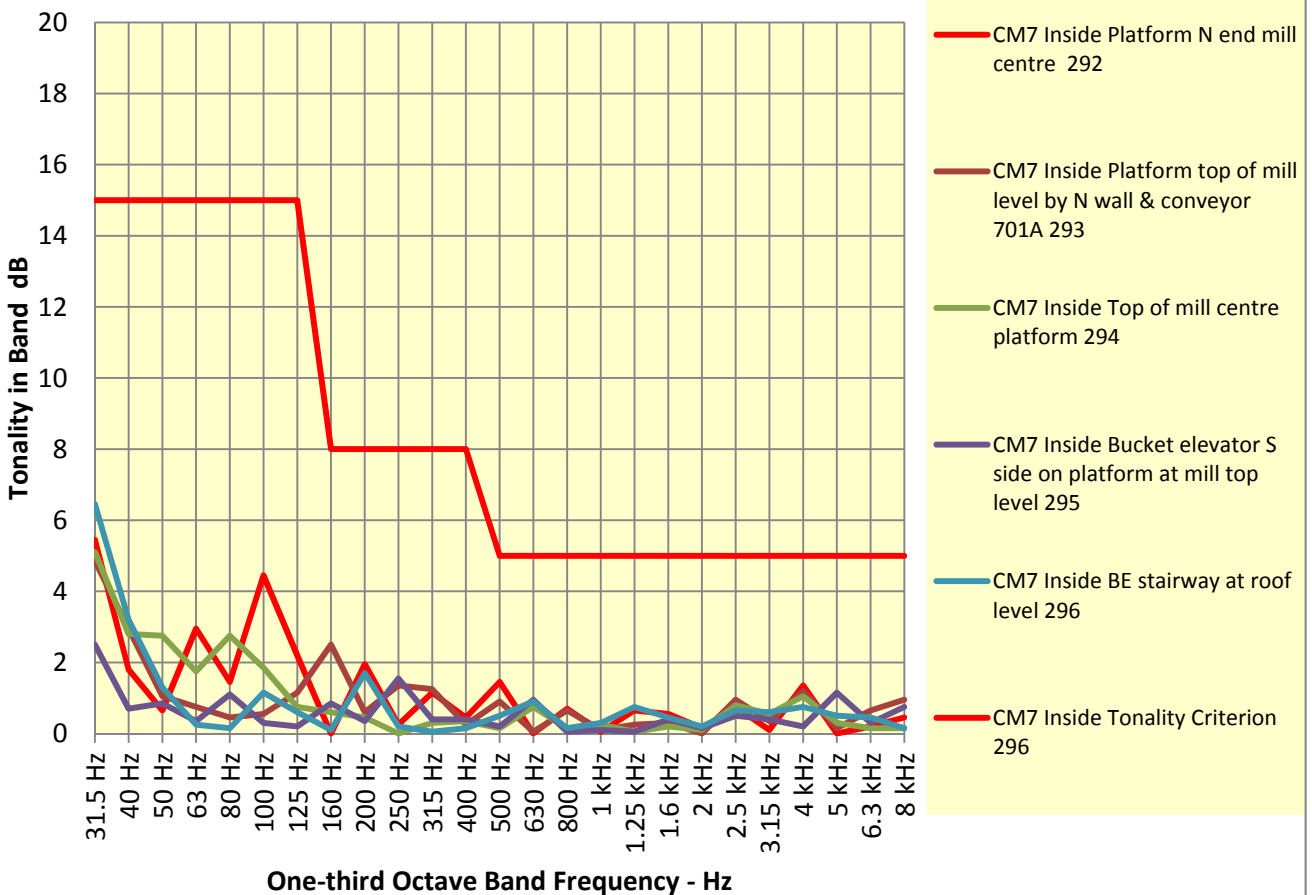


Figure 3.38: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill - inside mill platform level locations



**Figure 3.39A: Boral Cement Berrima - One-third octave band spectra for No.7
Cement Mill inside locations inside BE tower locations**

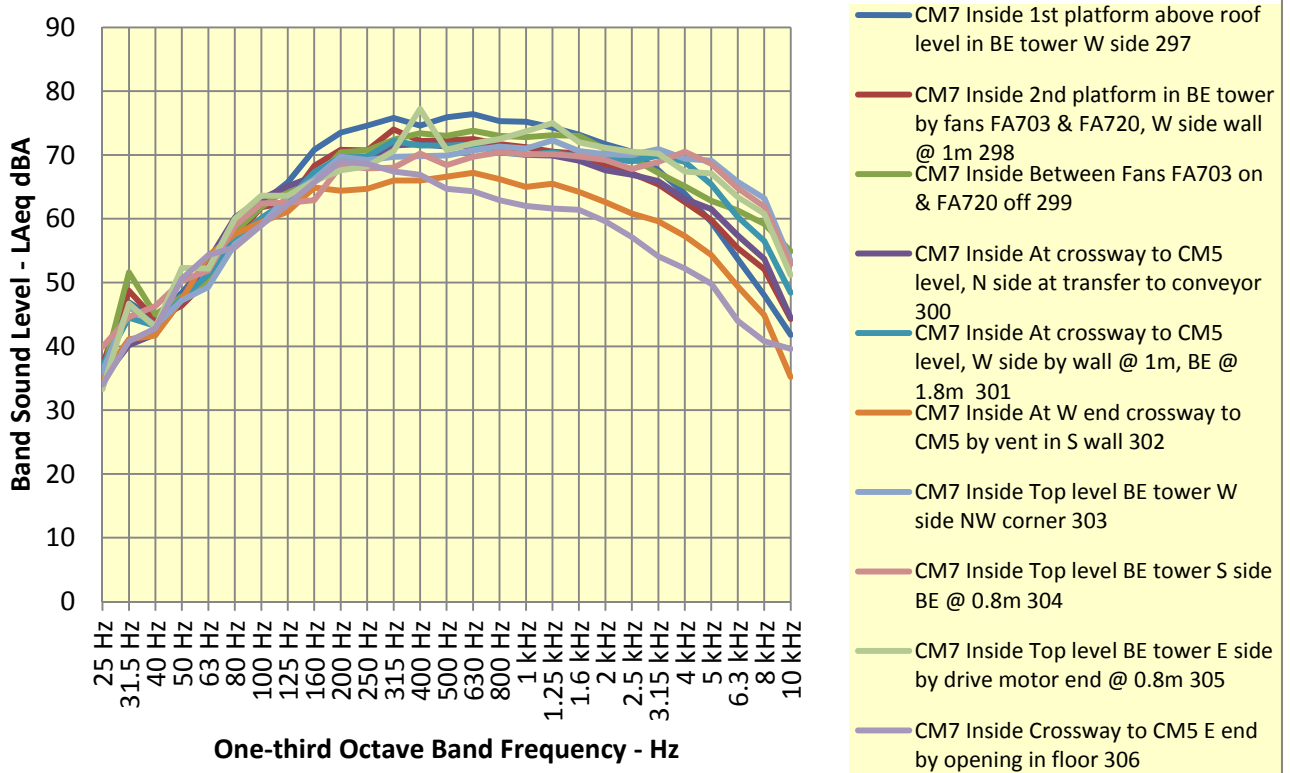


Figure 3.39: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill inside BE tower locations

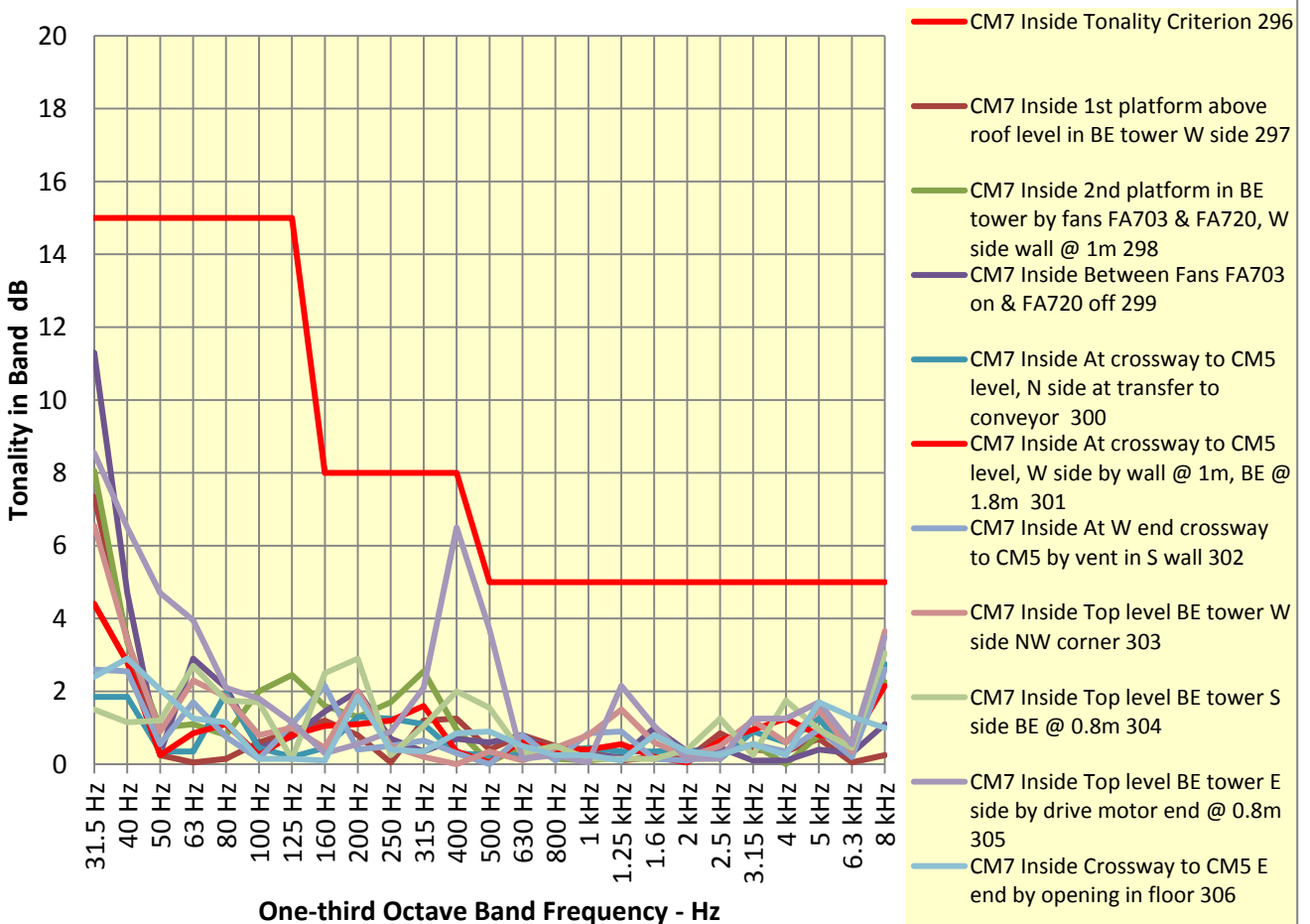


Figure 3.40A: Boral Cement Berrima - One-third octave band spectra for No.7 Cement Mill inside locations inside main baghouse and mill drive area

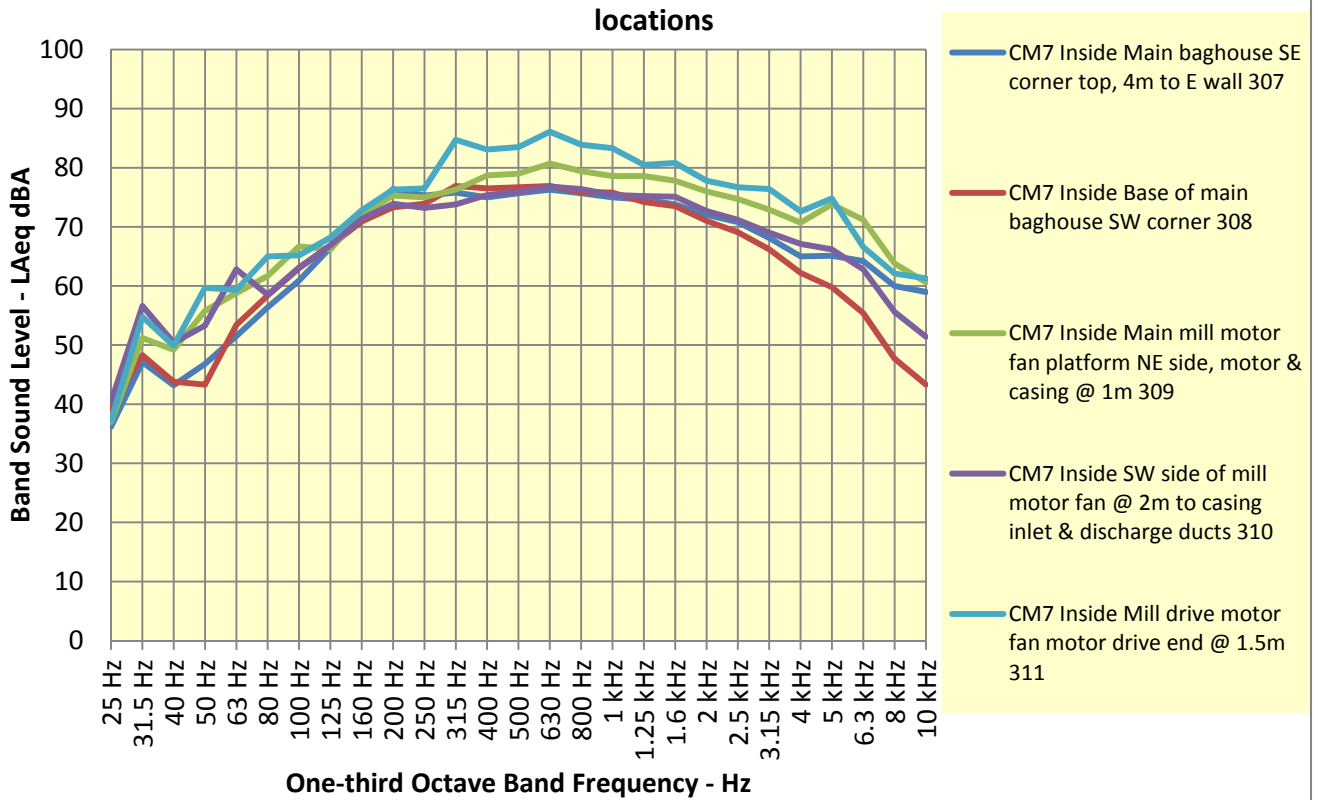


Figure 3.40: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.7 Cement Mill inside - main baghouse and mill drive

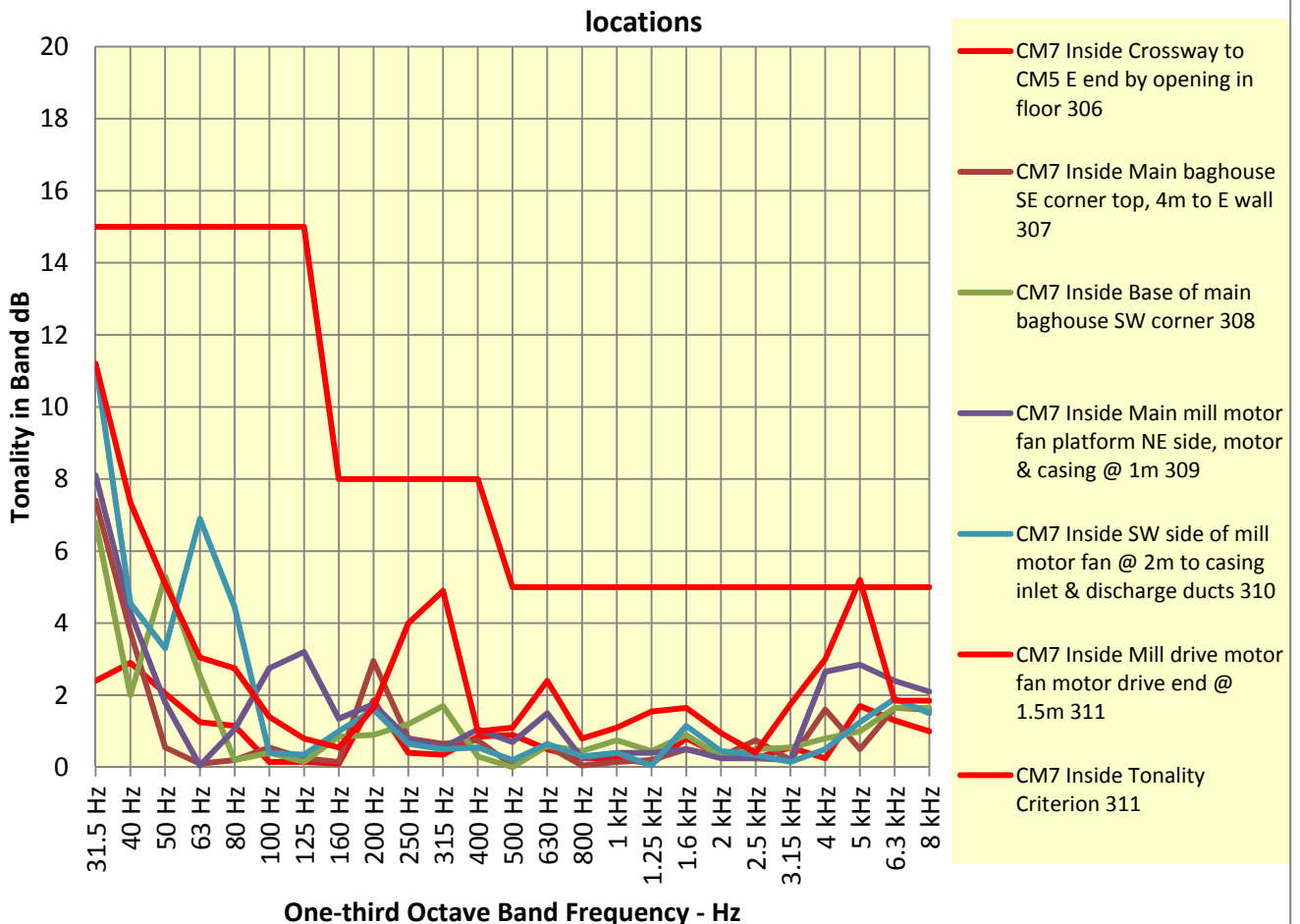


Figure 3.41A: Boral Cement Berrima - One-third octave band spectra for No.5 Cement Mill Building inside locations

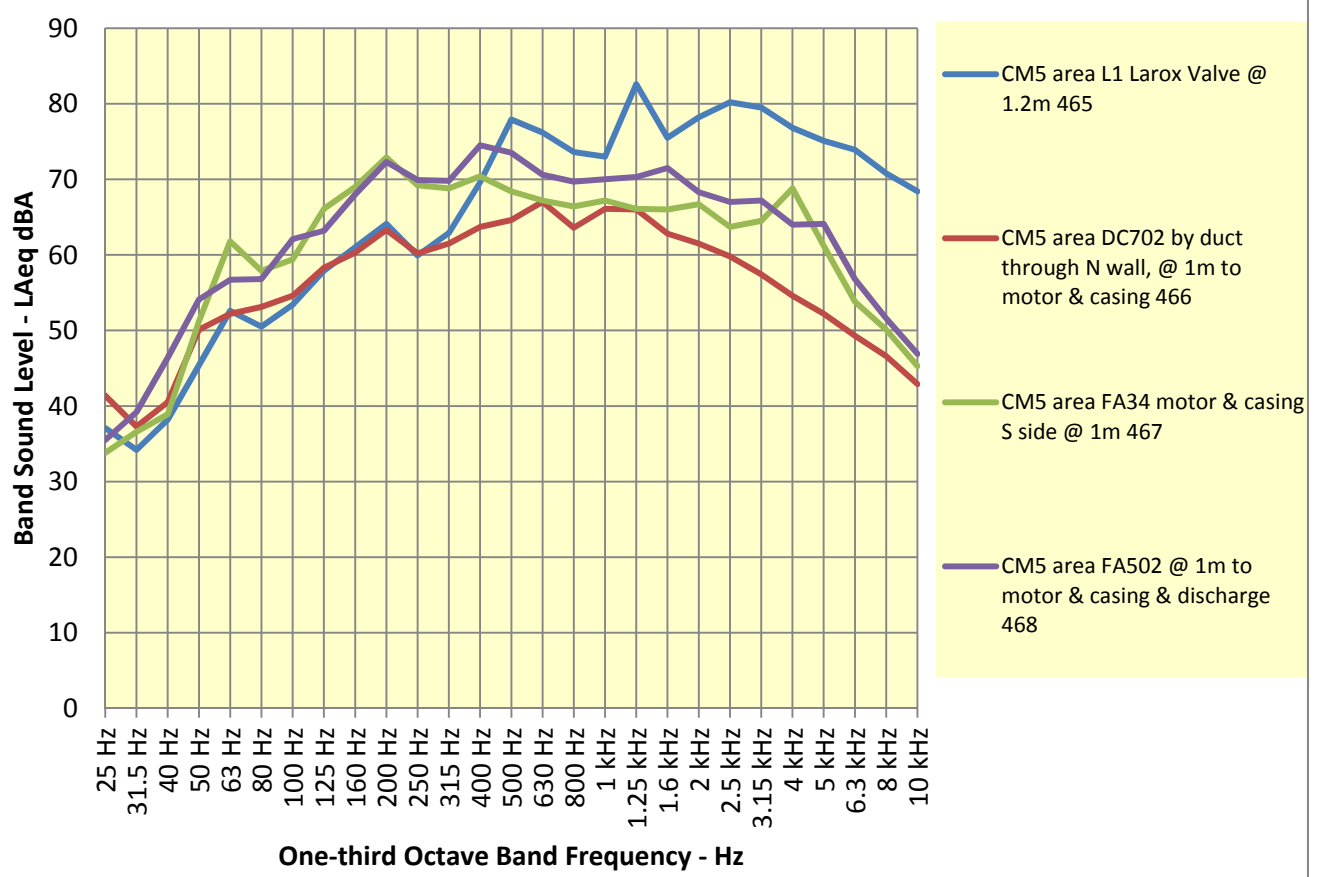


Figure 3.41: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.5 Cement Mill building inside locations

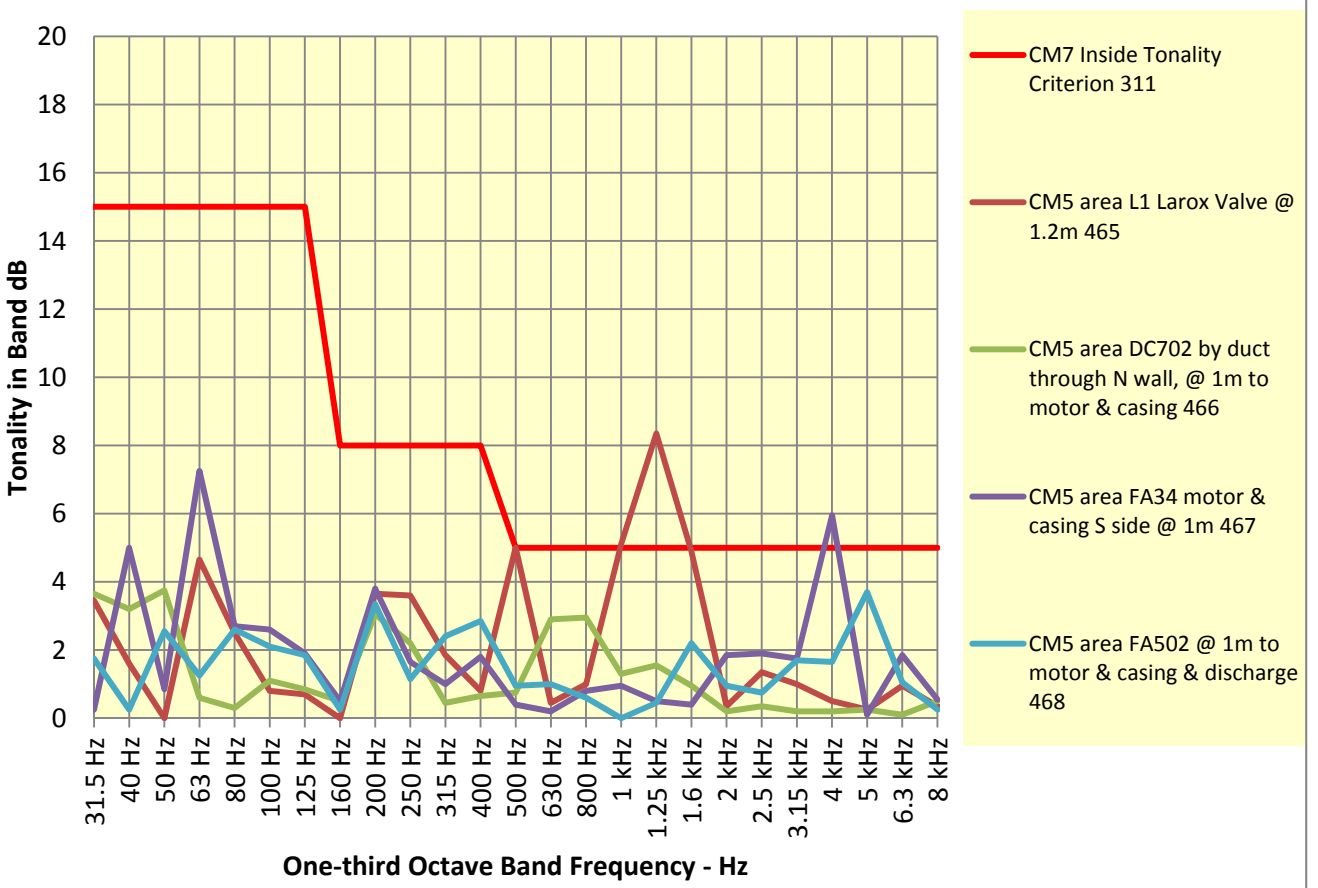


Figure 3.42A: Boral Cement Berrima - One-third octave band spectra for No.6 Cement Mill Building outside locations - Western Wall fans from conveyor gantry platform

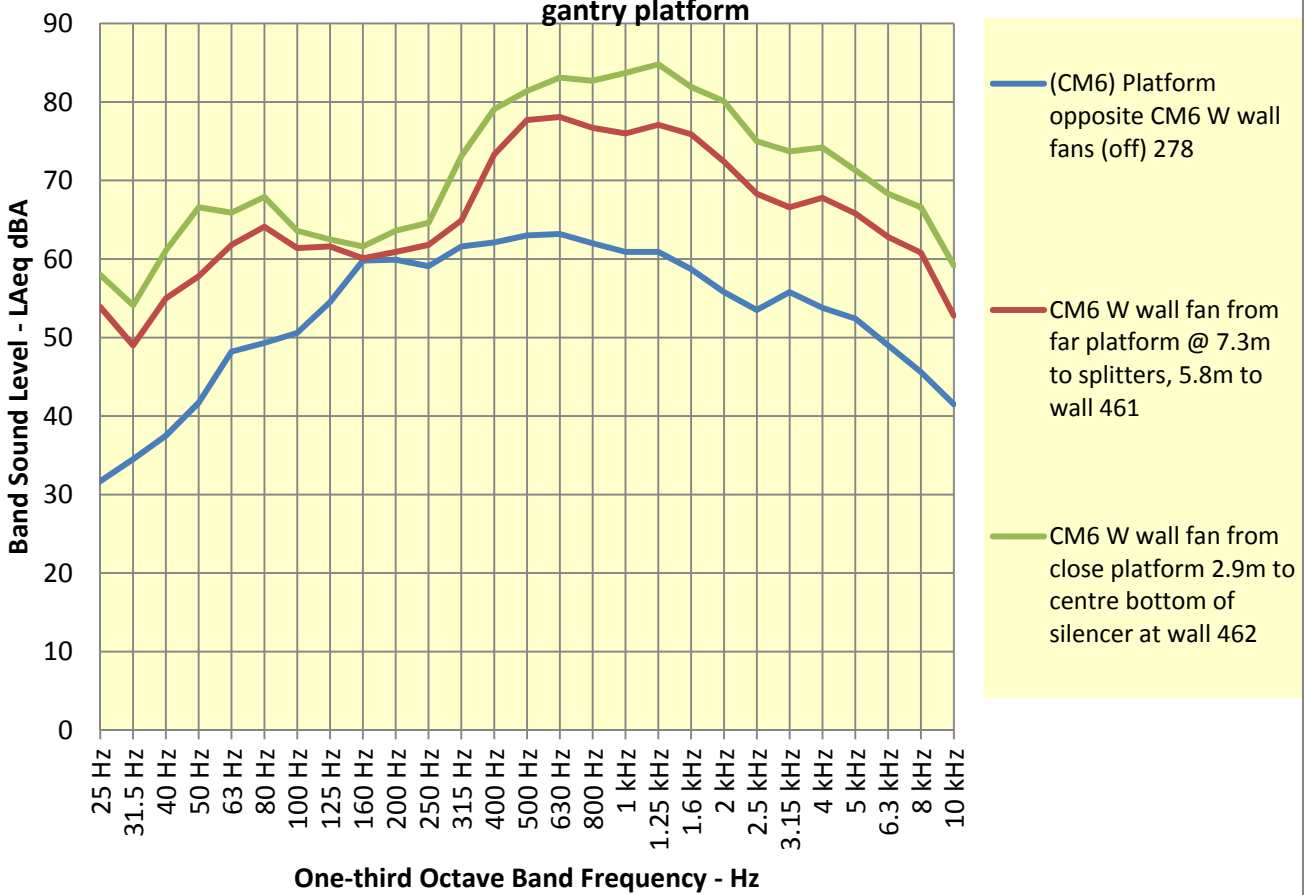


Figure 3.42: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.6 Cement Mill building outside locations - Western wall fans from conveyor gantry platform

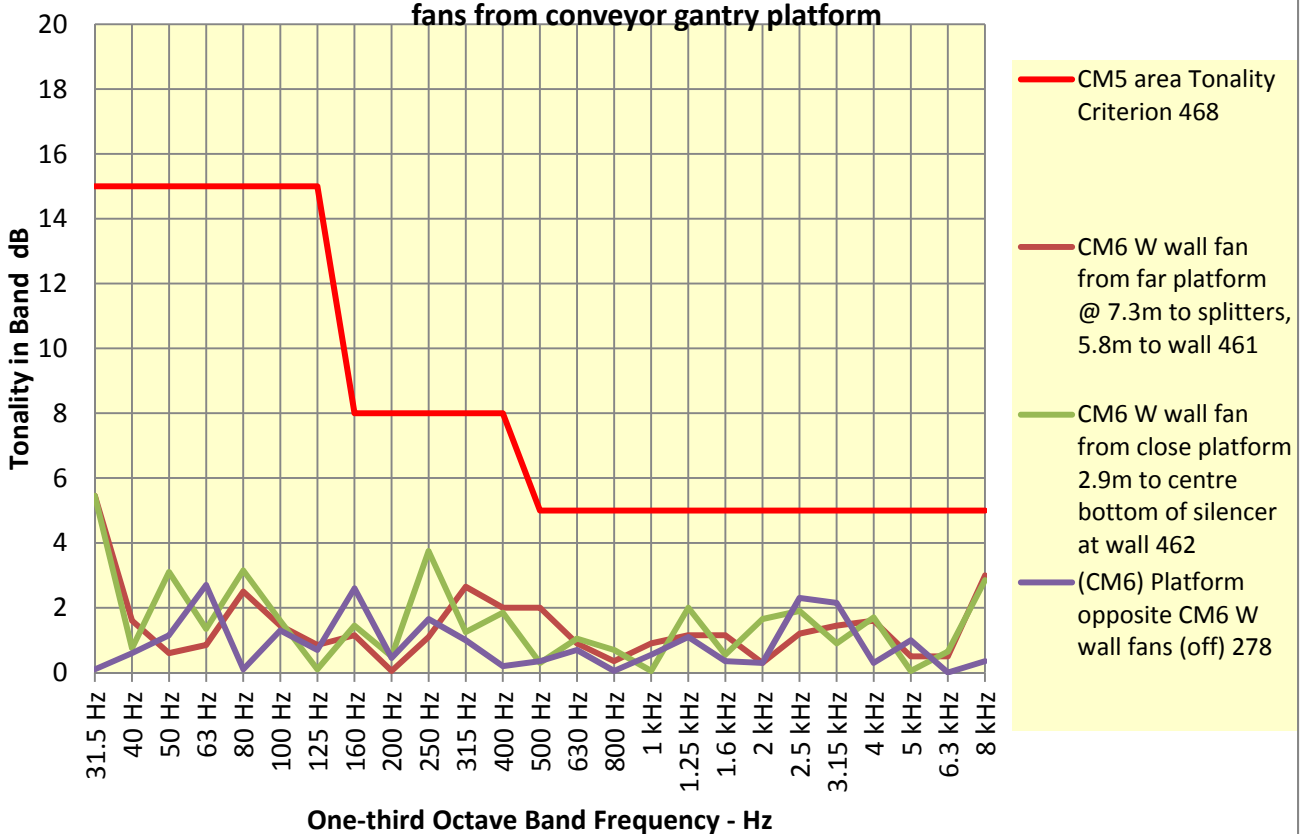


Figure 3.43A: Boral Cement Berrima - One-third octave band spectra for No.6 Cement Mill Building outside locations - southern and eastern side

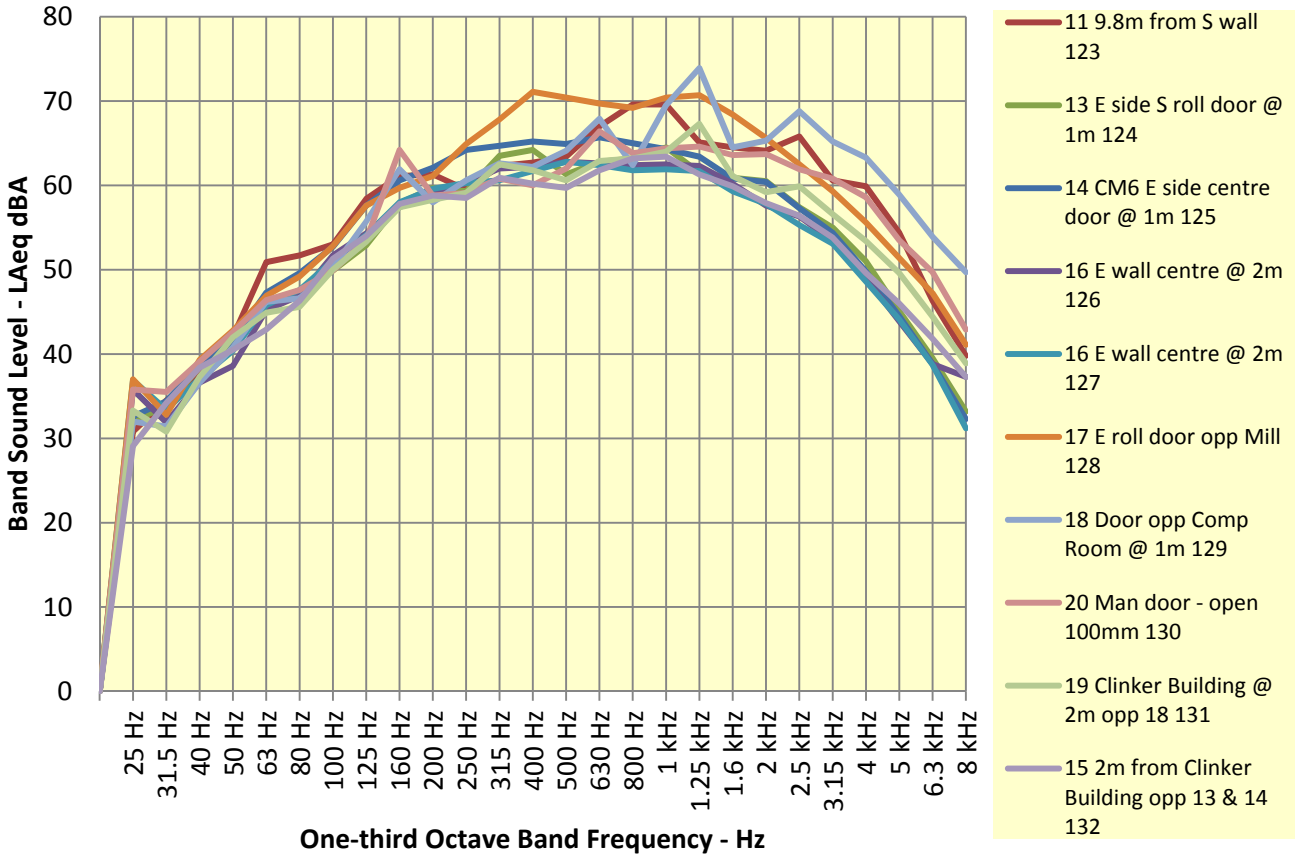


Figure 3.43: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.6 Cement Mill building outside locations - southern and eastern side

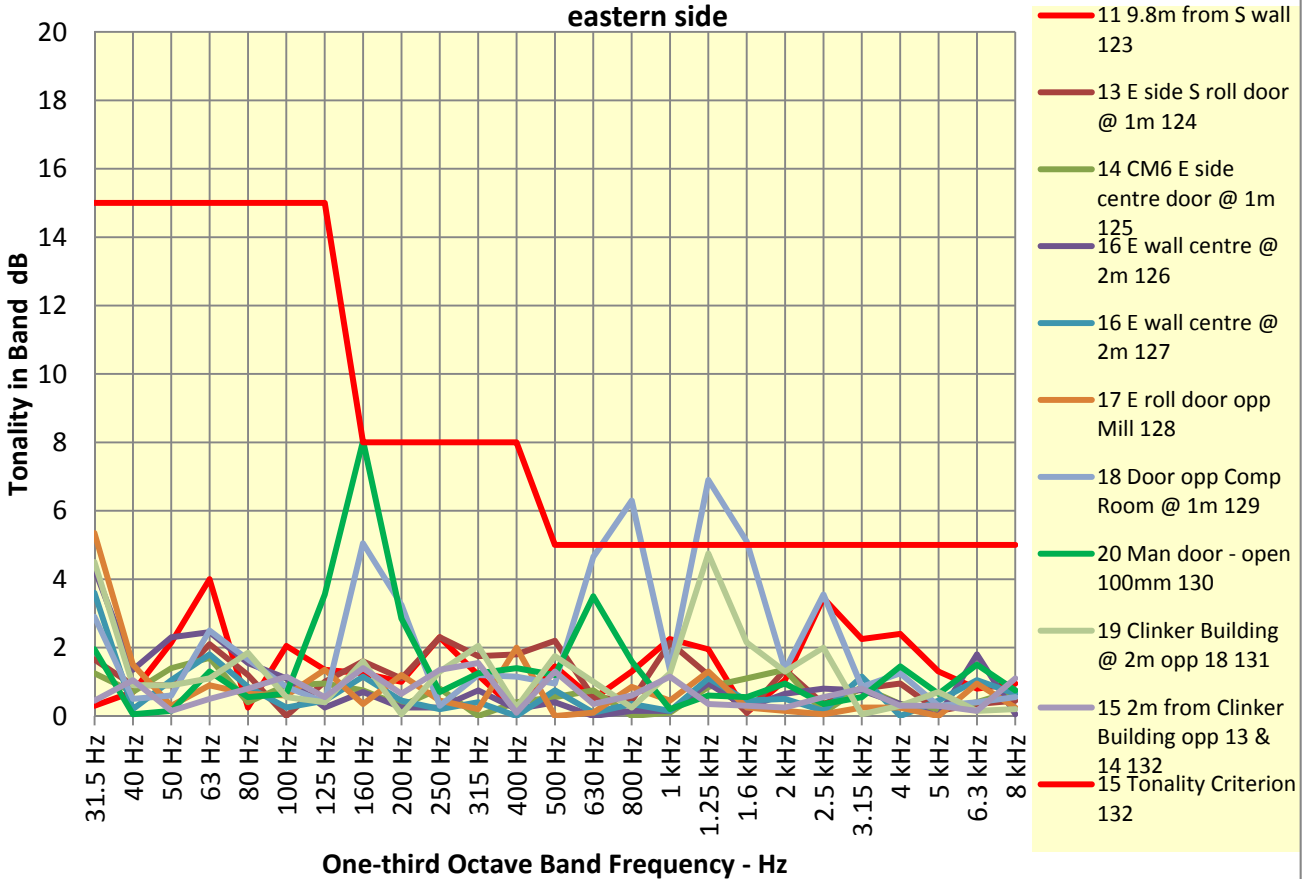


Figure 3.44A: Boral Cement Berrima - One-third octave band spectra for No.6 Cement Mill Building outside locations - northern side

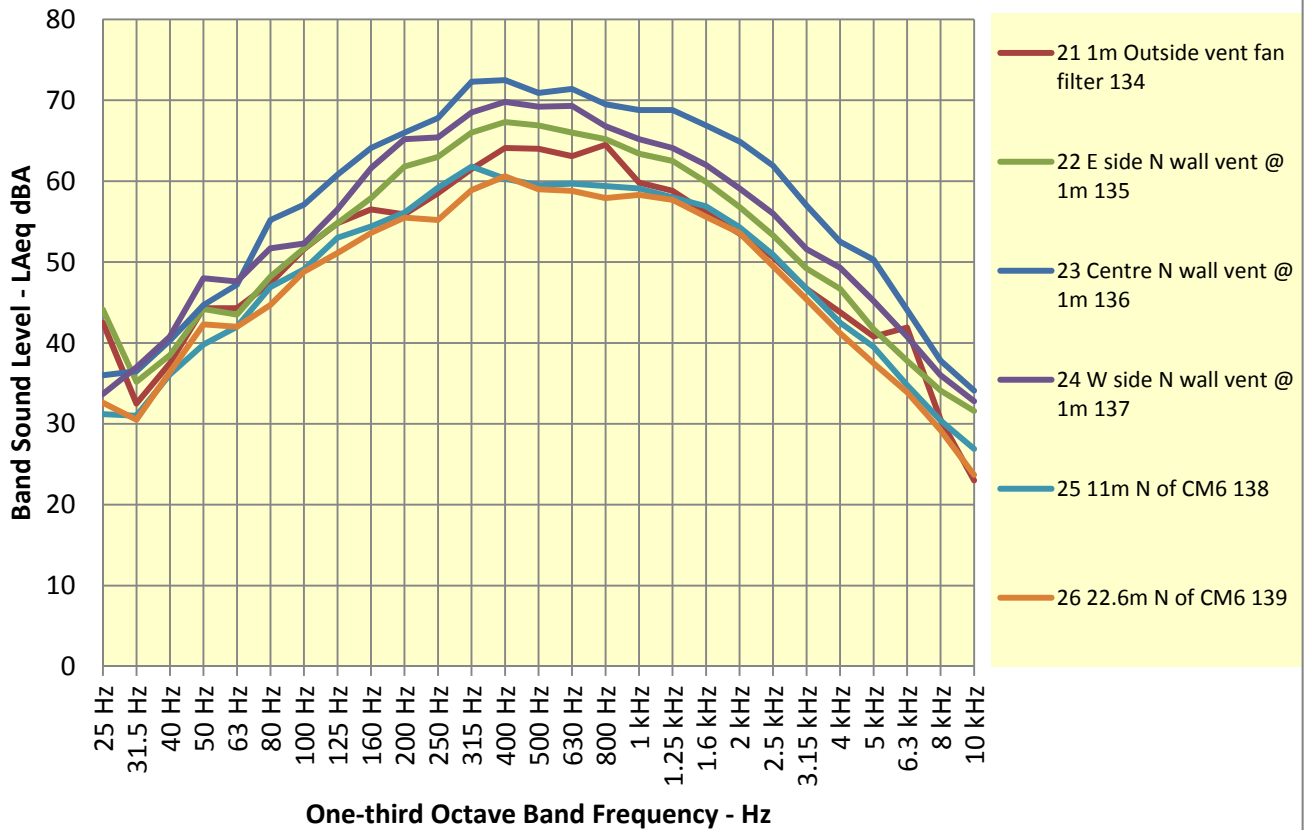


Figure 3.44: Boral Cement Berrima - Tonality assessment of One-third octave band spectra for No.6 Cement Mill building outside locations - northern side

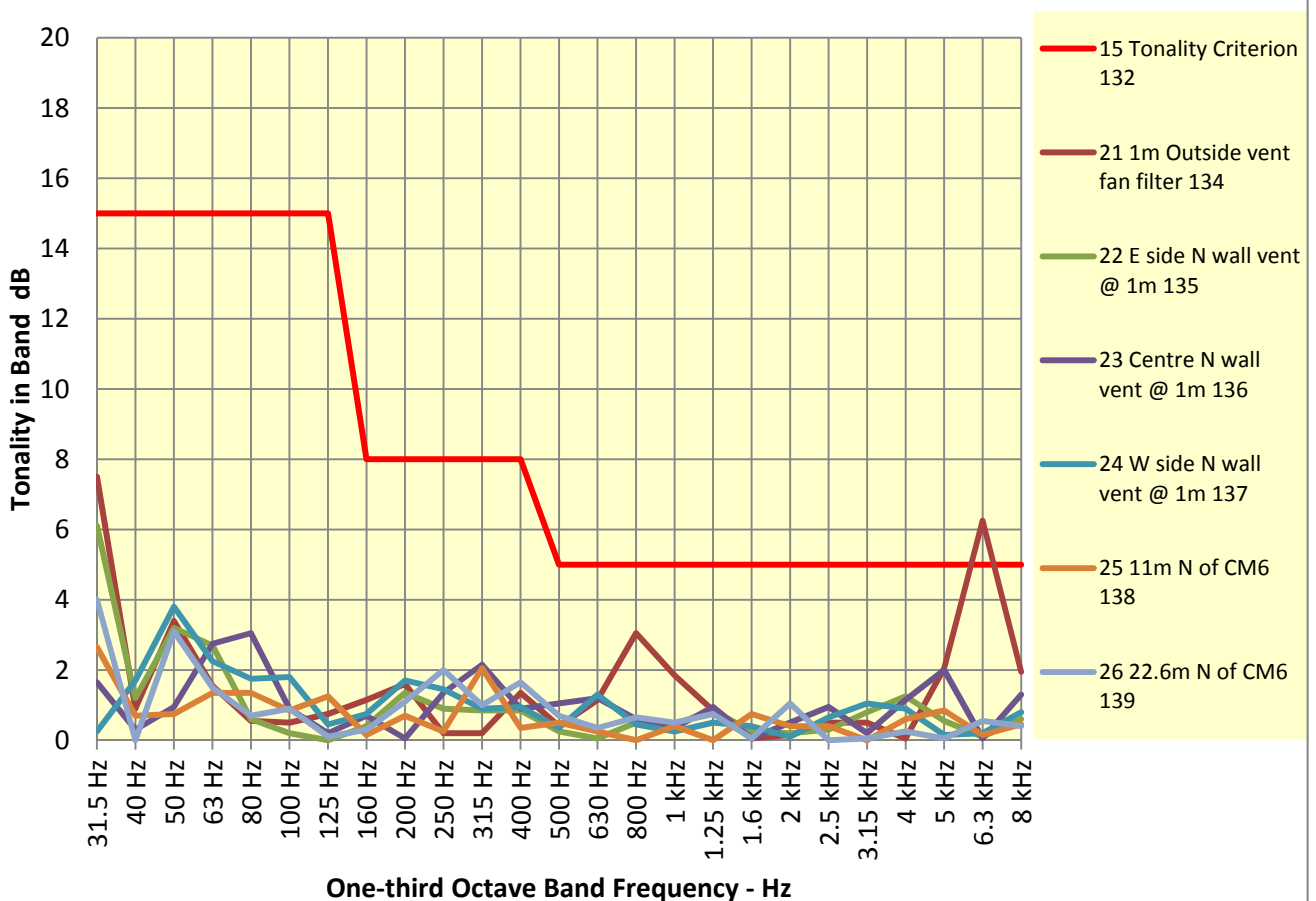


Table 4.5: Boral Cement Berrima Annual Noise Survey 2017
Attended residential measurements September and October 2017
Summary of statistical one-third octave band results

Location	Date	Time of day	File	Type	Total A	Sound level dBA in one-third octave band centre frequency - Hz																													
						25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Outside Northern Fence location	16/10/2017	20:54 Evening	142	LAeq	52	21	21	24	26	29	31	31	30	37	38	33	35	39	42	41	40	40	37	36	33	31	28	24	21	19	17	14	11		
				LA90	48	20	20	20	21	23	25	26	27	33	34	30	33	36	38	38	38	38	38	35	33	29	25	22	20	20	20	20	20	20	20
Outside Northern Fence location	16/10/2017	23:46 Night	149	LAeq	77	21	19	20	23	25	25	27	29	34	33	28	31	36	39	37	36	35	33	32	29	26	22	20	18	16	14	12	10		
				LA90	76	20	20	20	20	20	22	23	26	30	29	26	28	33	35	35	34	33	31	30	27	23	20	20	20	20	20	20	20	20	20
Store Yard Close	19/09/2017	10:48 Daytime	130	LAeq	60	33	37	39	41	43	44	44	46	48	48	47	47	49	50	50	48	49	48	47	45	44	42	40	38	35	32	30	23		
				LA90	55	16	22	25	27	31	34	35	39	42	42	40	41	43	44	44	43	43	42	41	37	34	29	24	19	15	11	8	5		
Store Yard Close	6/10/2017	12:29 Daytime	141	LAeq	59	24	23	29	31	36	37	50	41	42	44	42	44	48	50	49	48	49	48	48	46	43	41	38	34	30	26				
				LA90	54	20	20	20	21	23	25	26	27	33	34	30	33	36	38	38	38	38	38	35	33	29	25	22	20	20	20	20			

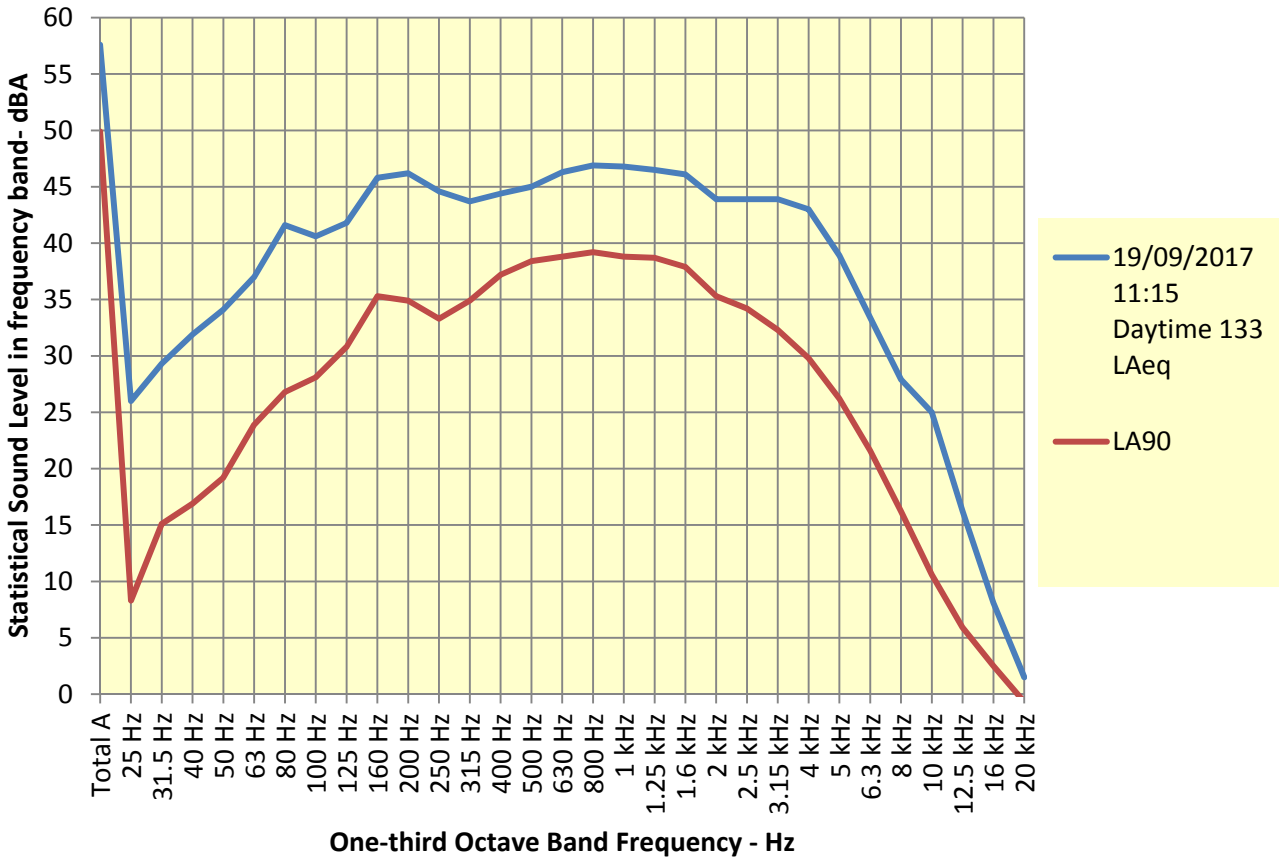
Table 4.6: Boral Cement Berrima Annual Noise Survey 2017
Attended residential measurements September and October 2017

Tonality assessment of statistical one-third octave band results

Note: If cell value exceeds tonality criteria it is shown as shaded pink

Location	Date	Time of day	File	Type	Tonality in one-third octave band - dB																											
					31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz
Outside Northern Fence location	19/09/2017	8:19 Daytime	127	LAeq	0.6	0.8	0.2	1.1	0.9	0.6	0.6	1.2	0.7	2.3	0.6	0.6	0.6	0.3	0.2	0.1	0.6	0.9	1.4	0.0	2.1	0.1	0.8	6.2	1.1	1.7	0.8	0.3
				LA90	1.8	0.1	0.3	1.2	0.1	0.1	0.4	1.3	0.1	2.0	0.2	0.4	0.5	0.5	0.3	0.5	0.0	0.9	0.3	0.1	0.1	0.4	0.3	0.3	0.6	0.3	0.2	0.2
Northern Boundary (inside)	19/09/2017	11:15 Daytime	1	LAeq	2.7	0.6	1.7	1.1	3.0	1.1	0.6	0.3	0.5	1.2	0.8	0.5	0.3	0.2	0.1	0.4	0.0	0.3	0.1	0.1	0.1	0.6	0.1	0.4	0.5	0.7		
				LA90	0.3	0.5	1.0	0.4	0.8	0.1	0.2	0.5	0.7	1.1	0.5	1.0	0.0	0.4	0.1	0.2	0.4	0.3	0.0	0.2	0.0	0.1	0.2	0.4	0.1	1.7		
Northern Boundary (inside)	6/10/2017	12:03 Daytime	140	LAeq	0.9	0.3	0.4	0.3	1.4	0.2	1.2	0.6	1.4	2.2	0.6	2.6	0.3	0.0	0.5	0.7	0.1	0.9	0.6	0.1	0.9	1.2	1.8	3.3	2.2	0.6		
				LA90	0.1	0.6	0.1	1.1	2.3	0.6	1.8	1.2	1.2	2.2	0.1	1.8	0.2	0.4	0.2	0.4	0.0	1.1	0.1	0.1	0.3	2.2	0.0	0.0	0.0	0.0		
Outside Northern Fence location	16/10/2017	20:54 Evening	142	LAeq	1.8	0.5	0.3	0.6	0.8	0.4	4.0	3.0	3.2	3.9	1.0	1.1	1.6	0.3	0.0	1.1	0.7	0.9	0.6	0.9	0.2	0.3	0.9	0.5	0.2	0.1		
				LA90	0.0	0.3	1.0	0.3	0.7	0.4	2.4	2.5	2.7	3.4	0.5	0.7	1.1	0.1	0.2	1.0	0.1	0.6	0.2	0.4	0.5	1.0	0.0	0.0	0.0	0.0		
Outside Northern Fence location	16/10/2017	23:46 Night	149	LAeq	1.4	0.7	0.1	1.4	1.1	0.1	1.7	3.3	2.0	3.9	1.2	1.2	2.0	0.1	0.1	0.7	0.6	1.4	0.3	0.0	0.1	0.5	0.3	0.4	0.1	0.1		
				LA90	0.0	0.0	0.0	0.8	0.0	0.6	0.8	2.8	1.1	3.1	0.9	1.2	1.2	0.2	0.3	0.4	0.4	1.3	0.1	0.2	1.5	0.0	0.0	0.0	0.0	0.0		
Tonality Criteria					15.0	15.0	15.0	15.0	15.0	15.0	15.0	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Store Yard Close	19/09/2017	10:48 Daytime	130	LAeq	0.7	0.3	0.0	0.0	0.9	0.7	0.4	1.0	0.5	0.5	0.6	0.0	0.9	0.5	1.1	0.8	0.1	0.6	0.5	0.2	0.1	0.4	0.1	0.5	0.9			
				LA90	1.5	0.0	0.8	0.5	1.3	1.7	0.3	1.8	1.3	1.9	0.4	0.6	0.6	0.1	0.3	0.3	0.4	1.4	0.5	0.6	0.3	0.1	0.4	0.5	0.2			
Store Yard Close	6/10/2017	12:29 Daytime	141	LAeq	4.0	2.2	1.2	1.5	5.8	11.0	4.7	0.7	1.8	1.7	1.2	1.2	1.3	0.3	0.4	0.6	0.2	0.6	0.7	0.4	0.8	0.0	0.1	0.2	3.5			
				LA90	0.0	0.3	1.0	0.3	0.7	0.4	2.4	2.5	2.7	3.4	0.5	0.7	1.1	0.1	0.2	1.0	0.1	0.6	0.2	0.4	0.5	1.0	0.0	0.0	0.0			

**Figure 4.32: Boral Cement Berrima Annual Environmental Noise 2017 -
Tonality assessment spectra for attended residential - 4 Melbourne St**



**Figure 4.32A: Boral Cement Berrima Annual Environmental Noise 2017 -
Tonality assessment spectra for attended residential - 4 Melbourne St**

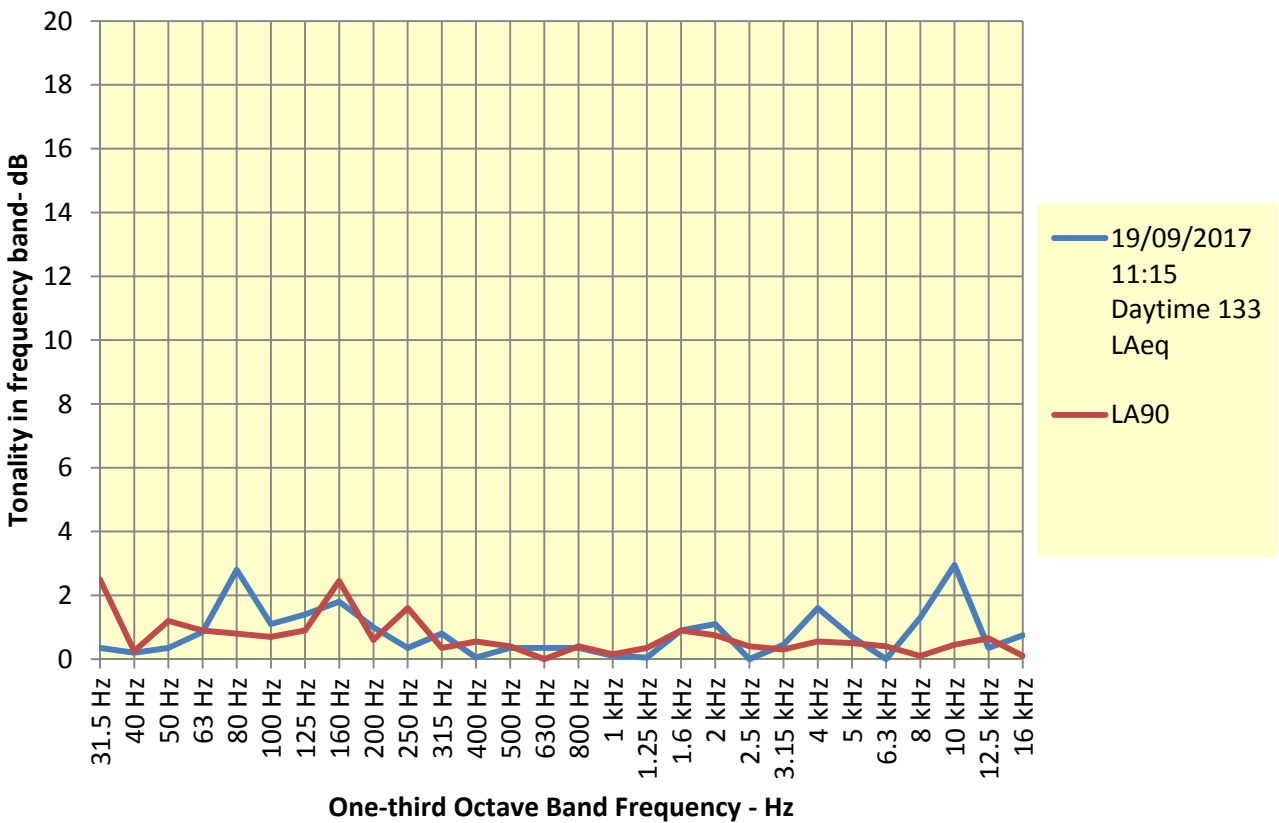


Figure 4.33: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 4 Melbourne St

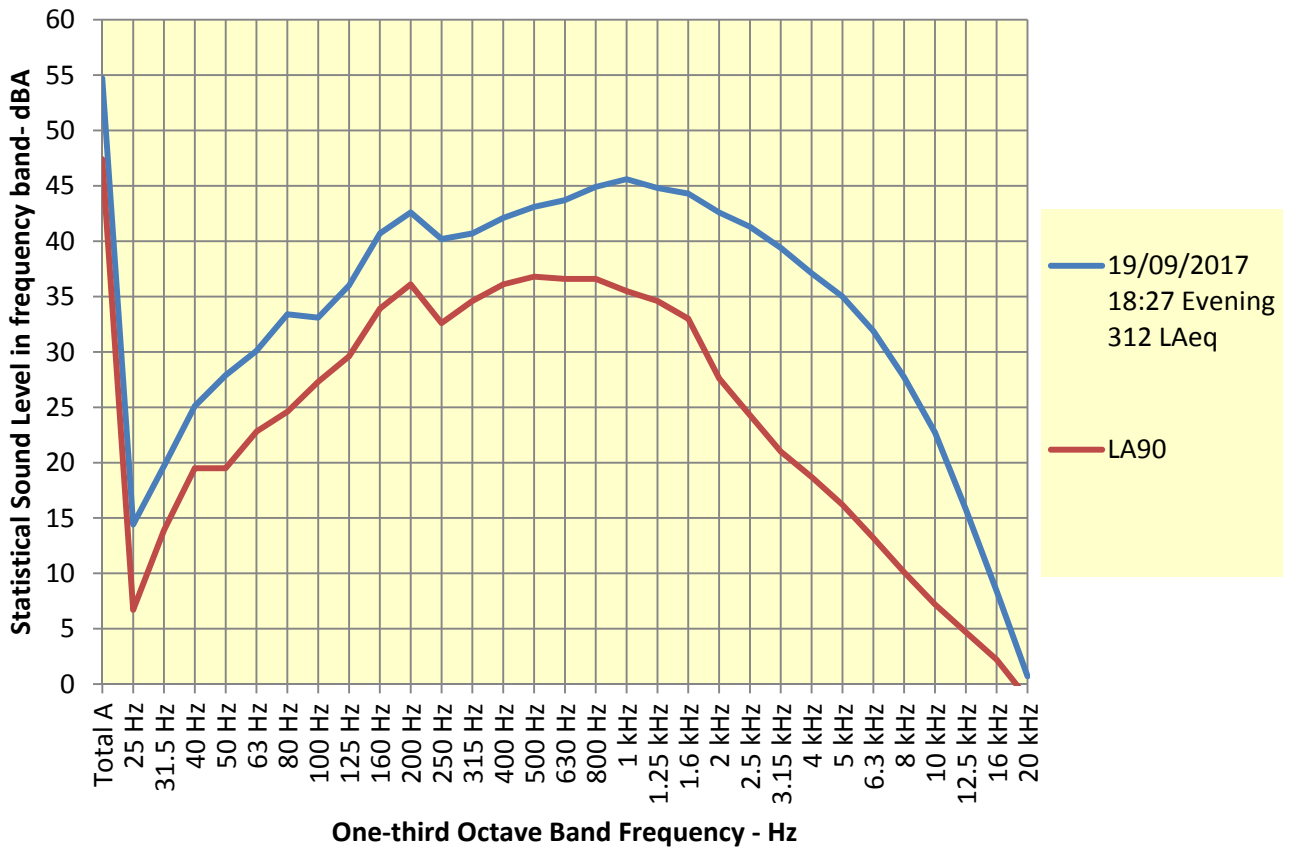


Figure 4.33A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 4 Melbourne St

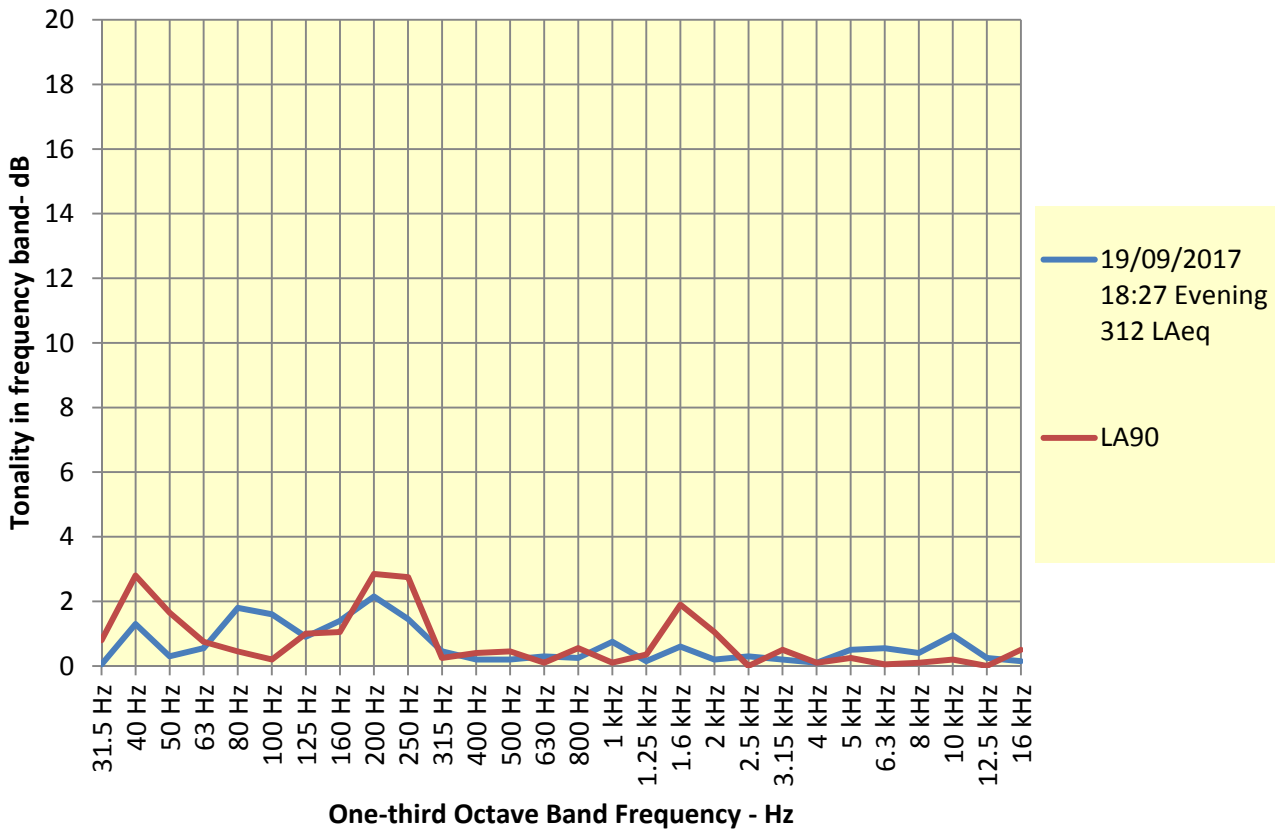


Figure 4.35: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 4 Melbourne St

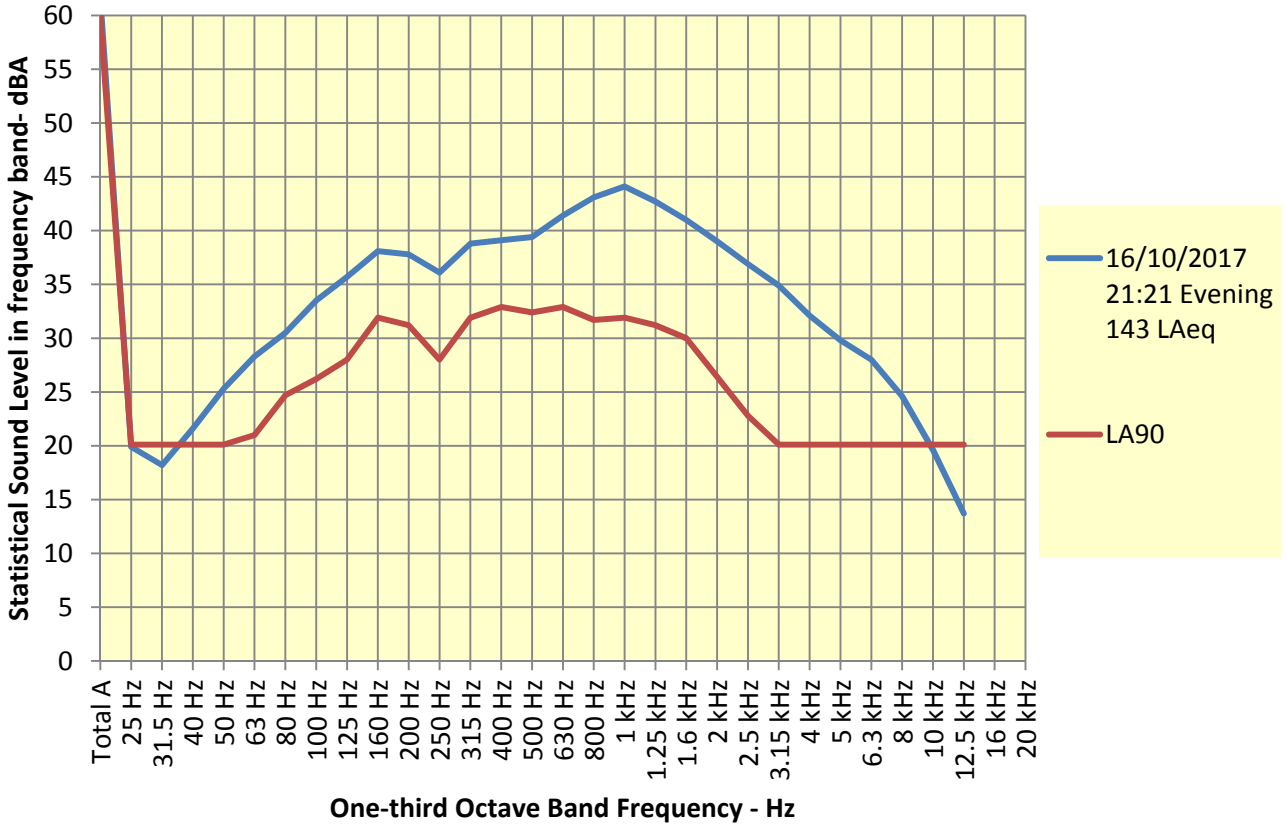


Figure 4.35A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 4 Melbourne St

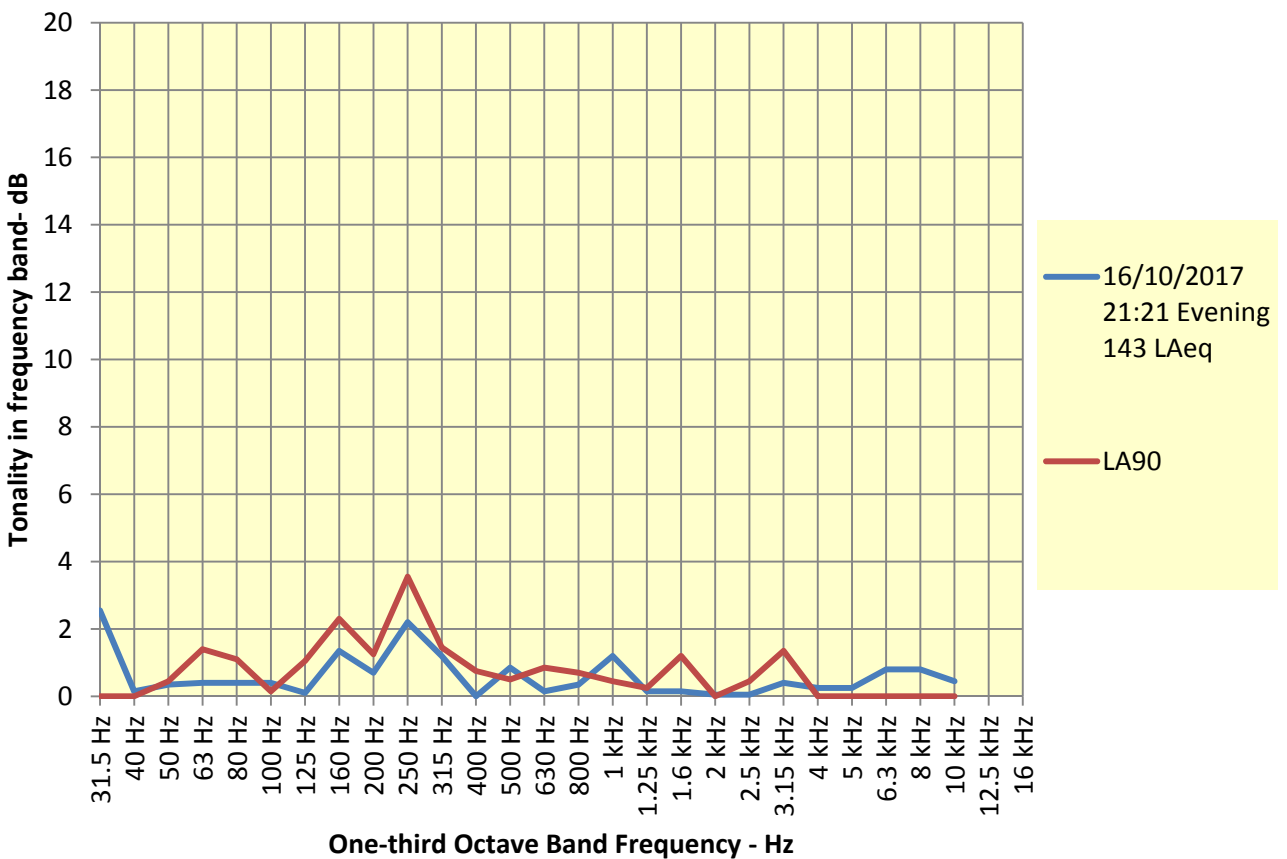


Figure 4.36: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 4 Melbourne St

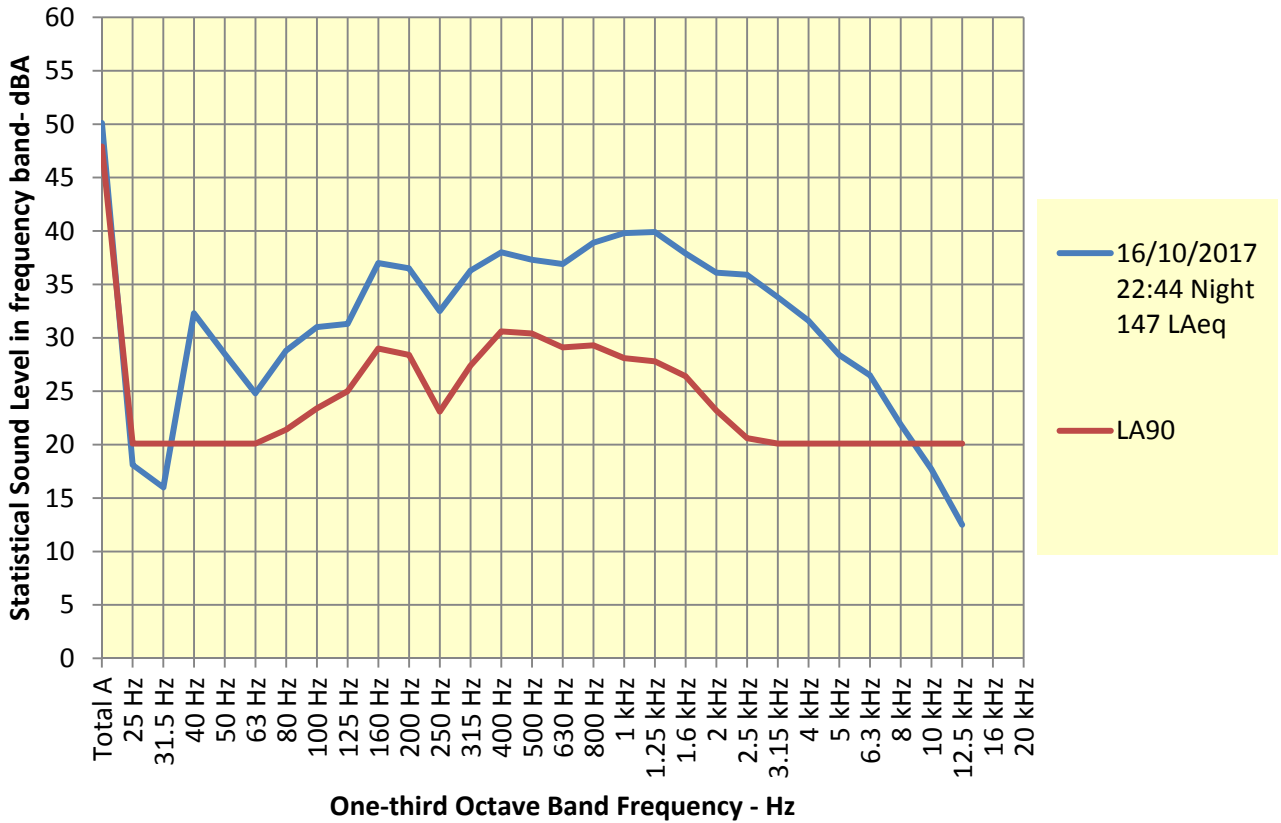


Figure 4.36A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 4 Melbourne St

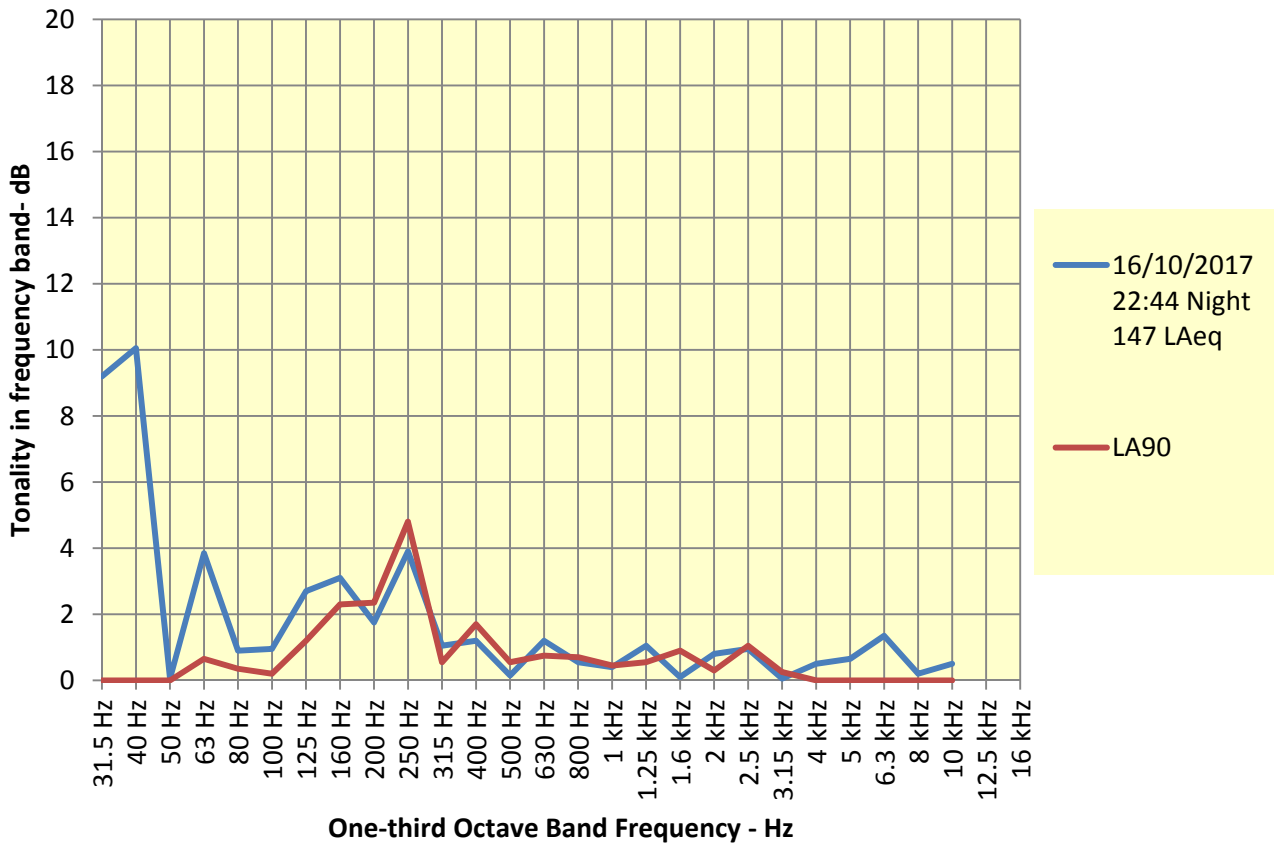


Figure 4.38: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 72 Taylor Ave

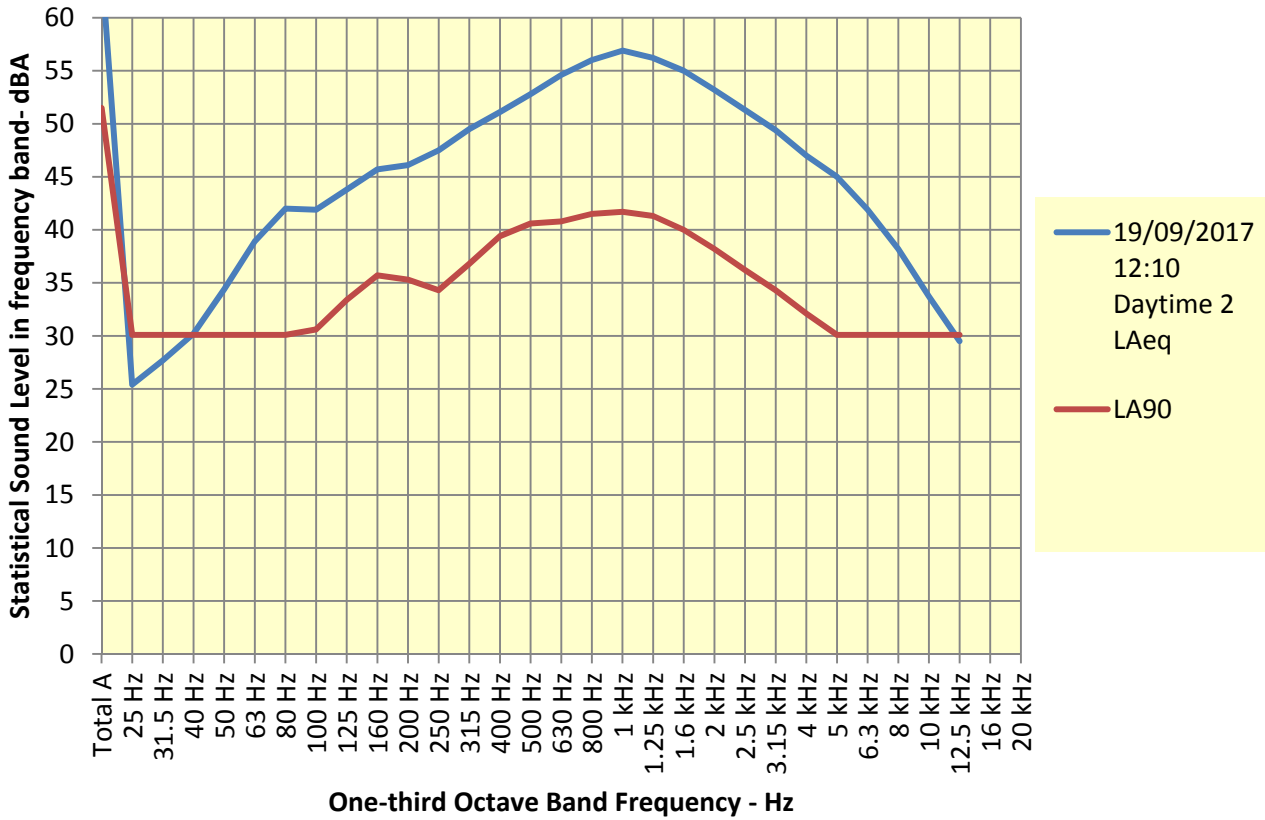


Figure 4.38A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 72 Taylor Ave

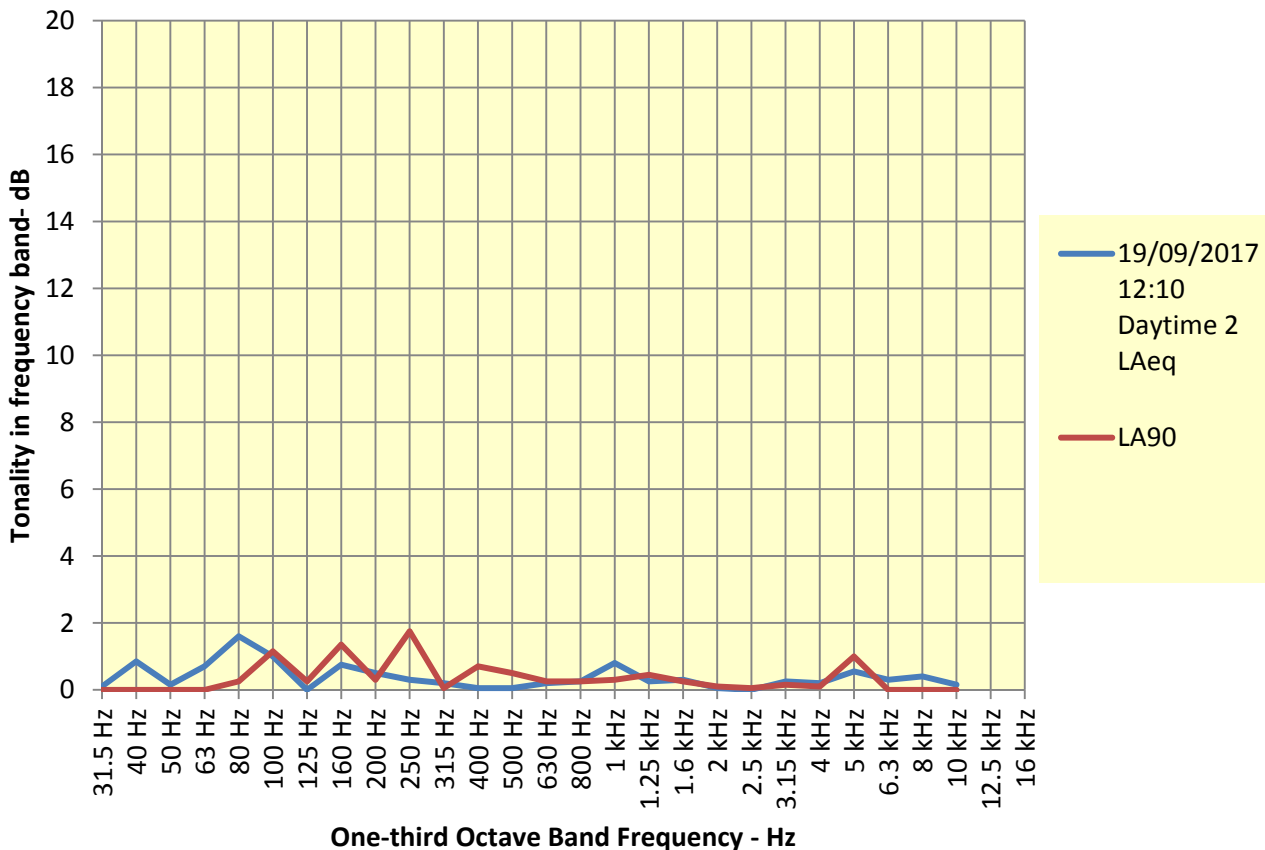


Figure 4.39: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 72 Taylor Ave

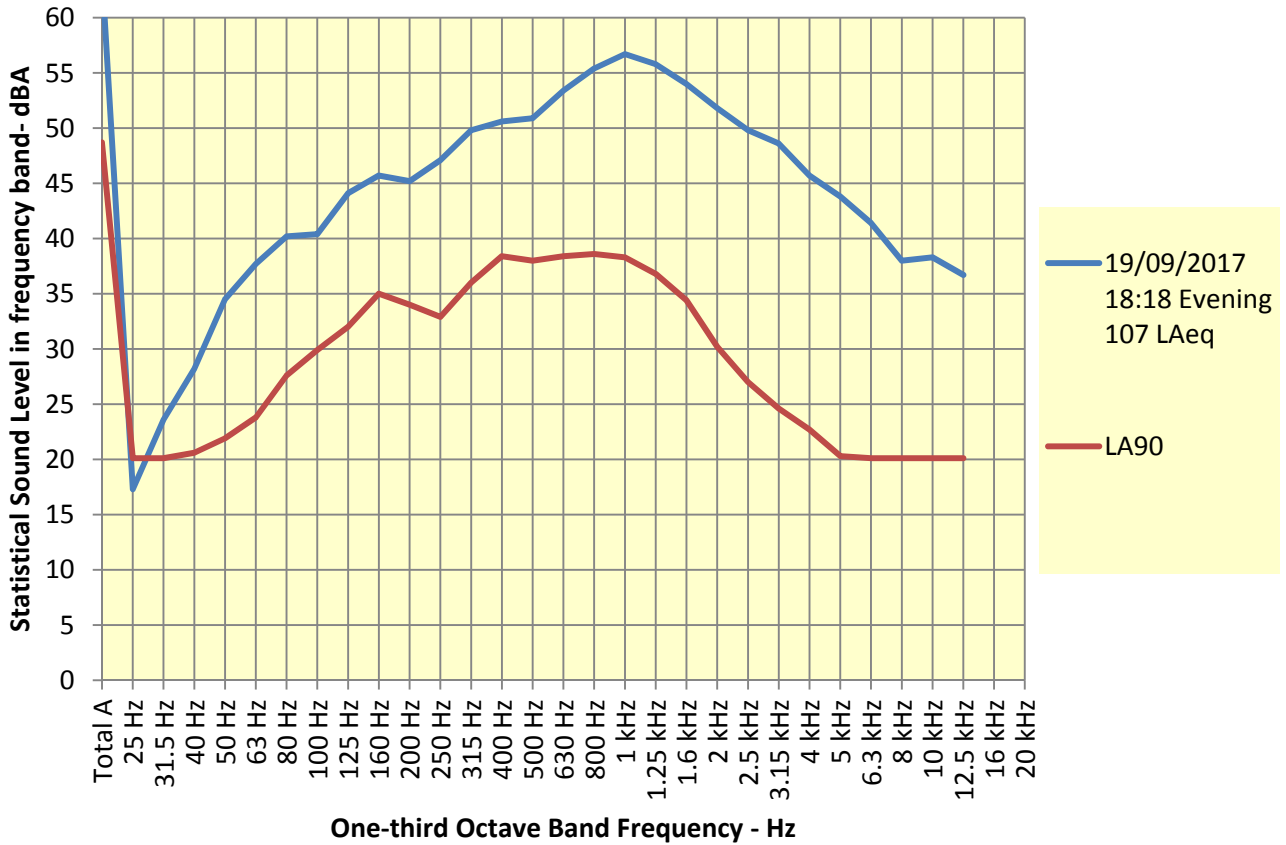


Figure 4.39A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 72 Taylor Ave

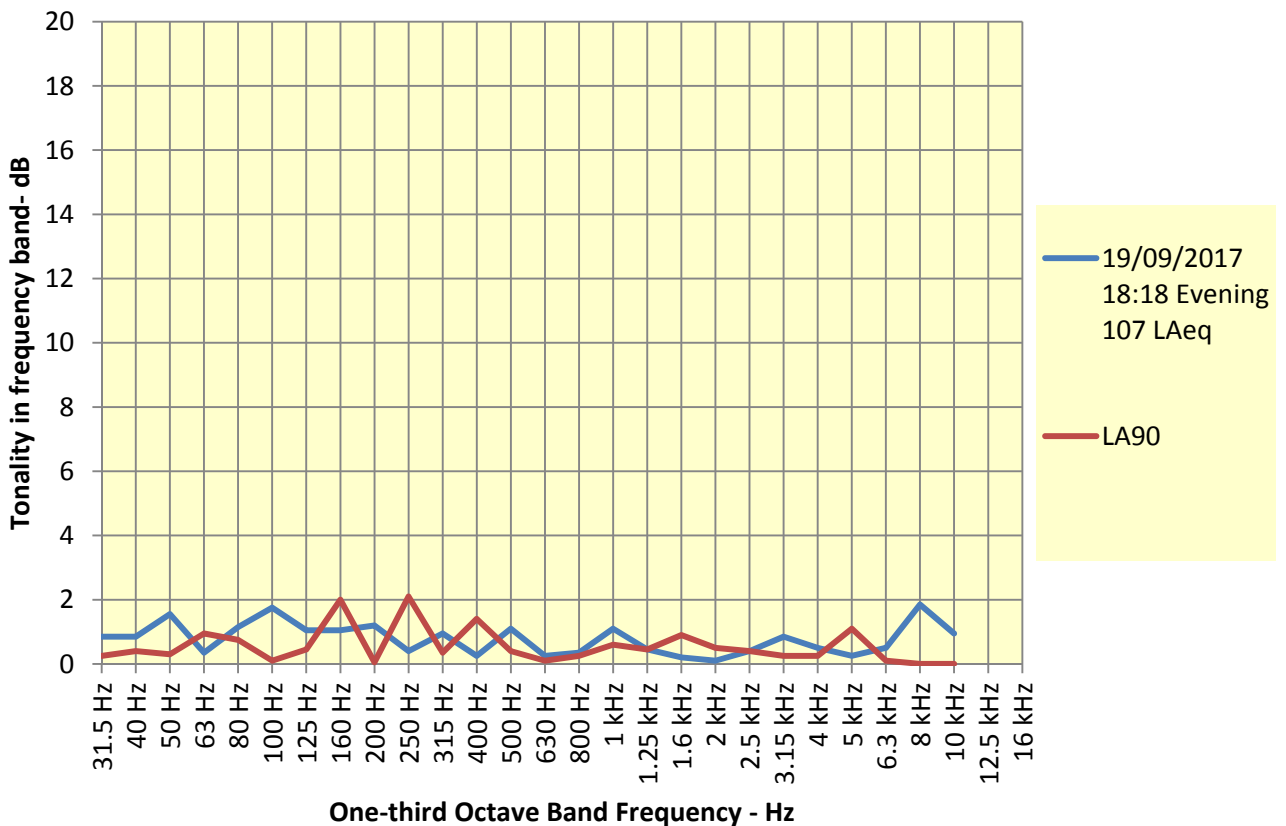


Figure 4.40: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 72 Taylor Ave

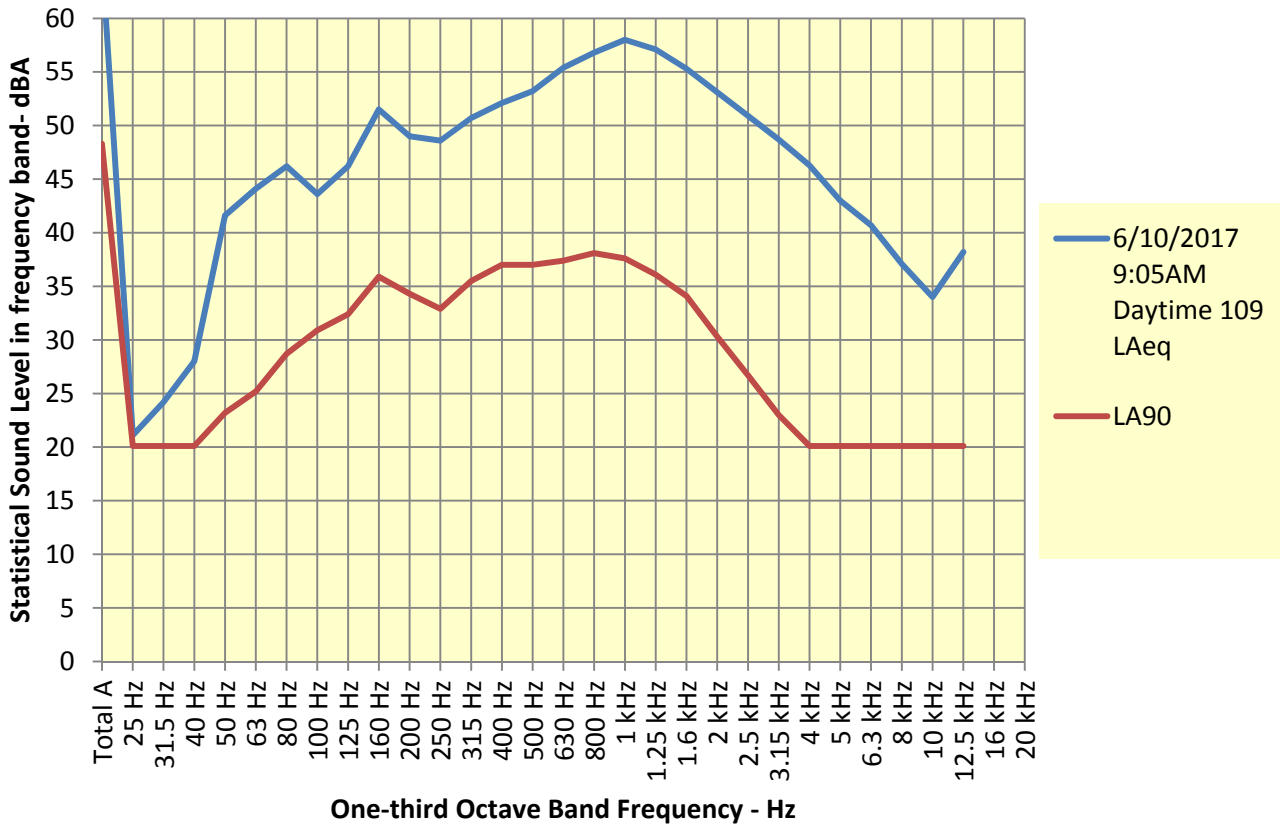


Figure 4.40A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 72 Taylor Ave

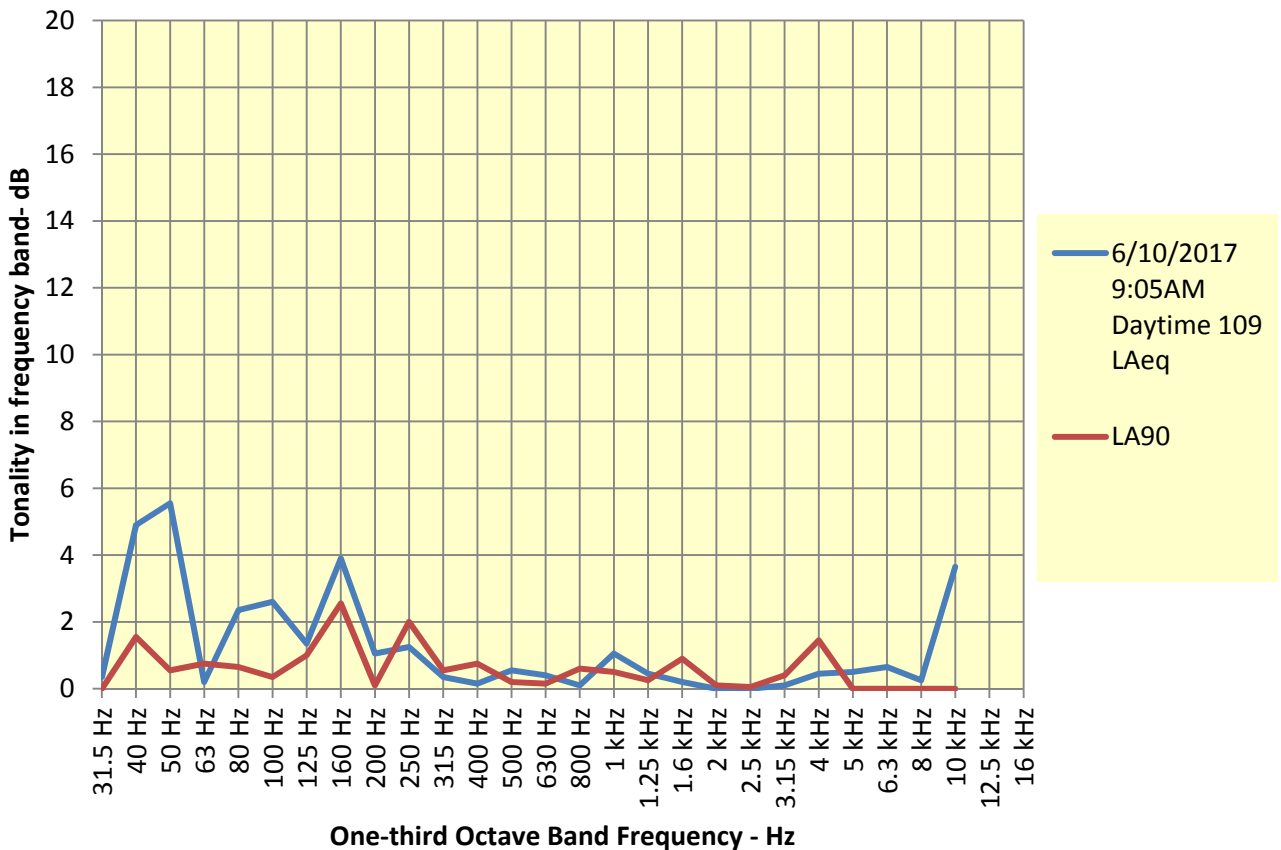


Figure 4.41: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 72 Taylor Ave

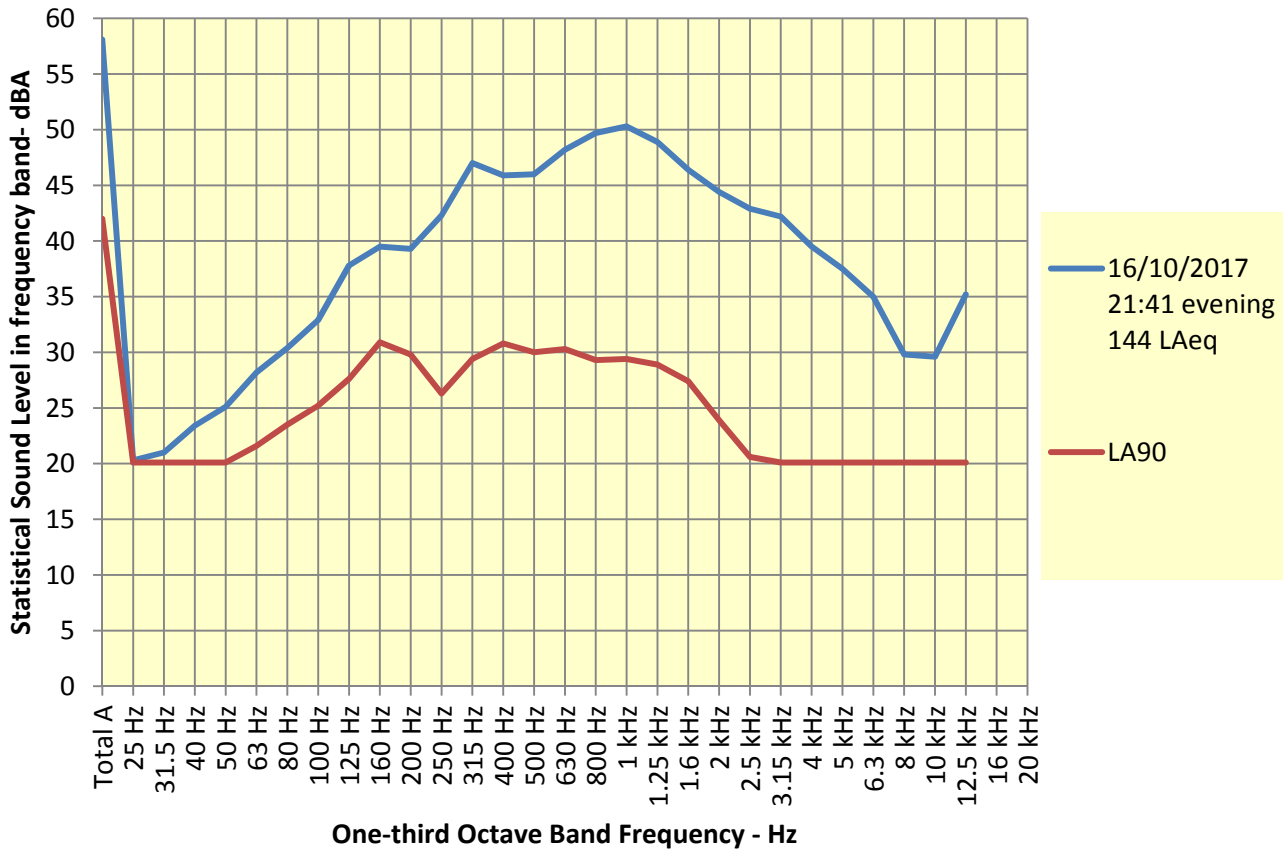


Figure 4.41A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 72 Taylor Ave

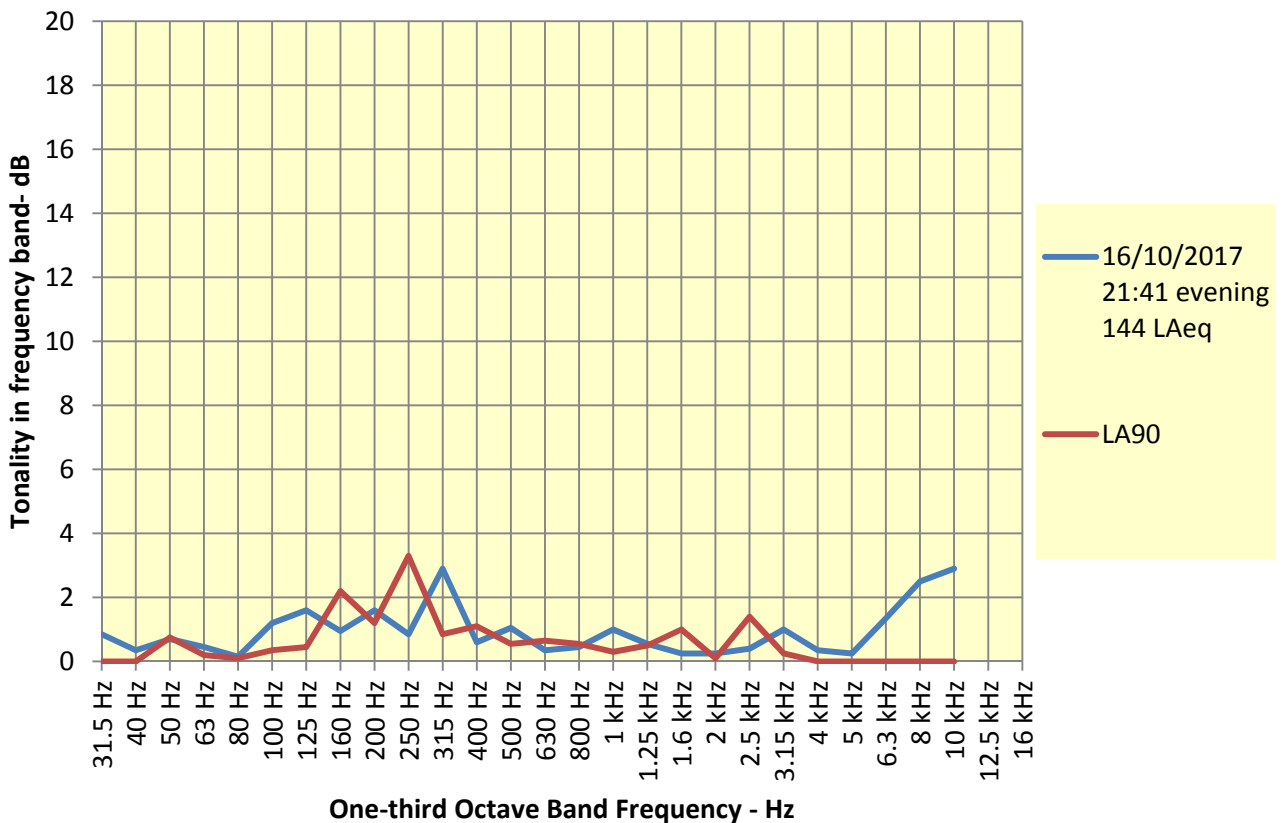


Figure 4.42: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 72 Taylor Ave

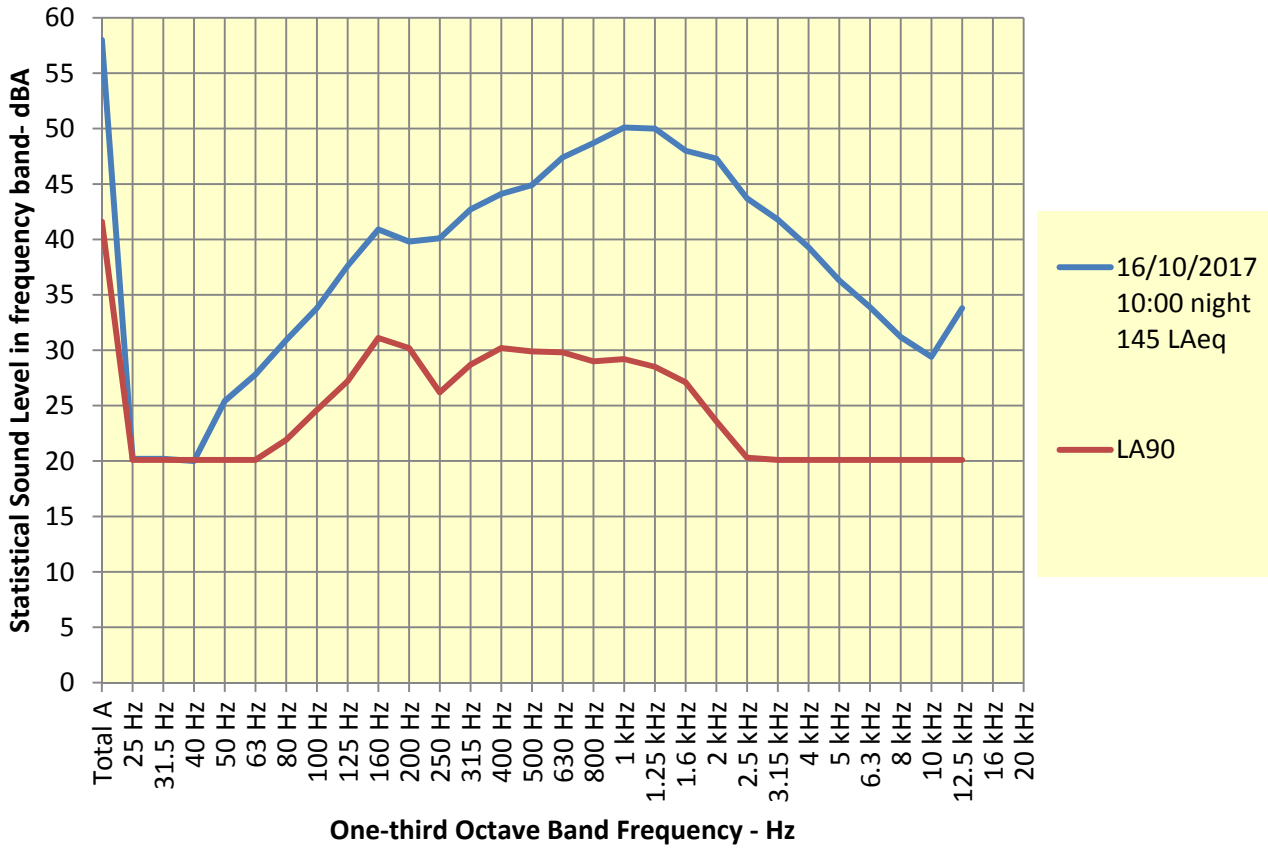


Figure 4.42A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 72 Taylor Ave

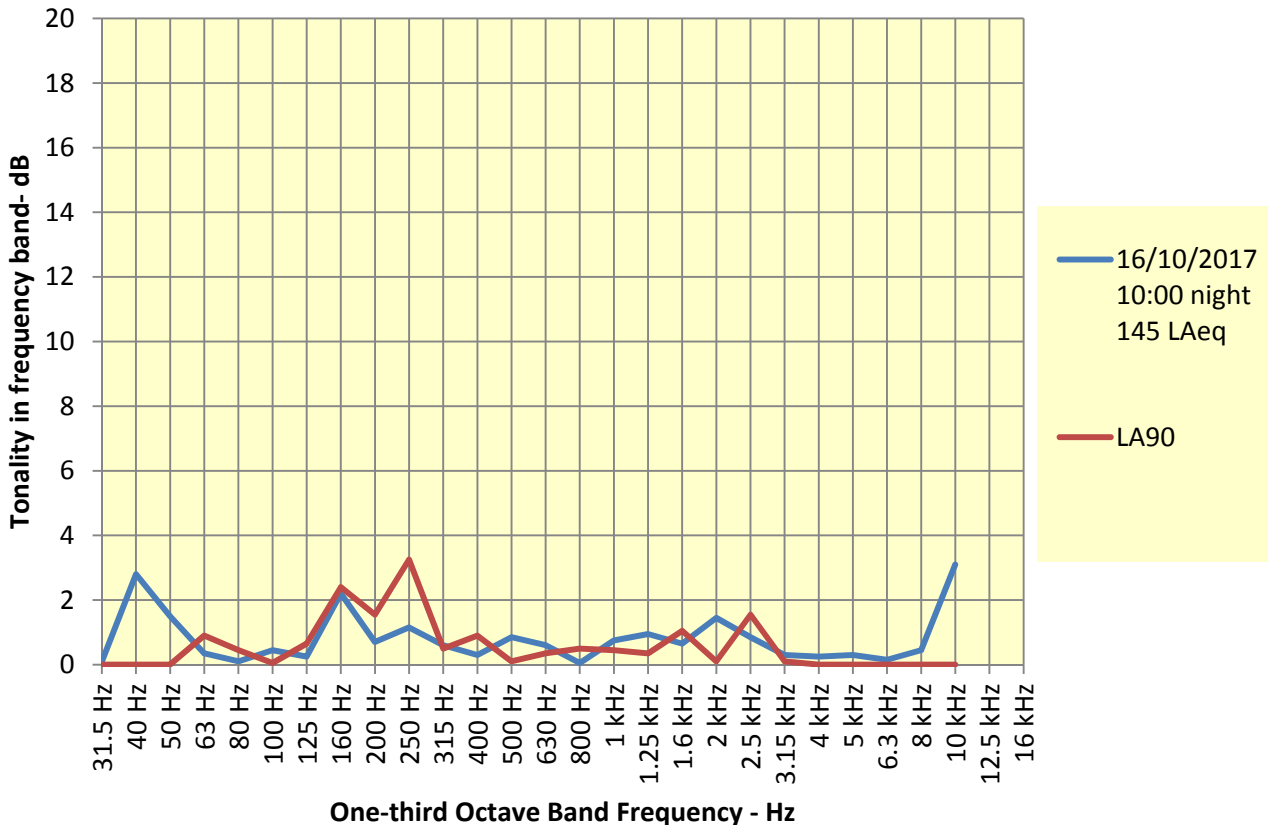


Figure 4.44: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 12 Brisbane St

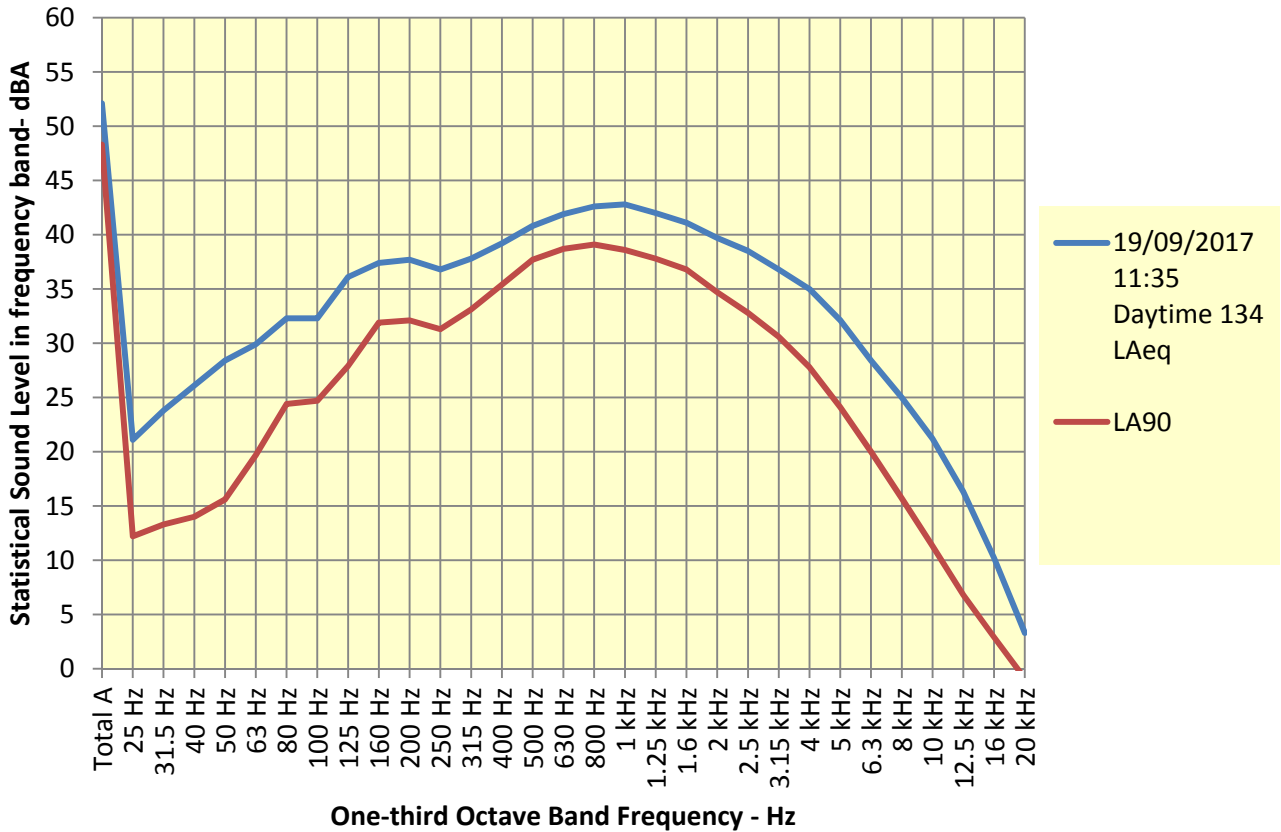


Figure 4.44A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 12 Brisbane St

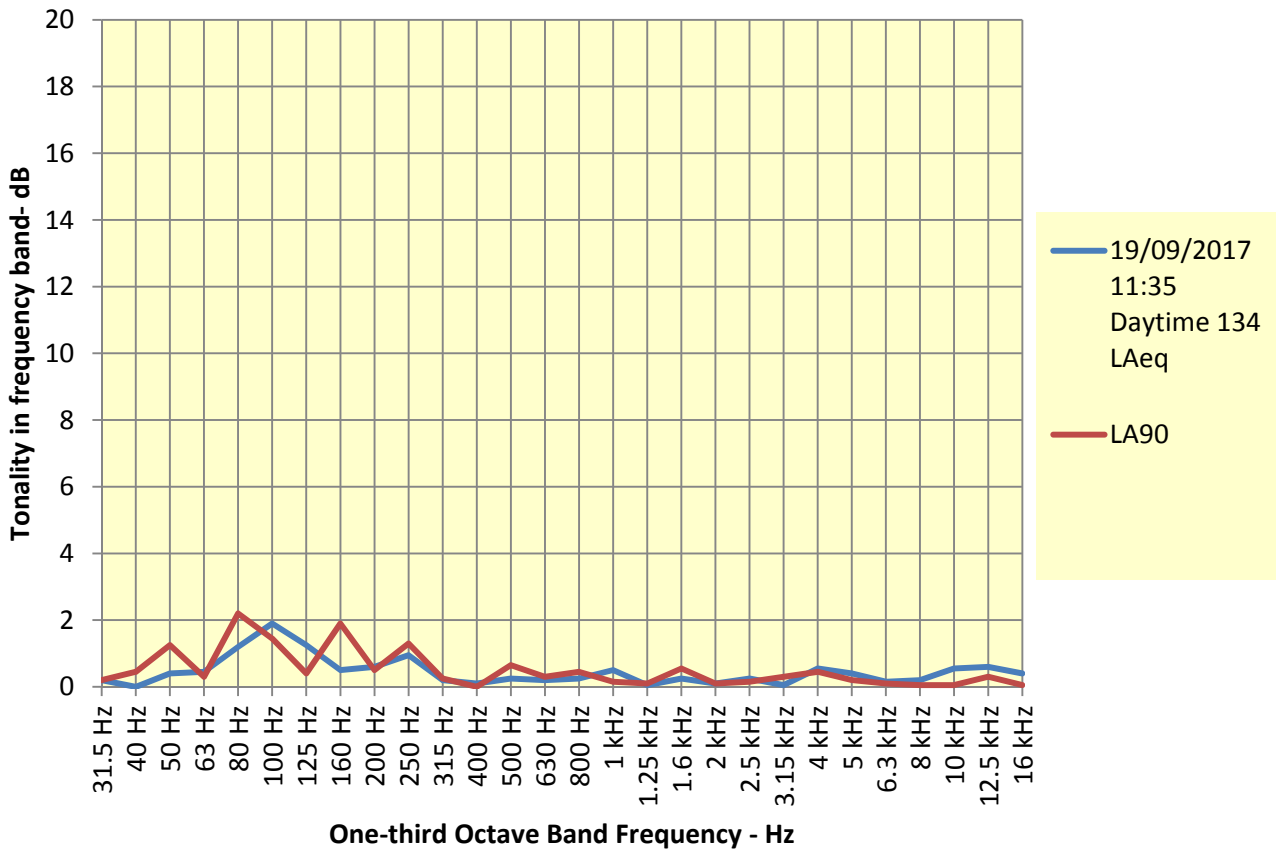


Figure 4.45: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 12 Brisbane St

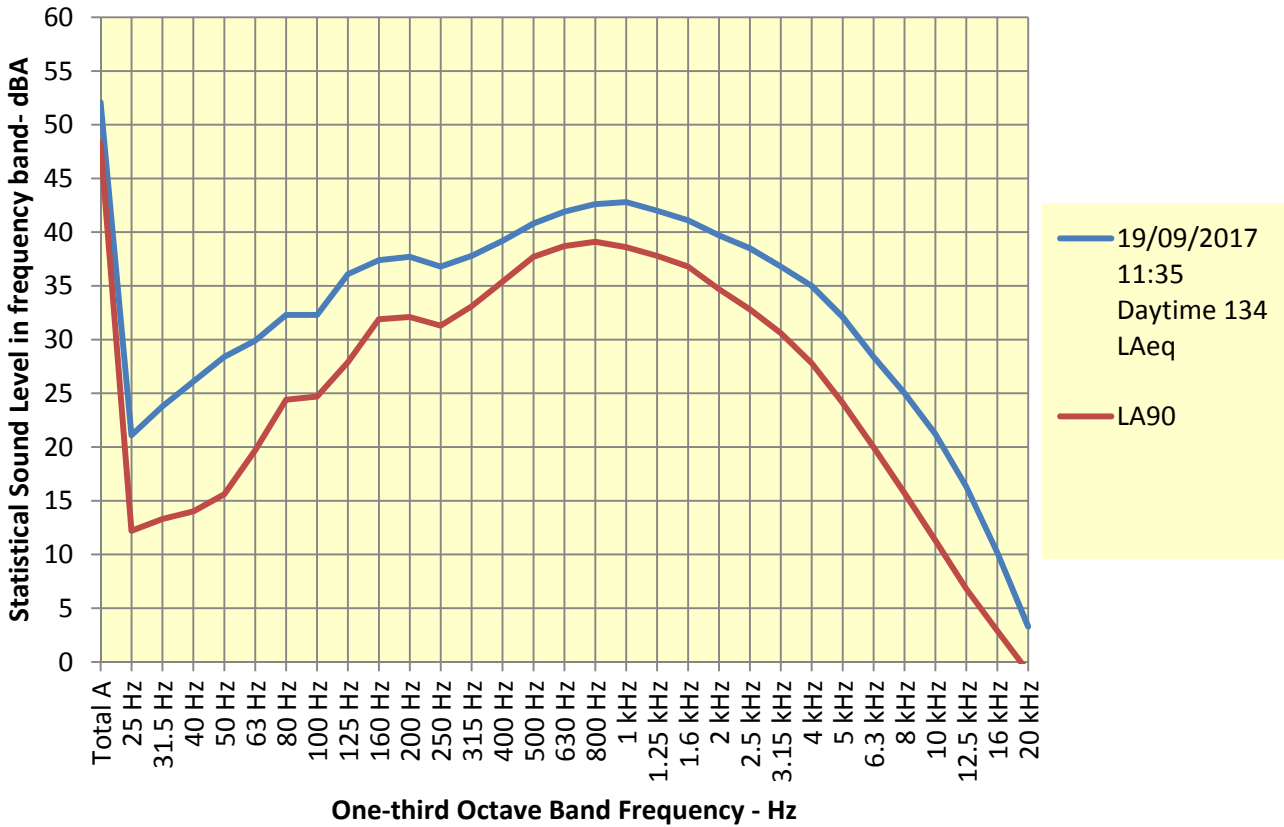


Figure 4.45A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 12 Brisbane St

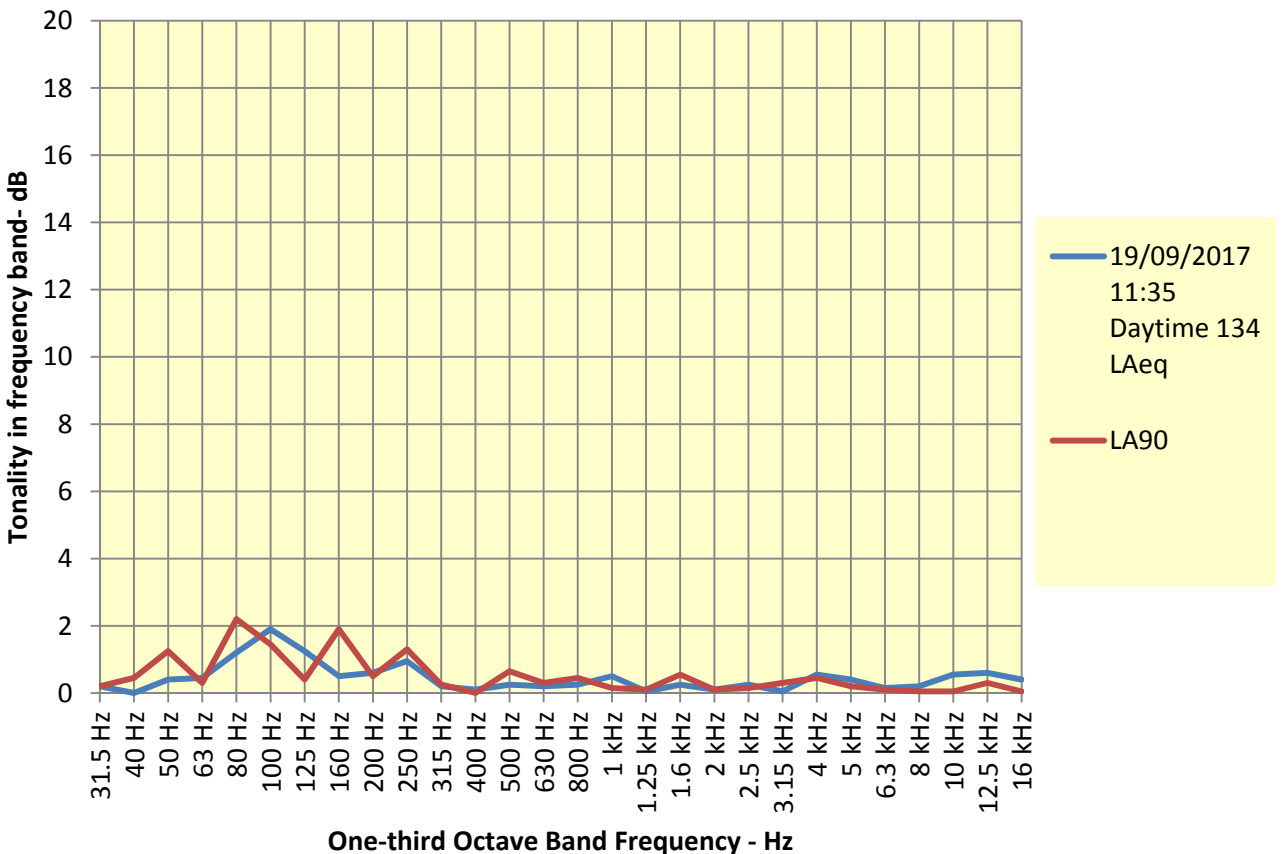


Figure 4.46: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 12 Brisbane St

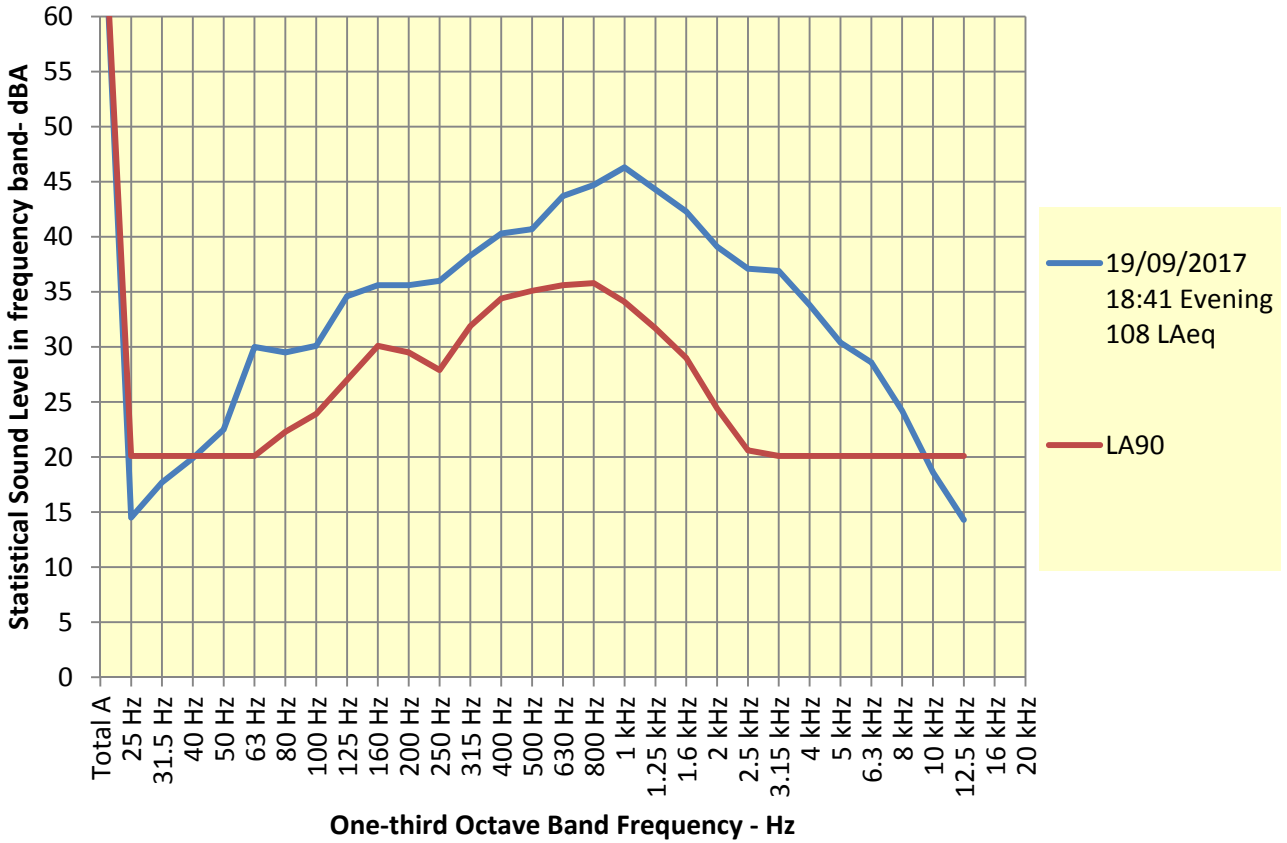


Figure 4.46A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 12 Brisbane St

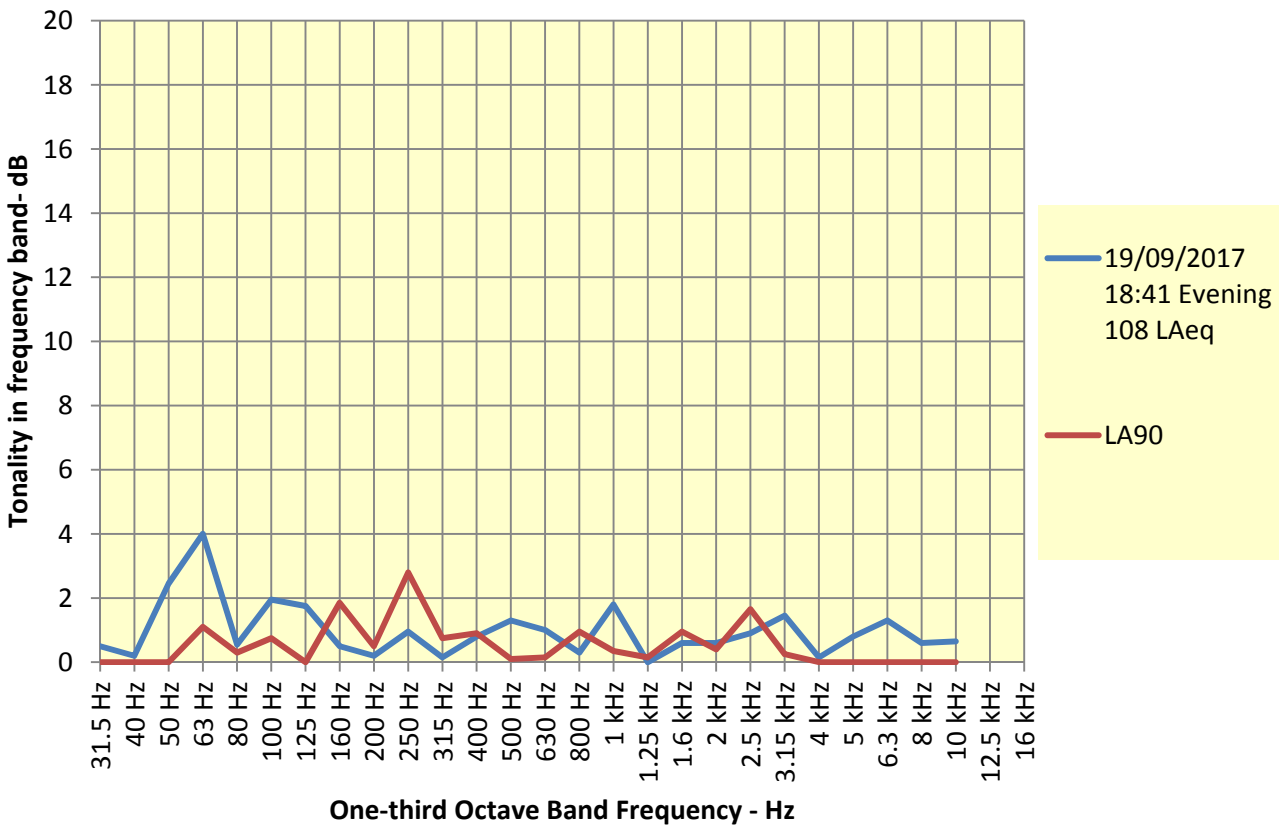


Figure 4.47: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 12 Brisbane St

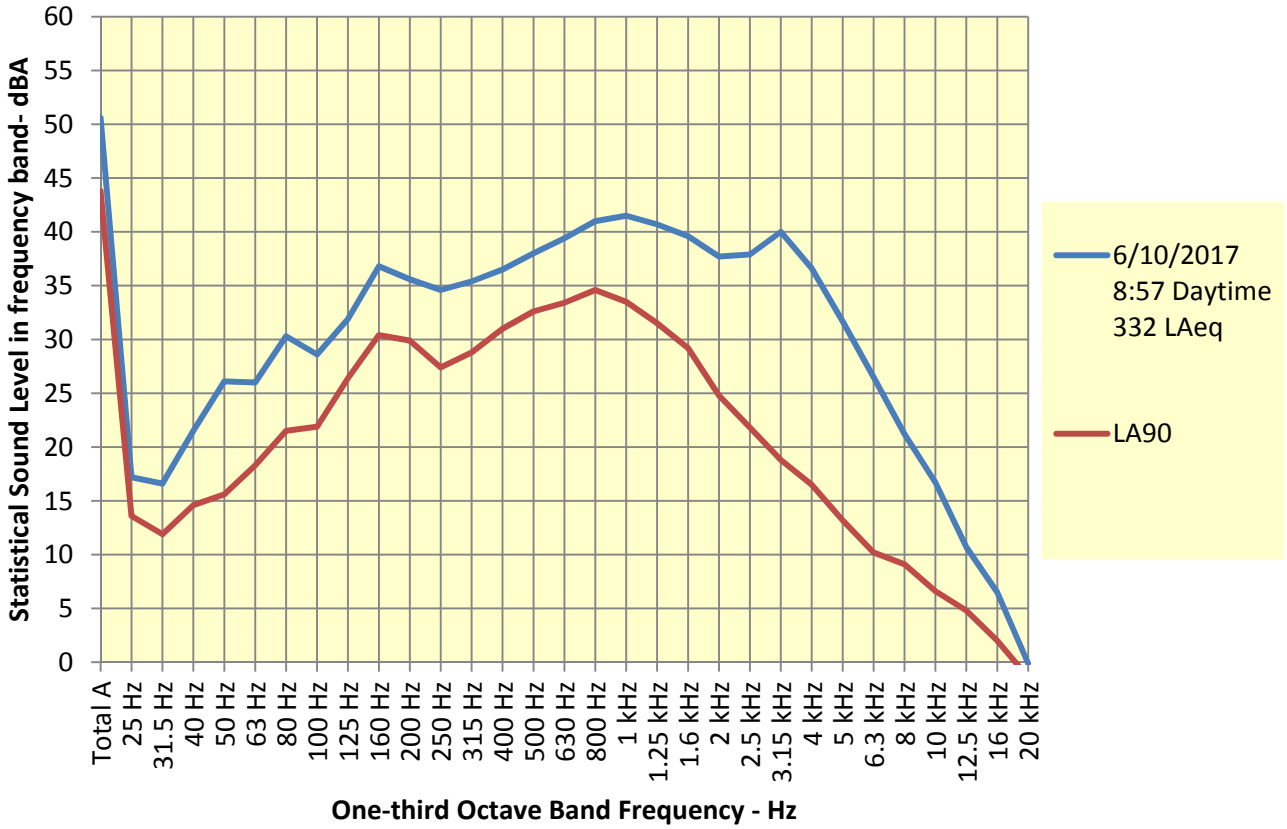


Figure 4.47A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 12 Brisbane St

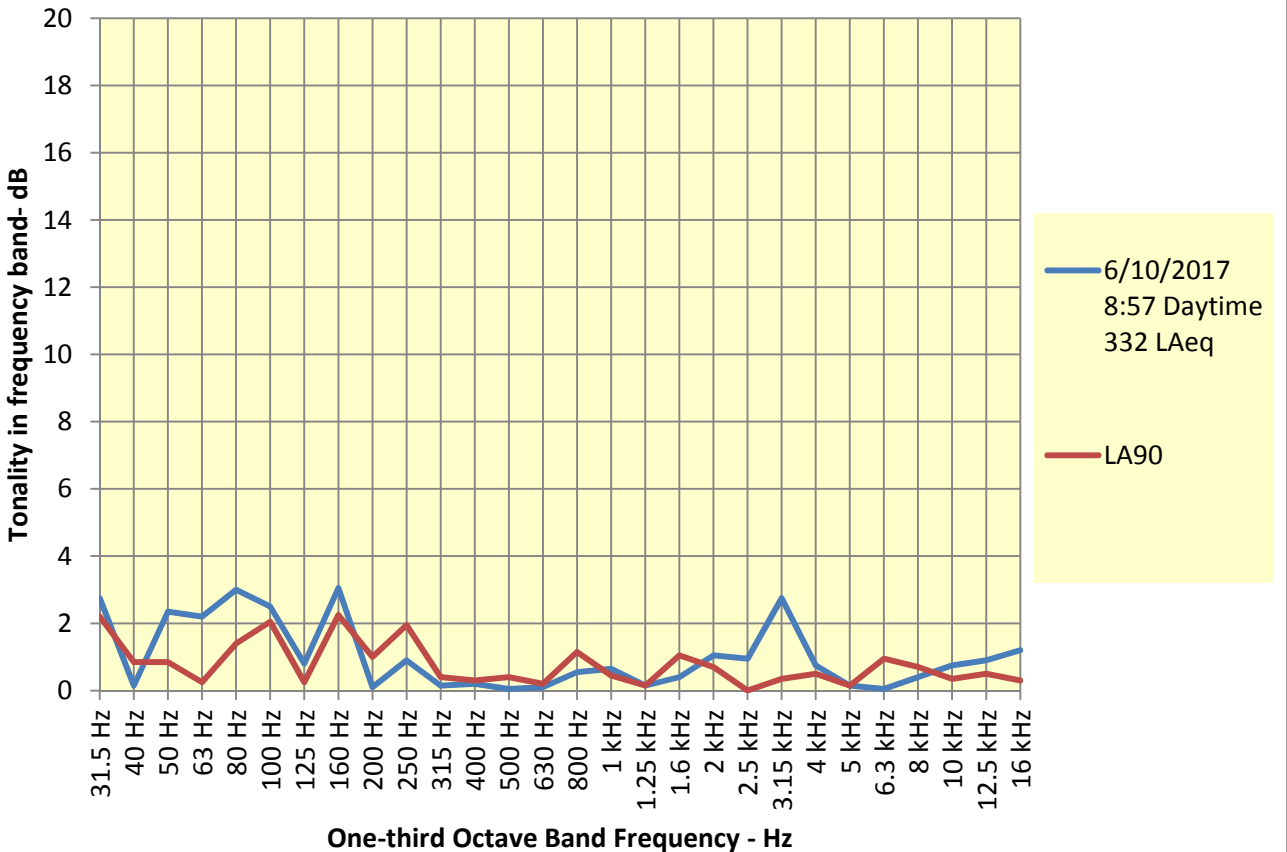


Figure 4.48: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - 12 Brisbane St

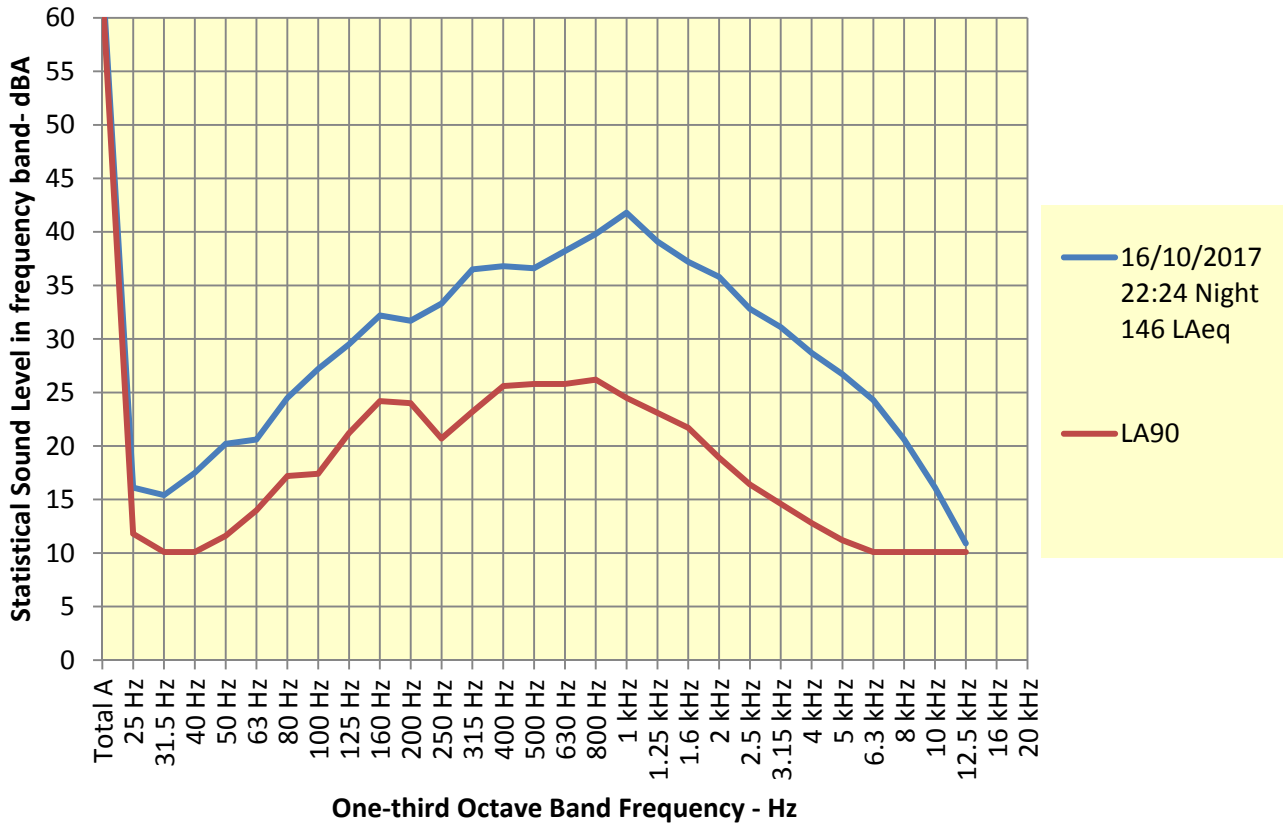


Figure 4.48A: Boral Cement Berrima Annual Environmental Noise 2017 - Tonality assessment spectra for attended residential - 12 Brisbane St

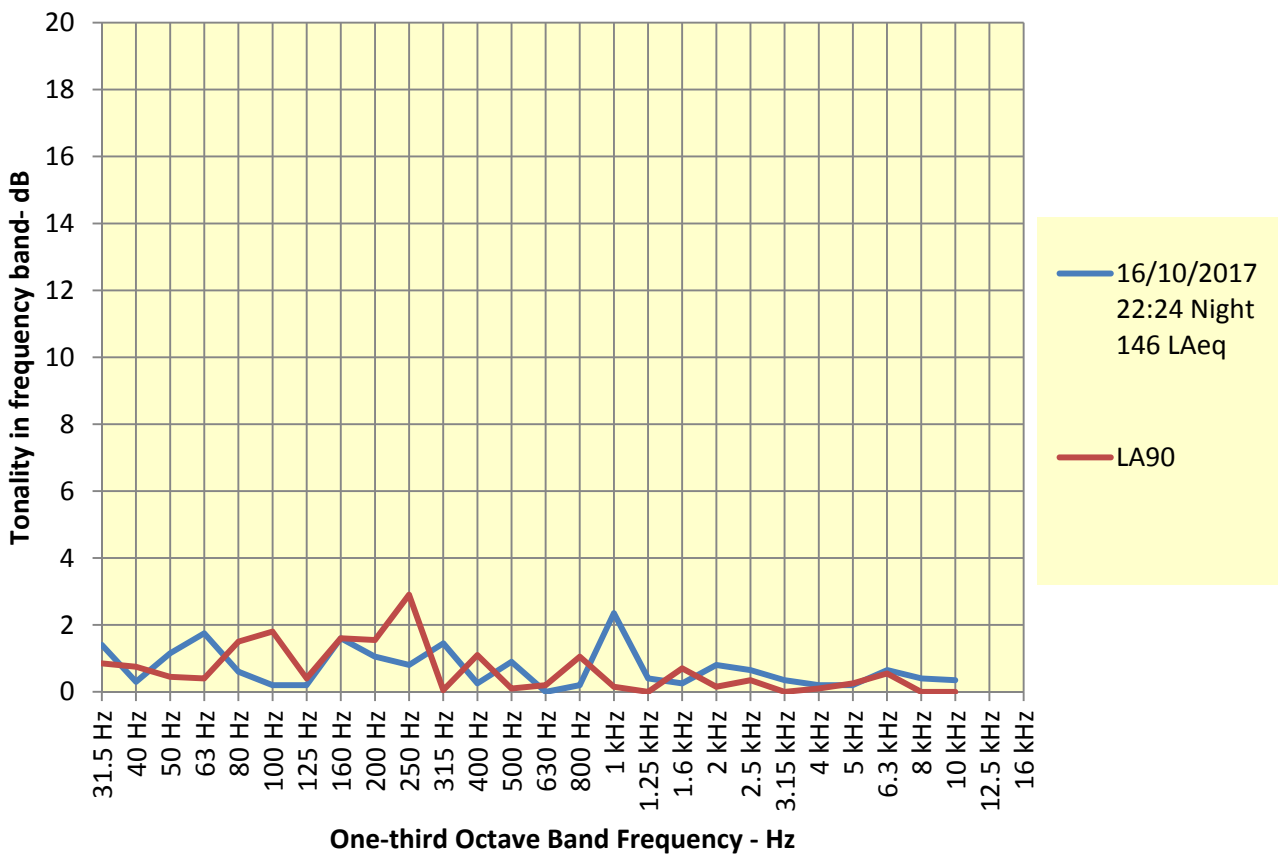


Figure 4.50: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Argyle St

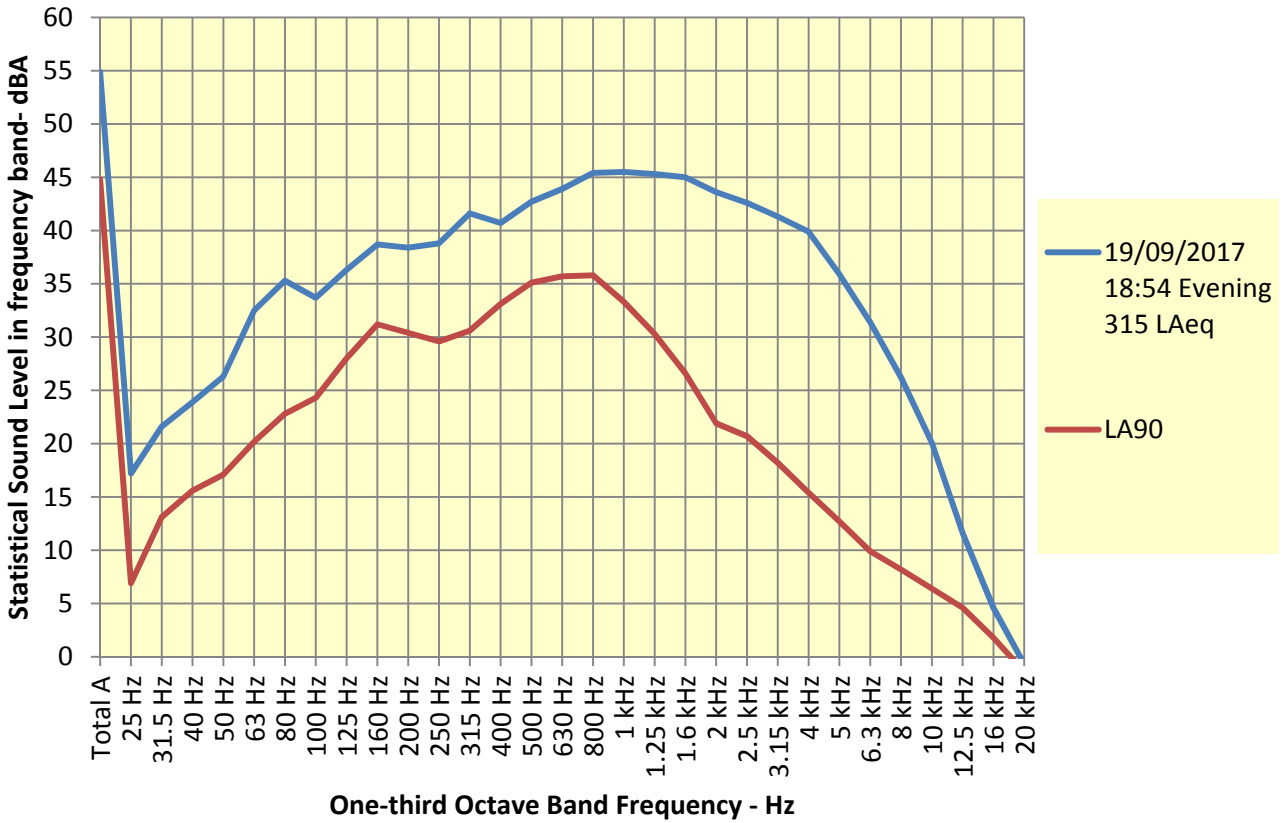


Figure 4.50A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Argyle St

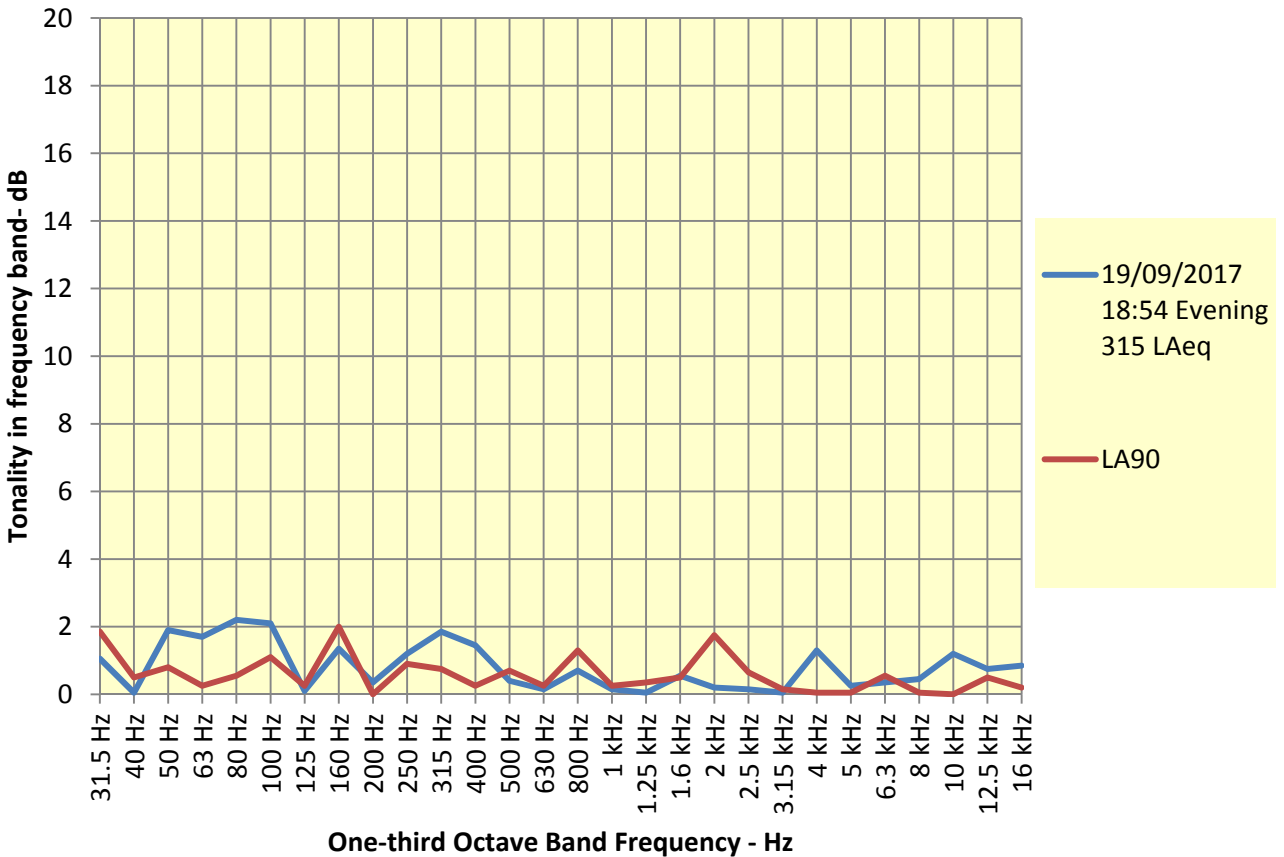


Figure 4.51: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Argyle St

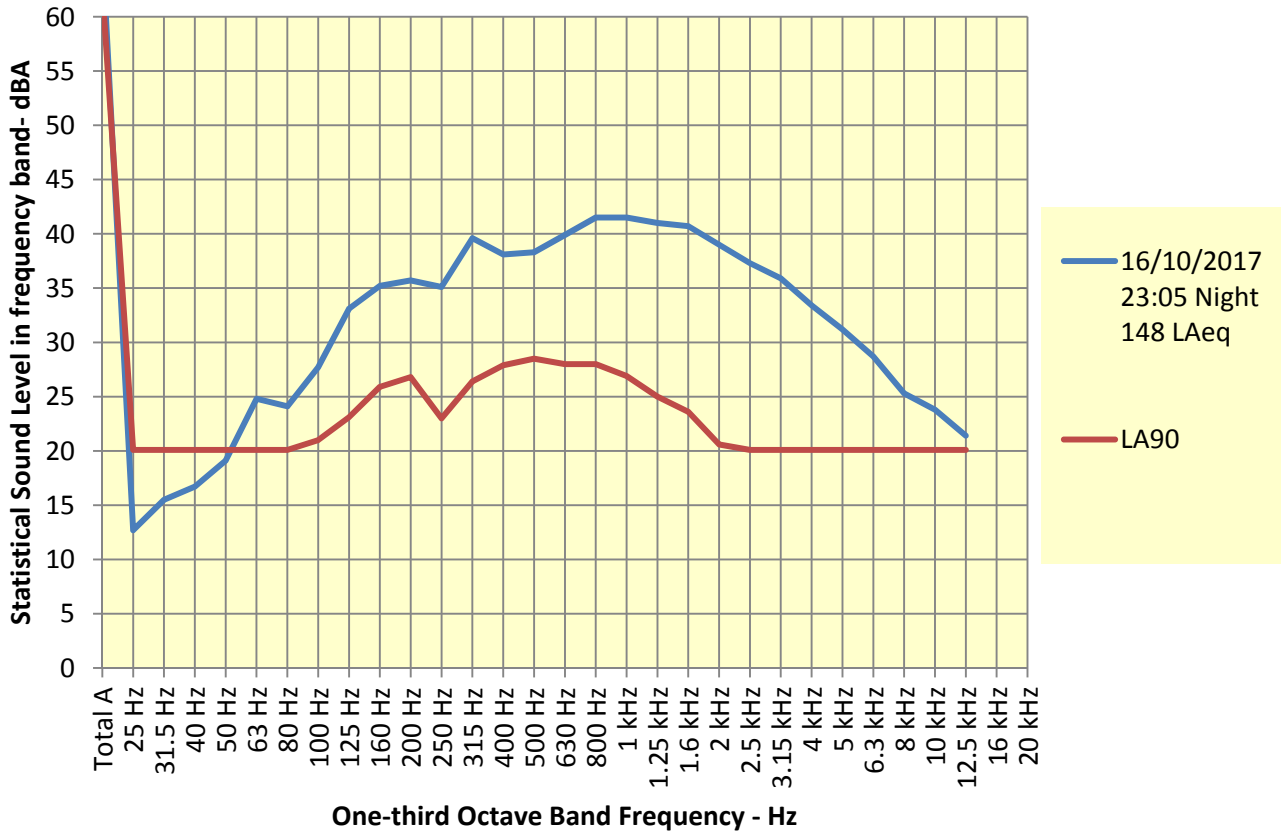


Figure 4.51A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Argyle St

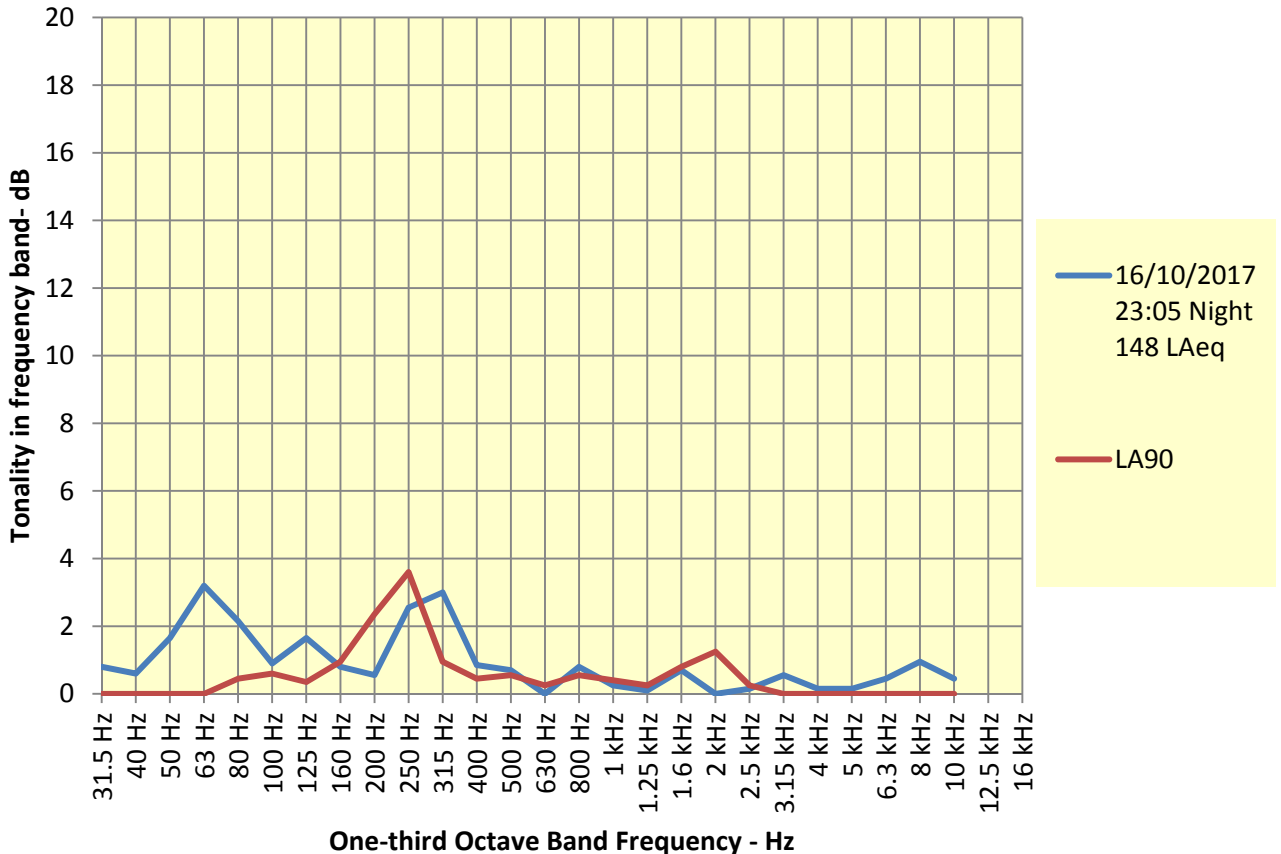


Figure 4.53: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Northern Boundary

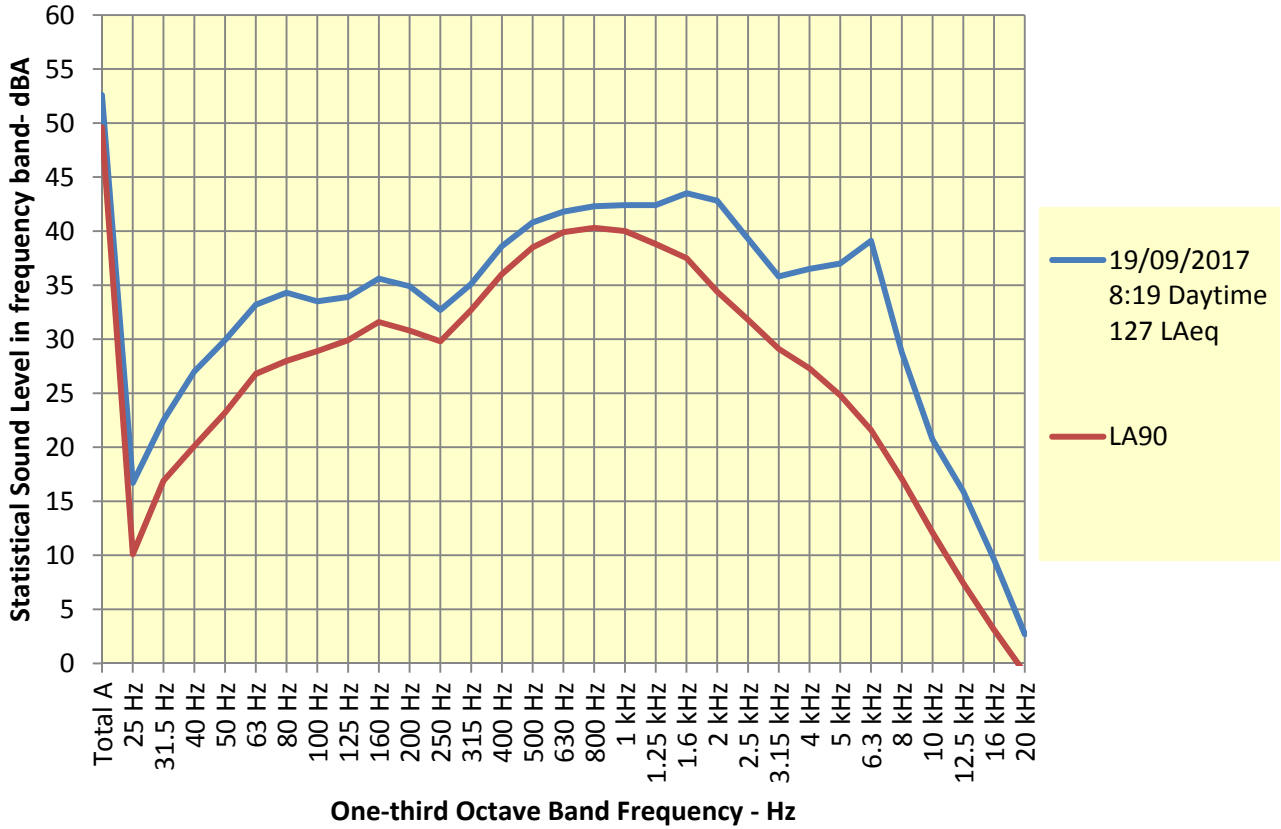


Figure 4.53A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Northern Boundary

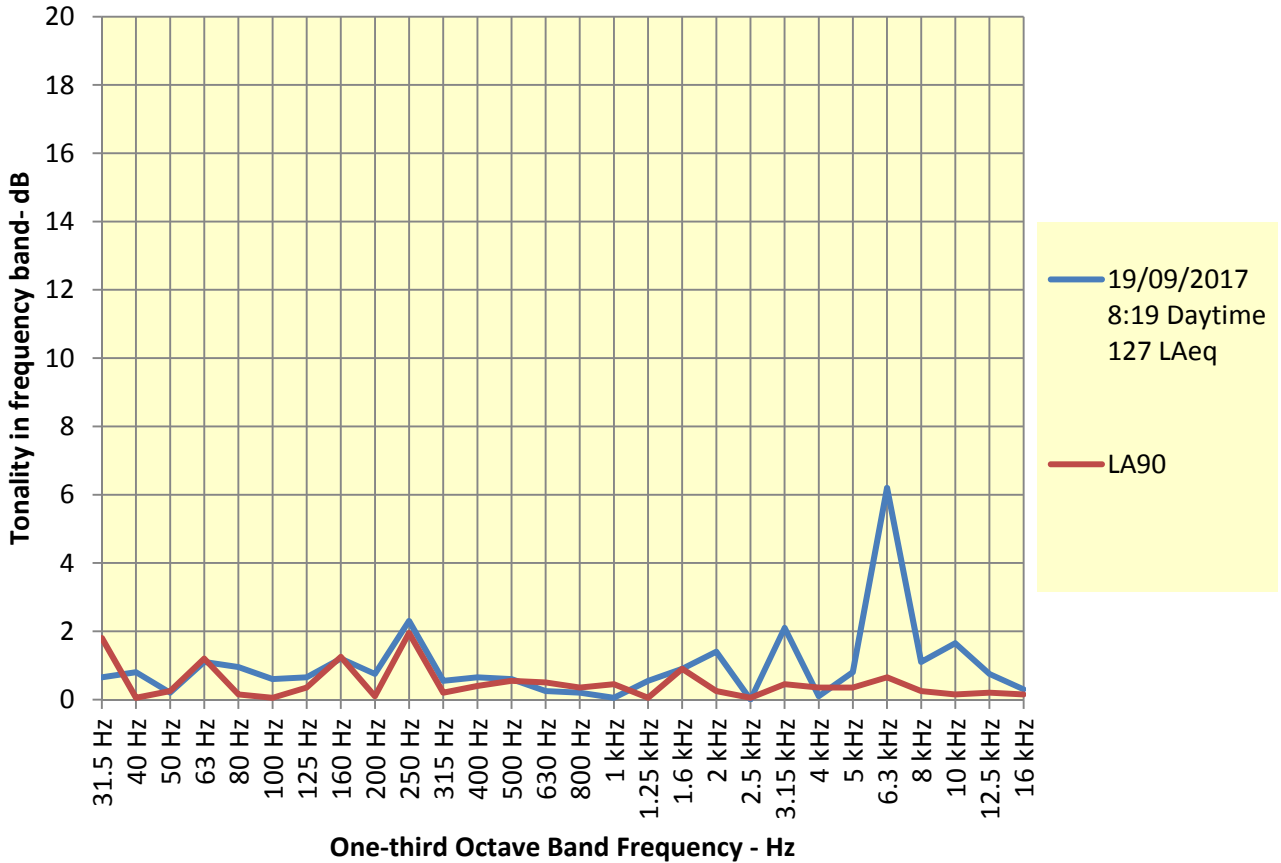


Figure 4.54: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Northern Boundary

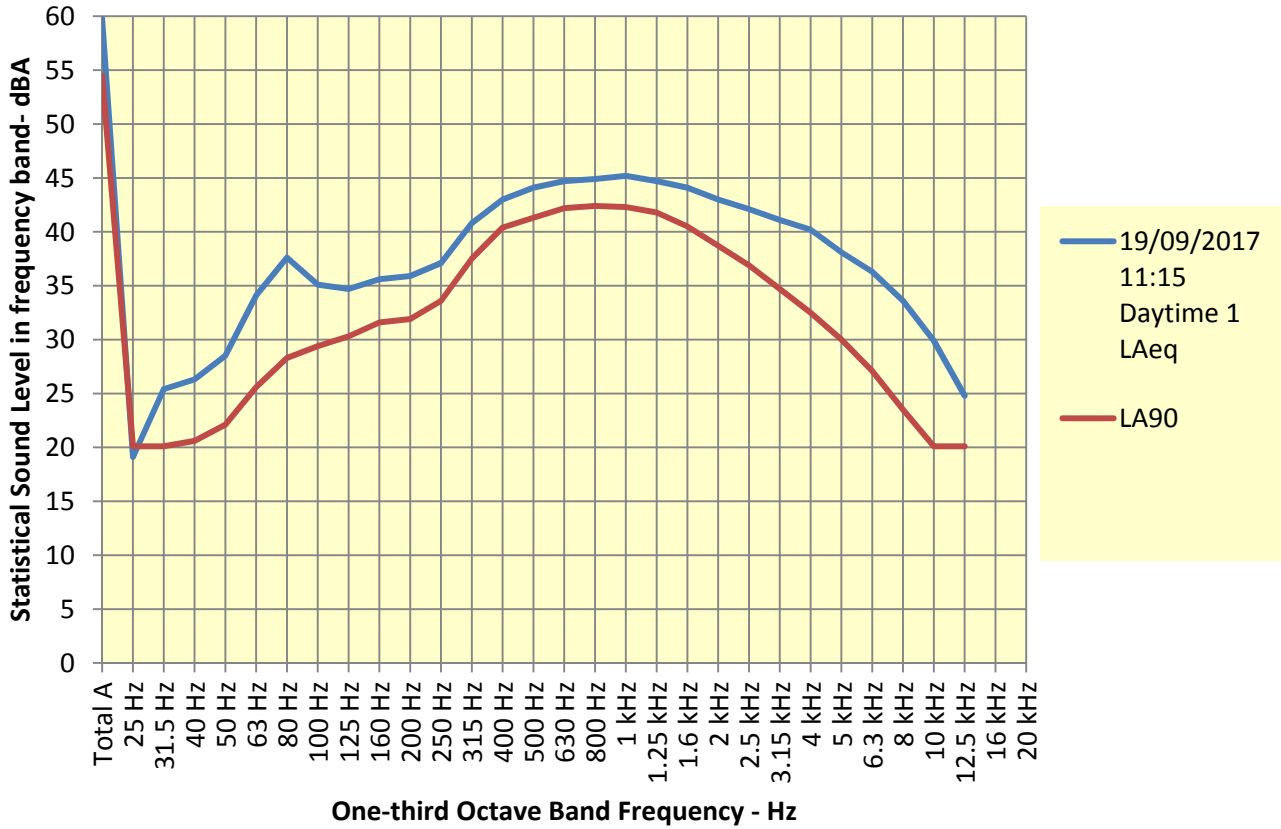


Figure 4.54A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Northern Boundary

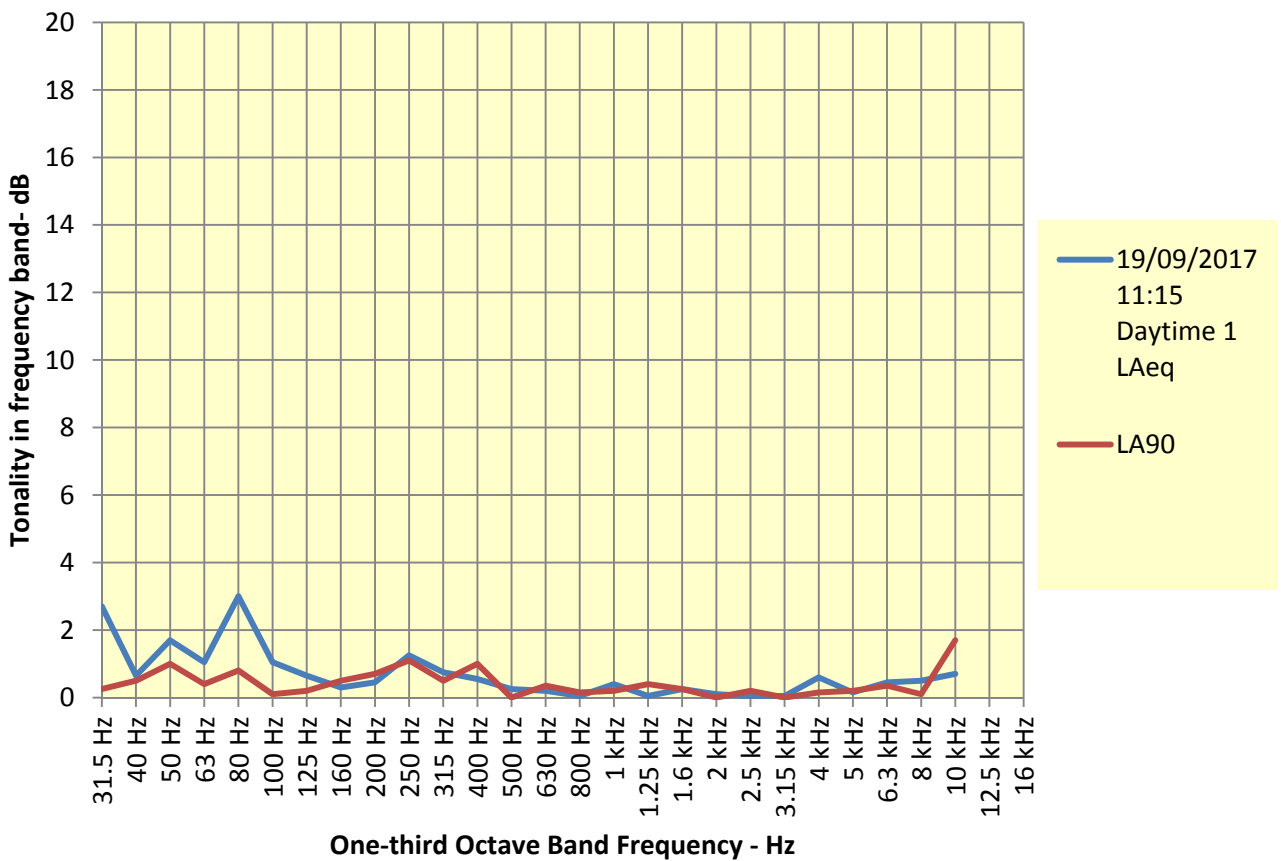


Figure 4.55: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Northern Boundary

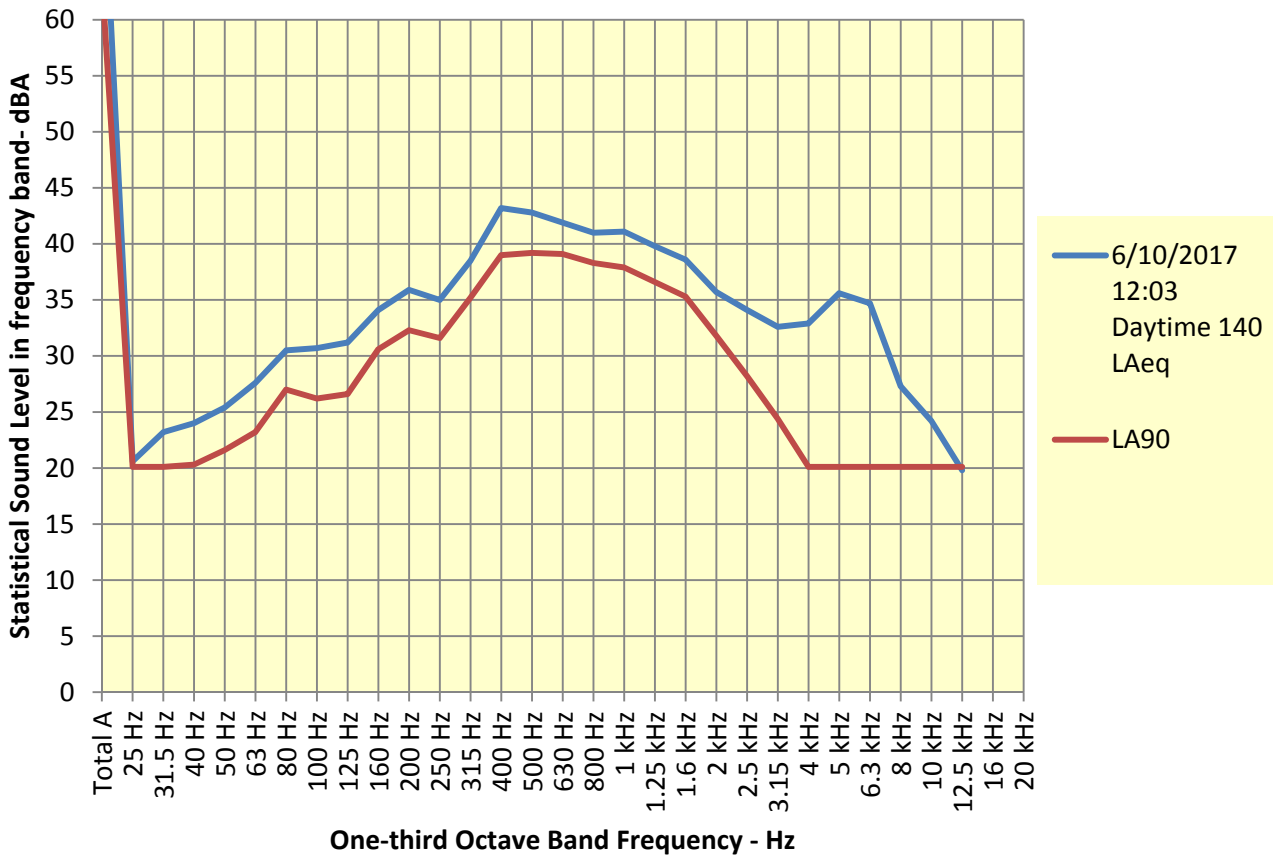


Figure 4.55A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Northern Boundary

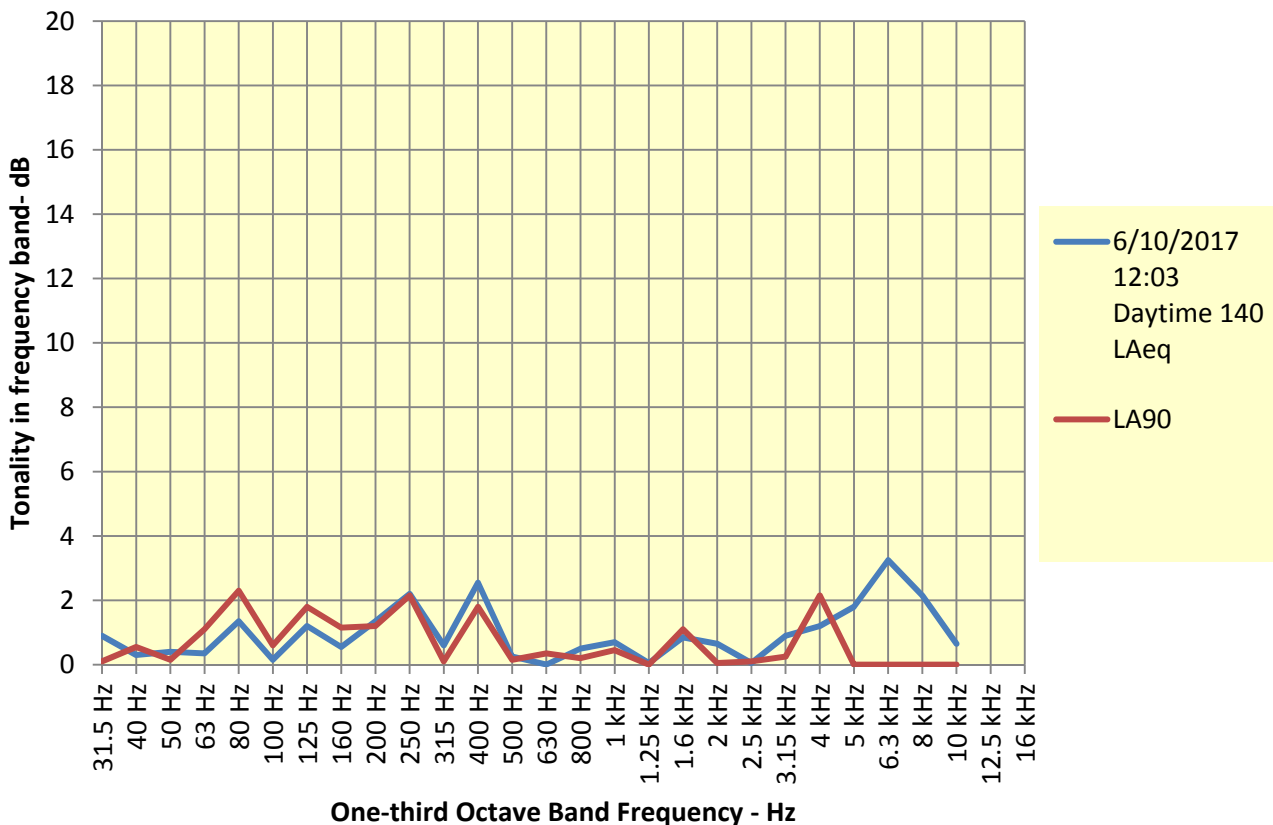


Figure 4.56: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Northern Boundary

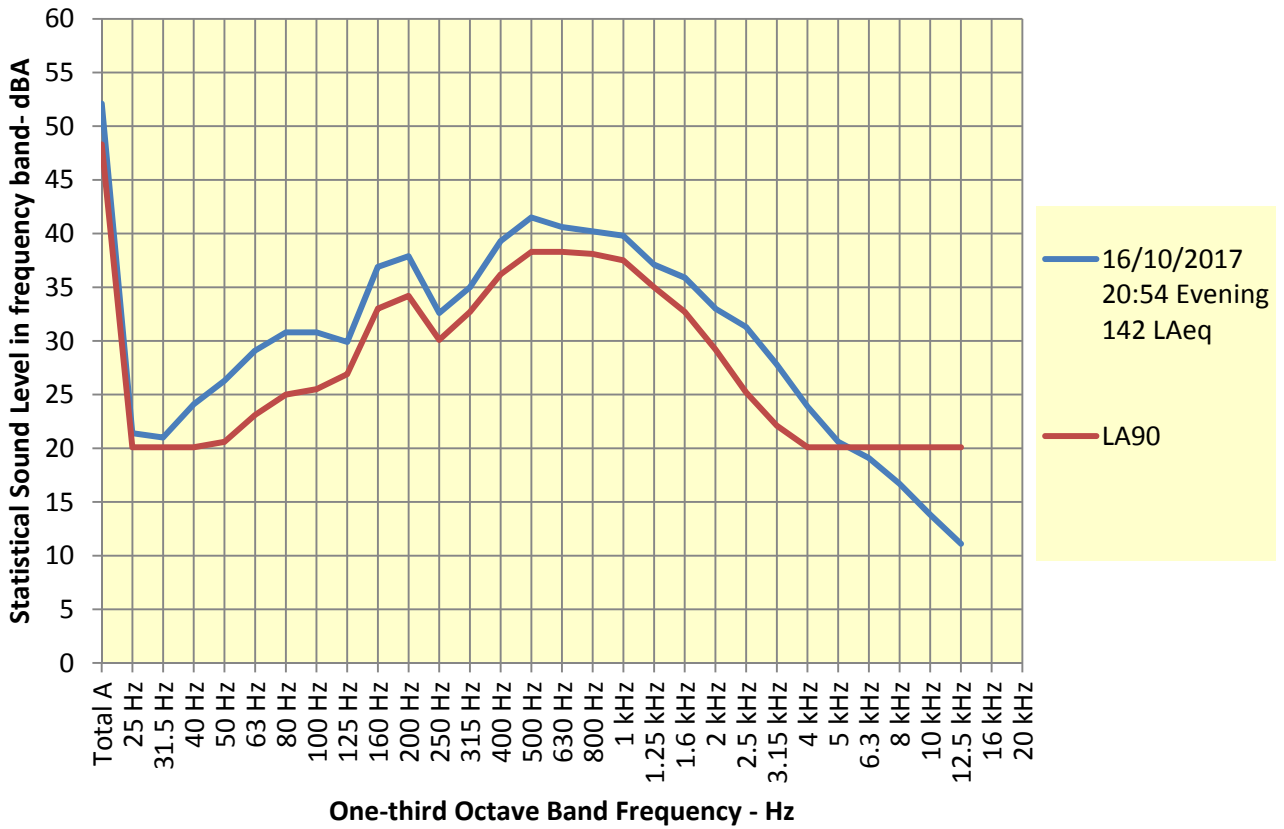


Figure 4.56A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Northern Boundary

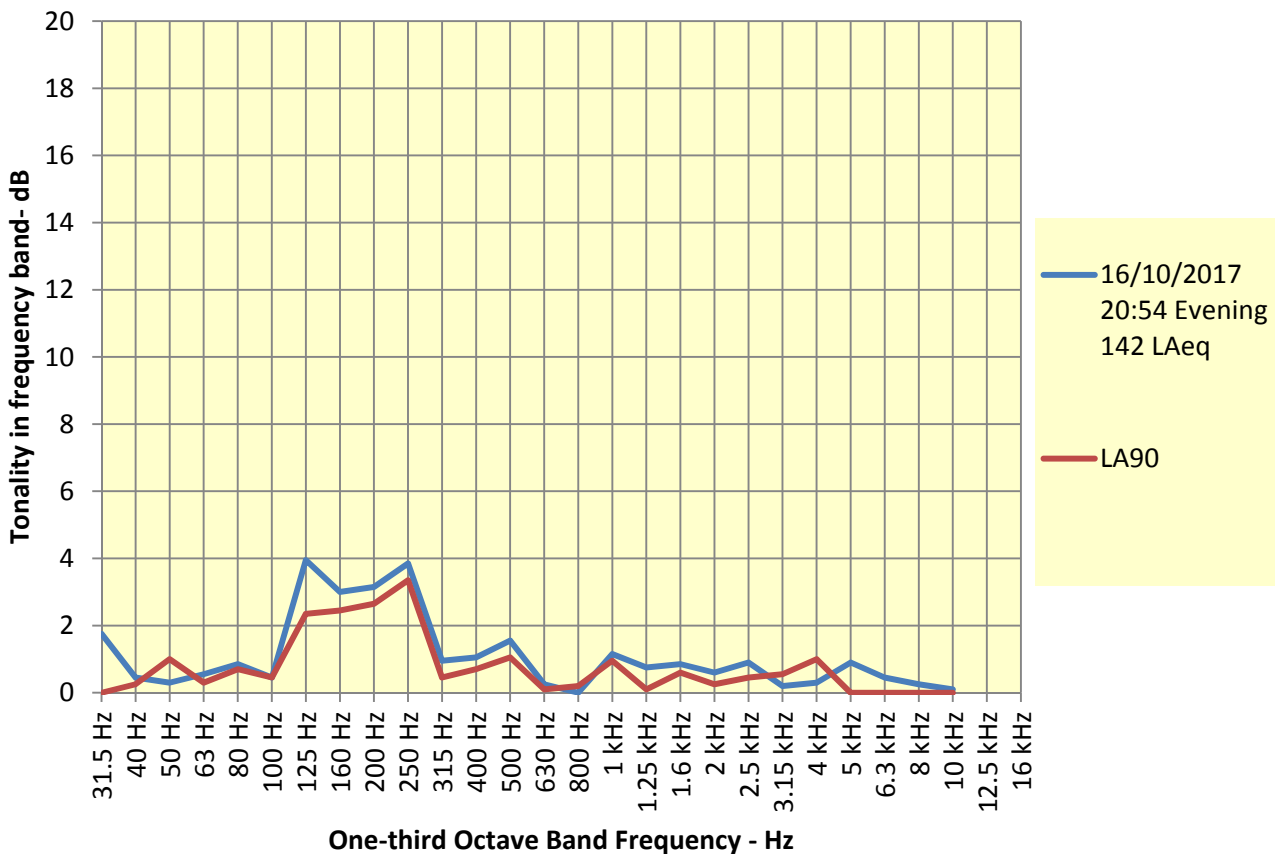


Figure 4.57: Boral Cement Berrima Annual Environmental Noise 2017 - Spectra for attended residential - Northern Boundary

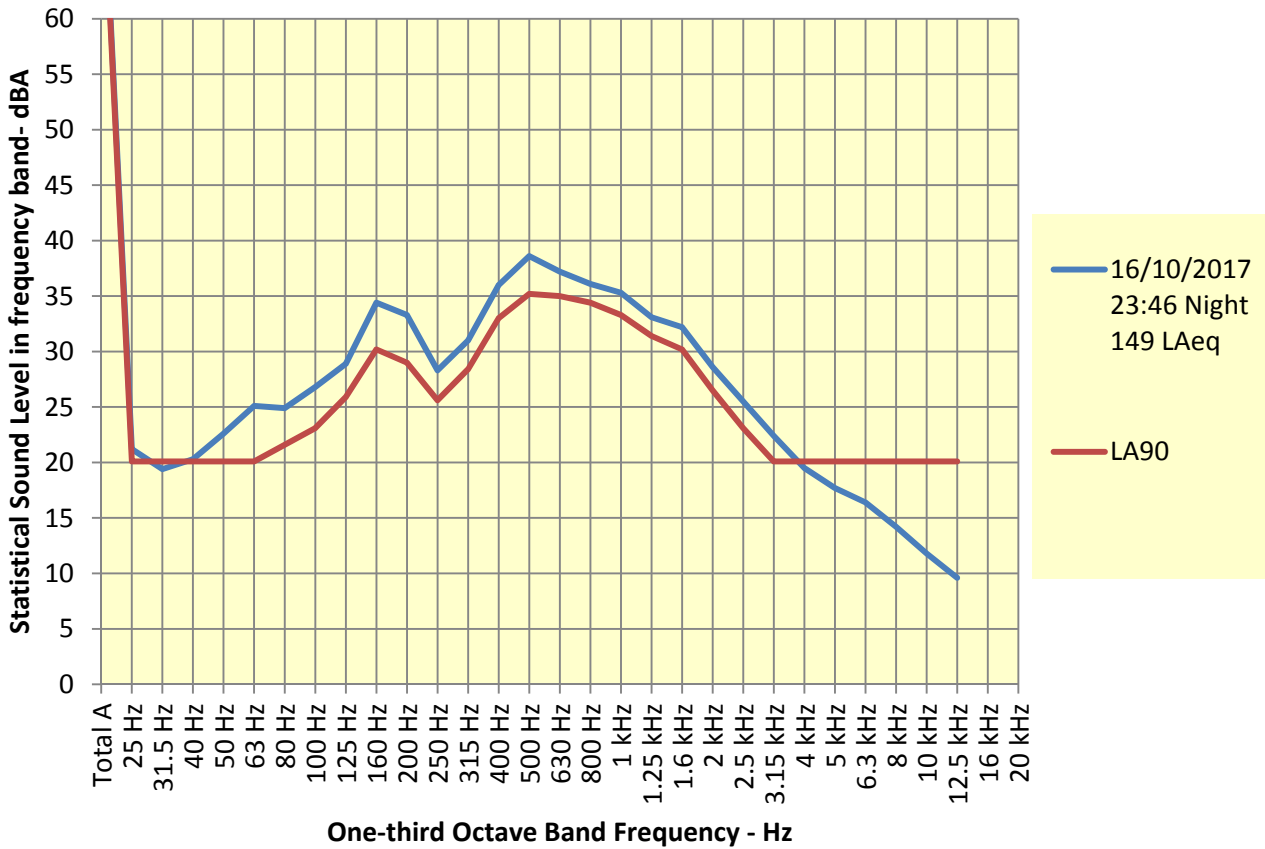
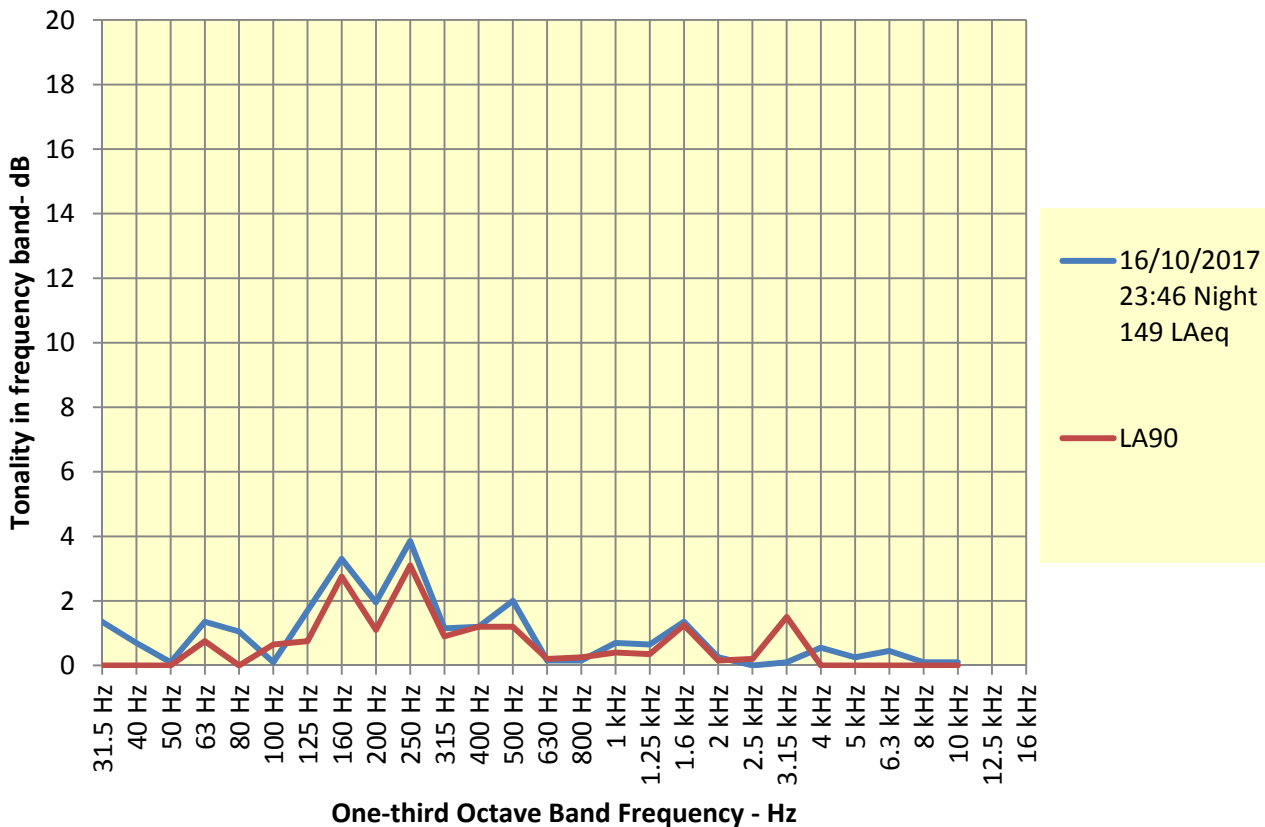


Figure 4.57A: Boral Cement Berrima Annual Environmental Noise 2017 - - Tonality assessment spectra for attended residential - Northern Boundary



Appendix B: Unattended environmental sound level results for 4 Melbourne Street

4 Melbourne St., New Berrima - 29 to 30 September 2017

Comparison of Period LAEQ, Period Average LA10 and Period 90% LA90 Results

Summary of Statistical Data

LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
4 Melbourne St., New Berrima	55	49	53	51	45	49	51	43	48	58	42	51
12 Brisbane St., New Berrima	54	49	51	49	44	47	49	43	46	55	41	49
72 Taylor Ave., New Berrima	60	53	58	55	49	54	56	45	53	59	45	54

L90.15-min 10%	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
4 Melbourne St., New Berrima	46	39	42	42	44	36	41	41	43	36	40	40
12 Brisbane St., New Berrima	47	39	43	42	45	36	41	41	44	35	40	40
72 Taylor Ave., New Berrima	51	41	44	44	47	38	43	43	46	38	43	44

L90.15-min	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
4 Melbourne St., New Berrima	47	41	44	44	44	37	42	42	44	38	42	42
12 Brisbane St., New Berrima	49	41	45	44	46	37	42	43	46	39	42	42
72 Taylor Ave., New Berrima	52	41	46	45	48	39	44	45	47	39	44	44

4 Melbourne St., New Berrima - 19 September to 1 October 2017

Comparison of Period LAEQ, Period Average LA90 and Period 90% LA90 Results - with and without rain

Summary of Statistical Data

LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
Including Rain periods	55	49	53	51	45	49	51	43	48	58	42	51
Excluding rain periods	55	49	53	51	45	49	51	43	48	58	42	51
Difference - Including - excluding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90.15-min 10%	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
Including Rain periods	46	39	42	42	44	36	41	41	43	36	40	40
Excluding rain periods	46	39	42	42	44	36	41	41	43	36	40	40
Difference - Including - excluding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90.15-min	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
	Including Rain periods	47	41	44	44	44	37	42	42	44	38	42
Excluding rain periods	47	41	44	44	44	37	42	42	44	38	42	42
Difference - Including - excluding	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

4 Melbourne St., New Berrima

Daytime LAEQ 19 September to 1 October 2017

Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
7:00		54	54	53	48	44	53	53	53	53	51				54	44	52	3.1
7:15		54	53	52	53	48	48	52	53	52	58	52			58	48	52	2.9
7:30		54	53	54	52	49	46	51	52	52	51	52			54	46	51	2.4
7:45		53	55	53	46	47	51	54	51	54	53	53			55	46	52	2.9
8:00		53	55	52	46	47	52	54	52	54	53	52			55	46	52	2.7
8:15		53	53	52	49	47	52	53	51	57	54	51			57	47	52	2.5
8:30		52	54	54	50	53	53	54	50		55	52			55	50	53	1.7
8:45		52	52	52	48	50	55	54	51	53	53	51			55	48	52	1.9
9:00		53	53	52	48	49	54	53	52	53	54	54			54	48	52	1.9
9:15		52	55	52	48	49	54	53	53	54	54	52			55	48	52	2.1
9:30		55	55	52	49	52	54	53	51	53	52	52			55	49	53	1.7
9:45		51	53	54	49	50	57	53	54	54	53	56			57	49	53	2.3
10:00		52	54	53	51	50	54	54	52	52	54				54	50	53	1.4
10:15		53	55	52	48	50	54	51	51	54	52	52			55	48	52	1.8
10:30		50	54	53	47	49	57	51	51	55	52	55			57	47	52	2.8
10:45		51	52	52	47	49	58	52	51	53	53	52			58	47	52	2.7
11:00		52	54	52	51	48	57	51	53	51	53	52			57	48	52	2.1
11:15		56	52	51	53	50	48	59	52	50	54	52			60	48	53	3.5
11:30	60	56	54	51	53	53	50	56	51	53	53	52			56	50	53	1.8
11:45		54	52	53	55	60	50	58	54	52	53	51			60	50	54	2.9
12:00		53	53	53	54	51	49	55	54	51	54	53			55	49	53	1.7
12:15		54	52	52	50	49	49	53	52	53	51	53			54	49	52	1.7
12:30		52	49	55	53	50	50	50	50	55	52	54			56	49	52	2.5
12:45		54	51	51	52	50	47	54	51	53	52	54			54	47	52	2.0
13:00		58	51	52	52	51	48	56	53	51	54	50			58	48	52	2.6
13:15		53	53	52	55	50	55	52	53	54	51	54			55	50	53	1.7
13:30		54	50	52	51	52	48	54	55	51	54	51			55	48	52	2.1
13:45		54	52	52	53	50	49	56	50	51	54	50			56	49	52	2.1
14:00		53	53	53	54	49	49	54	53	53	55	50			55	49	52	2.0
14:15		53	53	52	54	50	51	56	53	52	55	50			56	50	53	1.8
14:30		55	52	51	52	52	47	55	53	51	51	51			55	47	52	2.0
14:45		54	51	54	52	52	48	55	50	51	53	52			55	48	52	2.0
15:00		56	51	52	55	48	48	57	51	52	52	51			57	48	52	2.6
15:15		57	55	53	55	49	47	54	51	54	55	51			57	47	53	2.9
15:30		56	52	53	53	50	49	54	53	51	54	51			56	49	52	2.0
15:45		54	52	54	52	51	51	53	51	54	55	51			55	51	52	1.5
16:00		52	54	53	51	53	50	55	53	56	52	52			56	50	53	1.7
16:15		53	51	53	51	52	49	54	54	52	53	50			54	49	52	1.5
16:30		53	54	53	51	52	49	54	55	52	53	53			55	49	53	1.7
16:45		54	53	52	53	50	50	55	55	52	55	51			55	49	52	2.1
17:00		53	51	52	51	48	49	52	55	52	53	52			55	48	52	2.0
17:15		54	54	53	52	47	48	56	54	51	52	51			56	47	52	2.6
17:30		53	52	51	52	48	46	53	56	52	53	52			56	46	52	2.5
17:45		52	50	52	51	47	48	56	52	53	51	51			56	47	51	2.4
18:00		52	51	50	54	49	47	52	52	47	52	50			54	47	50	2.3
Max		60	55	55	60	53	59	56	56	55	56	55			60	53	57	2.3
Min		52	49	50	50	46	44	51	50	47	51	50			52	44	49	2.3
Ave		54	52	53	52	50	49	55	53	52	53	52			55	49	52	1.7
SD		1.9	1.3	1.2	1.2	2.4	1.7	1.8	1.5	1.3	1.4	1.2			2.4	1.2	1.5	0.4
E Ave		55	52	53	53	51	49	55	53	52	54	52			55	49	53	1.6

Evening LAEQ

Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
18:00		52	51	50	54	49	47	52	52	47	52	50			54	47	50	2.3
18:15		52	50	51	56	44	45	50	54	49	49	51			56	44	50	3.4
18:30		51	50	52	54	44	47	52	50	49	50	49			54	44	49	2.7
18:45		49	49	48	48	43	47	50	48	51	48	48			51	43	48	2.0
19:00		52	49	50	49	43	47	48	51	46	52	51			52	43	49	2.8
19:15		48	48	47	50	44	48	49	51	49	47				51	44	48	2.2
19:30		50	59	56	49	45	47	48	50	45	51	46			59	45	50	4.4
19:45		50	49	47	47	43	45	46	52	47	47				52	43	47	2.3
20:00		47	48	46	51	49	44	48	48	46	48	48			51	44	48	1.8
20:15		46	48	48	48	42	44	46	48	48	49	46			49	42	47	2.0
20:30		47	48	50	46	46	46	47	48	49	49	46			50	46	47	1.5
20:45		49	47	47	46	42	45	47	48	49	47	46			49	42	47	1.9
21:00		49	46	44	47	44	45	47	48	49	48	49			49	44	47	1.9
21:15		49	48	46	57	41	44	47	46	45	48	46			57	41	47	3.9
21:30		47	45	48	49	43	45	49	47	49	49	48			49	43	47	2.1
21:45		49	47	45	45	42	44	48	48	49	47	45			49	42	46	2.2
22:00		48	47	46	46	45	44	49	45	47	46	44			49	44	46	1.5
Max		52	59	56	57	49	48	52	54	51	52	51			59	48	52	3.4
Min		46	45	44	45	41	44	46	45	45	46	44			47	41	45	1.5
Ave		49	49	48	50	44	45	48	49	48	49	47			50	44	48	1.6
SD		1.9	3.0	2.9	3.7	2.3	1.3	1.7	2.3	1.6	1.8	1.9			3.7	0.6	2.1	0.8
E Avg		49	50	49	51	45	46	49	50	48	49	48			51	45	49	1.9

Night LAEQ

Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
22:00		48	47	46	46	45	44	49	45	47	46	44			49	44	46	1.5
22:15		49	45	47	46	41	45	48	48	48	46	46			49	41	46	2.1
22:30		49	45	46	46	43	43	48	46	49	48	45			49	43	46	2.1
22:45		47	46	47	46	44	42	48	45	48	46	45			48	42	46	1.7
23:00		46	44	45	48	43	44	48	45	49	47	46			49	43	46	2.1
23:15		46	48	47	48	40	47	46	46	50	47	45			50	40	46	2.7
23:30		46	46	43	44	40	42	48	42	45	47	44			48	40	44	2.2
23:45		45	45	43	42	40	42	45	41	46	45	46			46	40	44	2.1
0:00		46	46	46	45	38	42	45	44	46	45	45			46	38	44	2.4
0:15		46	45	45	46	40	42	48	43	44	46	45			48	40	44	2.2
0:30		44	42	45	42	39	42	46	41	47	45	45			47	39	44	2.3
0:45		45	44	45	41	41	43	47	44	46	45	46			47	41	44	1.9
1:00		44	43	45	44	39	42	44	44	45	46	46			46	39	44	2.1
1:15		44	44	45	42	43	42	45	43	46	44	44			46	42	44	1.4
1:30		46	44	47	41	42	42	46	43	45	47	46			47			

4 Melbourne St., New Berrima

Daytime LA90 19 September to 1 October 2017

Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
7:00		46	46	45	39	40	45	46	43	46	46	47			47	39	44	2.6
7:15		45	46	44	39	42	43	46	42	45	45	47			47	39	44	2.4
7:30		44	46	44	39	41	43	46	41	45	46	48			48	39	44	2.6
7:45		44	49	44	39	42	44	46	41	47	46	46			49	39	44	2.9
8:00		44	47	43	40	42	45	46	41	47	46	46			47	40	44	2.6
8:15		43	47	44	40	42	43	47	42	48	48	45			48	40	44	2.6
8:30		44	47	43	41	43	47	47	42	48	48	46			48	41	45	2.6
8:45		44	45	42	40	44	48	46	42	47	48	46			48	40	45	2.6
9:00		44	44	42	40	44	48	46	42	47	48	45			48	40	44	2.5
9:15		42	43	41	40	44	47	45	43	46	47	46			47	40	44	2.4
9:30		43	43	42	40	44	47	45	42	46	47	47			47	40	44	2.3
9:45		42	43	43	41	44	48	45	41	46	47	48			48	41	44	2.5
10:00		42	42	44	41	44	47	47	41	45	47	47			47	41	44	2.6
10:15		42	42	43	41	44	47	46	41	45	45	45			47	41	44	2.2
10:30		42	42	42	41	43	47	44	42	46	45	48			48	41	44	2.3
10:45		41	42	43	40	43	50	43	40	46	45	46			50	40	44	3.0
11:00		41	42	43	41	43	50	45	41	45	46	47			50	41	44	2.8
11:15	43	42	41	43	41	41	50	42	41	47	44	46			50	41	44	3.0
11:30	34	42	41	42	42	42	49	44	43	45	44	46			49	41	44	2.3
11:45	47	41	42	42	42	41	51	44	40	46	44	47			51	40	44	3.3
12:00	47	41	41	42	43	42	48	43	41	46	43	48			48	41	43	2.8
12:15	47	40	40	41	42	43	46	43	40	46	48	48			48	40	43	2.7
12:30	46	40	41	43	41	42	48	41	39	49	43	48			49	39	43	2.6
12:45	47	41	41	42	42	41	47	43	40	47	42	47			47	40	43	2.6
13:00	47	40	41	44	44	41	48	45	40	47	43	47			48	40	43	2.8
13:15	47	42	42	43	43	42	48	42	41	47	43	48			48	41	44	2.7
13:30	48	43	40	42	42	41	49	43	40	47	43	49			49	40	43	3.3
13:45	48	42	42	44	43	42	48	40	40	47	43	48			48	40	44	2.8
14:00	48	43	41	44	41	43	48	41	41	47	43	47			48	41	44	2.6
14:15	48	44	41	43	42	42	49	44	40	47	44	48			49	40	44	3.0
14:30	48	42	43	41	42	41	48	45	41	46	44	46			48	41	44	2.4
14:45	48	43	43	42	42	41	48	41	40	46	45	49			49	40	43	3.0
15:00	47	41	43	43	41	42	47	41	40	46	44	48			48	40	43	2.7
15:15	48	41	44	43	42	41	48	45	40	48	43	46			48	40	44	2.7
15:30	47	43	42	43	43	43	48	42	40	47	44	46			48	40	43	2.4
15:45	46	43	44	43	42	42	47	43	42	48	43	46			48	42	44	2.0
16:00	46	42	43	42	41	44	49	43	41	46	45	46			49	41	44	2.4
16:15	47	42	44	42	41	44	47	42	41	46	45	47			47	41	44	2.4
16:30	46	43	42	42	42	43	47	49	41	46	45	46			49	41	44	2.5
16:45	46	42	43	43	39	43	47	48	41	45	44	45			48	39	44	2.7
17:00	46	42	43	43	37	42	46	49	40	46	45	46			49	37	44	3.3
17:15	47	43	44	45	37	41	47	49	40	46	44	45			49	37	44	3.3
17:30	48	43	44	45	40	41	46	49	41	45	44	45			49	40	44	2.7
17:45	46	43	43	44	38	40	46	47	42	44	44	44			47	38	43	2.4
18:00	47	43	45	44	37	40	45	47	39	44	43	43			47	37	43	2.9
Max	48	45	49	45	44	44	51	49	43	49	48	49			51	43	47	2.6
Min	34	40	40	41	37	40	43	40	39	44	42	43			44	34	40	2.7
Ave	46	42	43	43	41	42	47	45	41	46	45	47			47	41	44	2.3
SD	2.6	1.2	2.0	1.0	1.6	1.3	1.8	2.3	0.9	1.0	1.6	1.3			2.6	0.9	1.6	0.5
90%	46	41	41	42	39	41	45	41	40	45	43	45			46	39	42	2.4
																Median	42	

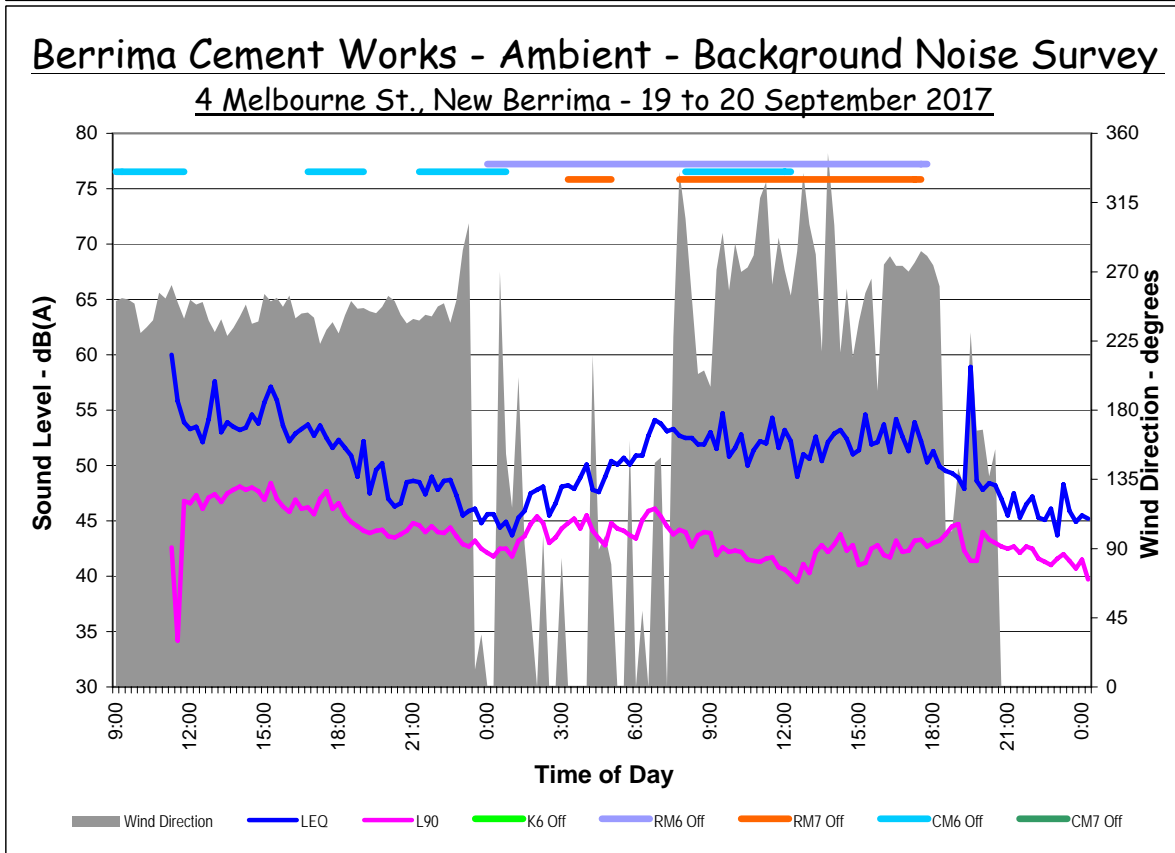
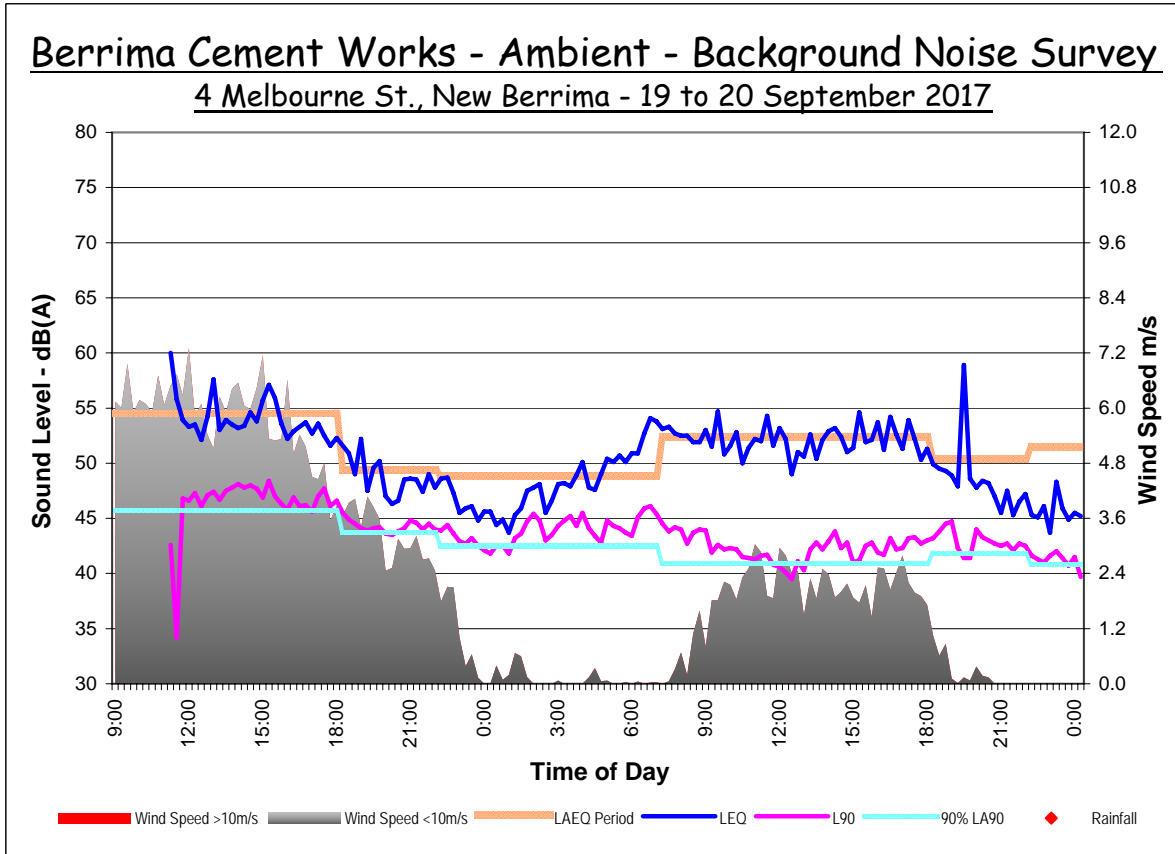
Evening LA90

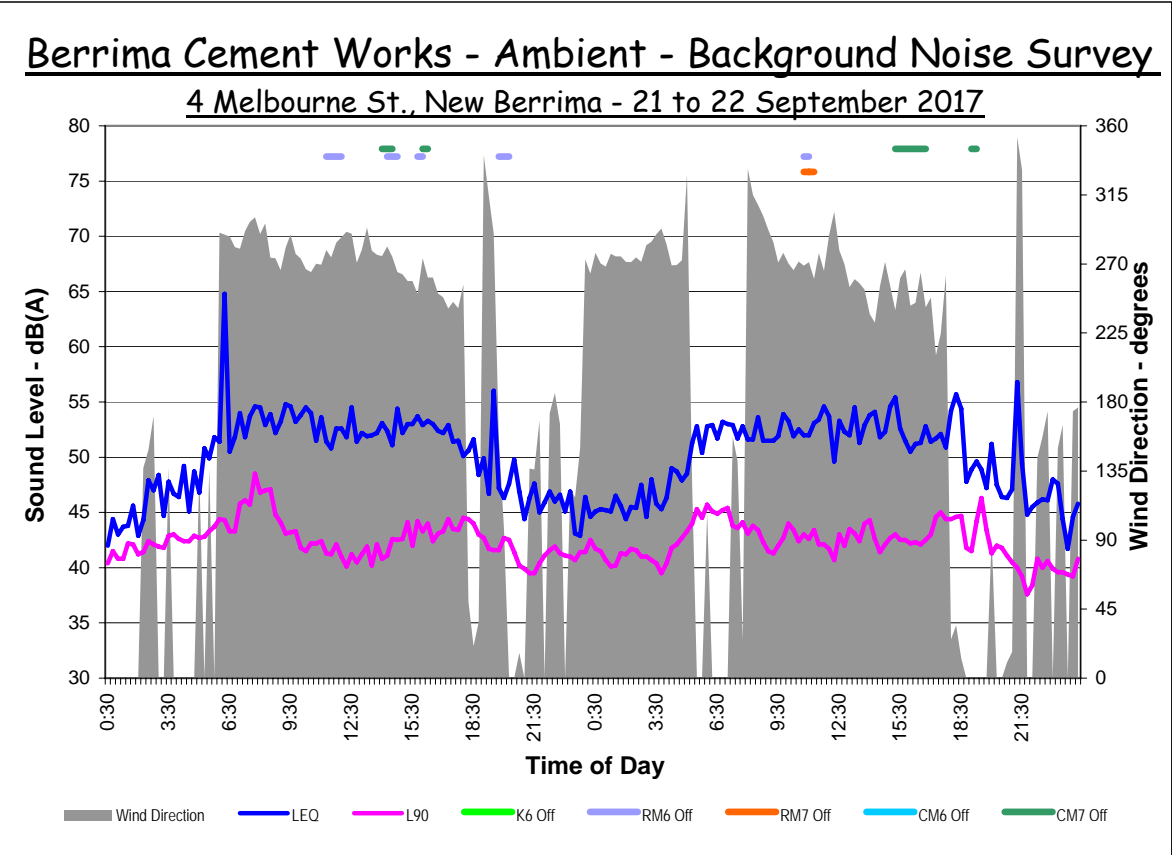
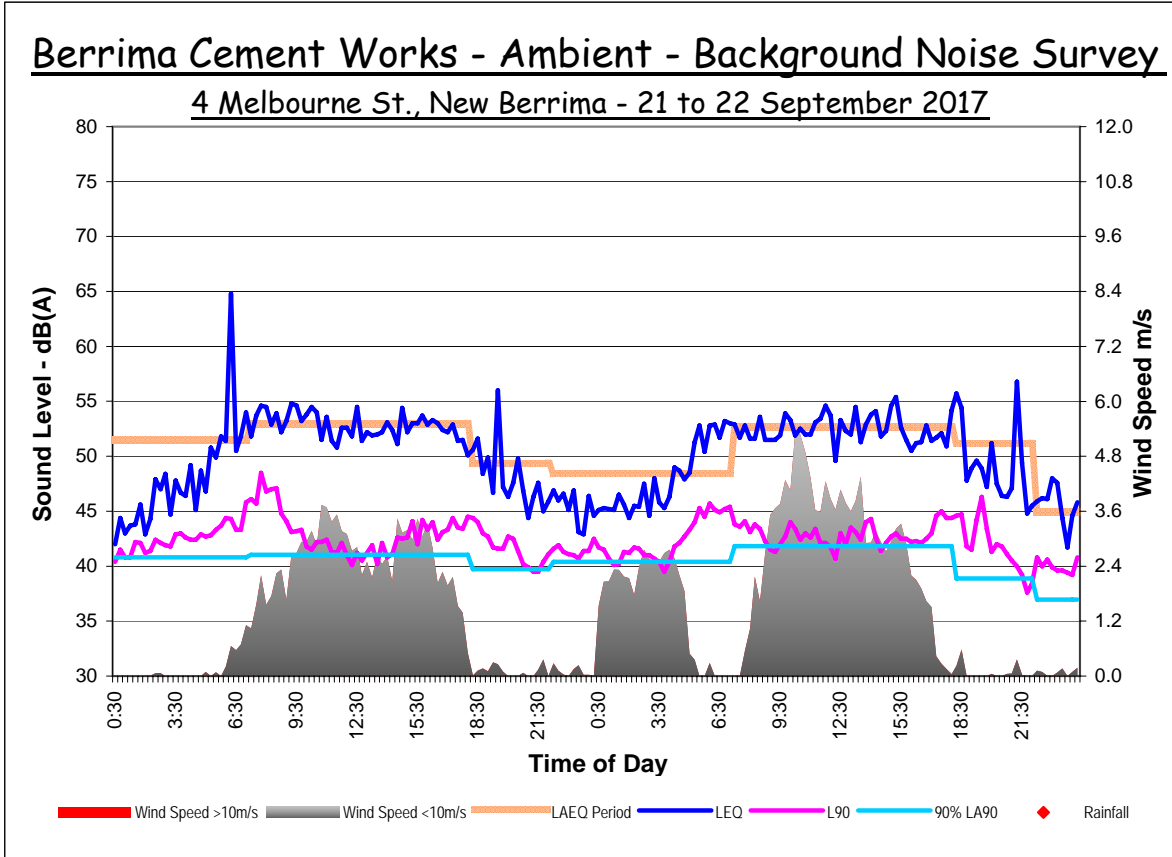
Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
18:00	47	43	45	44	37	40	45	47	39	44	43	43			47	37	43	2.9
18:15	46	43	44	45	37	40	44	47	39	44	42	43			47	37	43	3.0
18:30	45	44	44	45	36	40	44	46	40	45	43	43			46	36	43	2.9
18:45	45	45	43	42	36	40	43	46	40	44	43	43			46	36	42	2.7
19:00	44	45	43	42	36	40	43	47	39	44	43			47	36	42	3.0	
19:15	44	42	42	44	37	40	42	47	39	44	42			47	37	42	2.9	
19:30	44	41	42	46	37	40	42	46	38	45	41			46	37	42	3.1	
19:45	44	41	42	43	37	40	43	45	40	44	41			45	37	42	2.5	
20:00	44	44	43	41	37	40	43	45	40	45	42			45	37	42	2.5	
20:15	44	43	43	42	37	39	43	44	41	45	41			45	37	42	2.4	
20:30	44	43	41	42	38	40	43	43	41	45	41			45	38	42	1.9	
20:45	44	43	40	41	38	40	44	42	45	44	41			45	38	42	2.2	
21:00	45	43	40	41	37	41	44	43	43	44	41			44	37	41	2.2	
21:15	45	43	40	40	38	40	44	42	40	45	41			45	38	41	2.1	
21:30	44	42	40	39	39	41	43	42	42	44	42			44	39	41	1.7	
21:45	45	43	40	38	38	40	43	41	43	43	42			43	38	41	2.1	
22:00	44	43	41	38	38	40	44	41	43	43	42			44	38	41	1.9	
Max	47	45	45	46	39	41	45	47	45	45	43	43			47	39	44	2.4
Min	44	41	40	38	36	39	42	41	38	43	41	43			44	36	40	2.3
Ave	44	43	42	42	37	40	43	44	41	44	42	43			44	37	42	2.1
SD	0.8	0.9	1.6	2.4	0.8	0.3	0.7	2.3	1.7	0.6	0.8	0.4			2.4	0.3	1.1	0.7
90%	44	42	40	39	36	40	43	42	39	43	41	43			44	36	41	2.2
																Median	41	

Night LA90

Time	19/9	20/9	21/9	22/9	23/9	24/9	25/9	26/9	27/9	28/9	29/9	30/9	1/10	2/10	Maximum	Minimum	Average	SD
22:00	44	43	41	38	38	40	44	41	43	43	42				44	38	41	1.9
22:15	44	42	42	41	38	40	44	41	42	43	41				44	38	41	1.8
22:30	44	41	42	40	38	40	45	41	43	42	41				45	38	41	1.9
22:45	44	41	41	41	38	40	45	40	43	43	41				45	38	41	1.8
23:00	43	42	41	40	37	40	43	40	45	43	41				45	37	41	2.3
23:15	43	42	41	40	36	40	44	39	45	45	42				45	36	41	2.7
23:30	43	41	41	40	36	39	44	39	42	44	42				44	36	41	2.2
23:45	43	41	41	39	36	39	43	39	41	43	42				43	36	40	2.0
0:00	42	42	41	39	36	39	43	39	42	43	42				43	36	41	2.2
0:15	42	40	43	41	36	39	44	39	41	43	42				44	36	41	2.4
0:30	43	40	42	38	36	39	43	39	41	43	42				43	36	40	2.4
0:45	43	42	42	38	36	40	43	38	41	43	42				43	36	40	2.5
1:00	42	41	41	38	36	40	42	37	41	43	41				4			

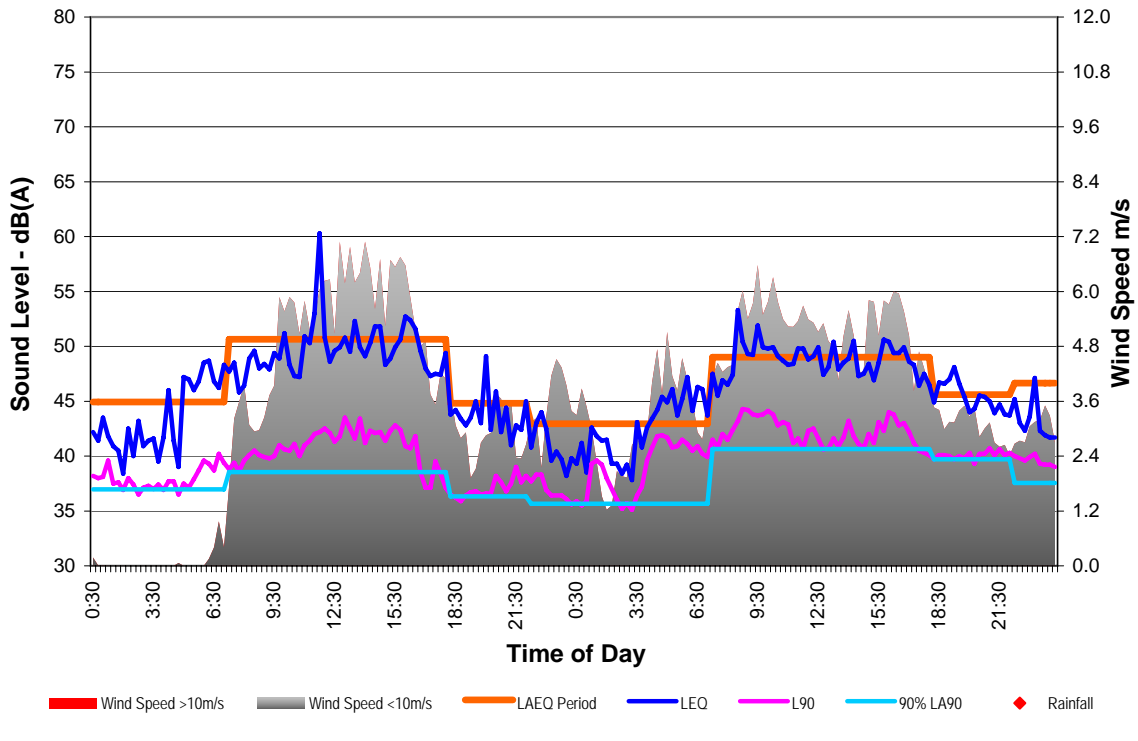
Two Day Results of Ambient Noise Monitoring





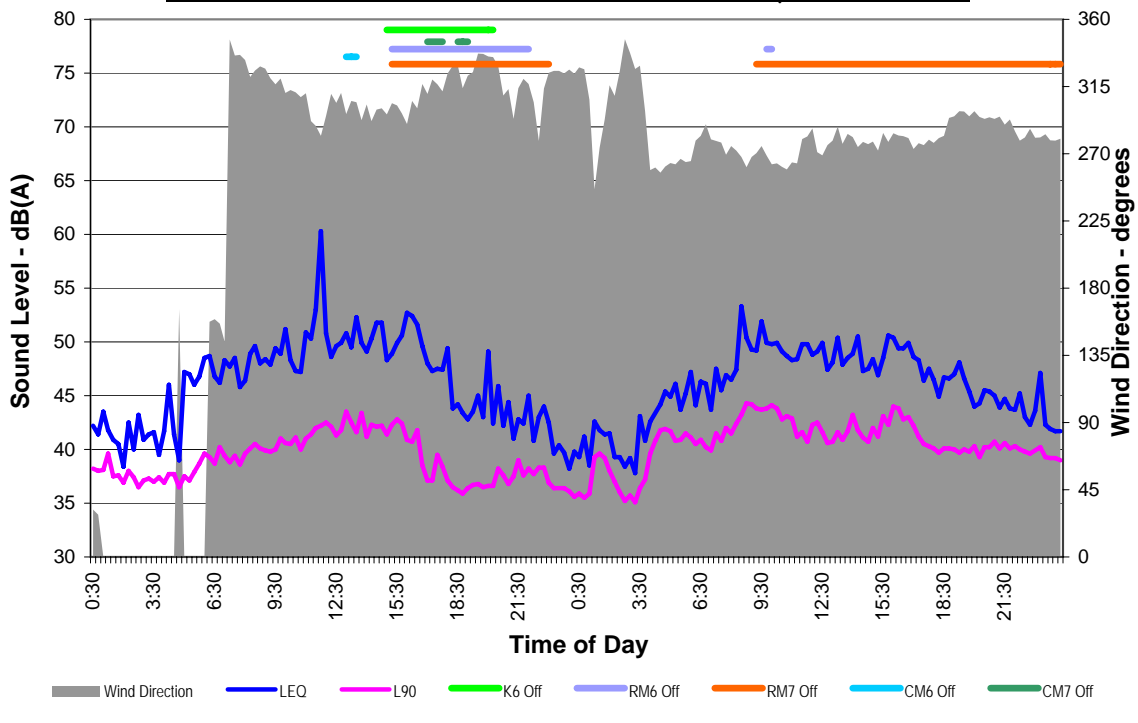
Berrima Cement Works - Ambient - Background Noise Survey

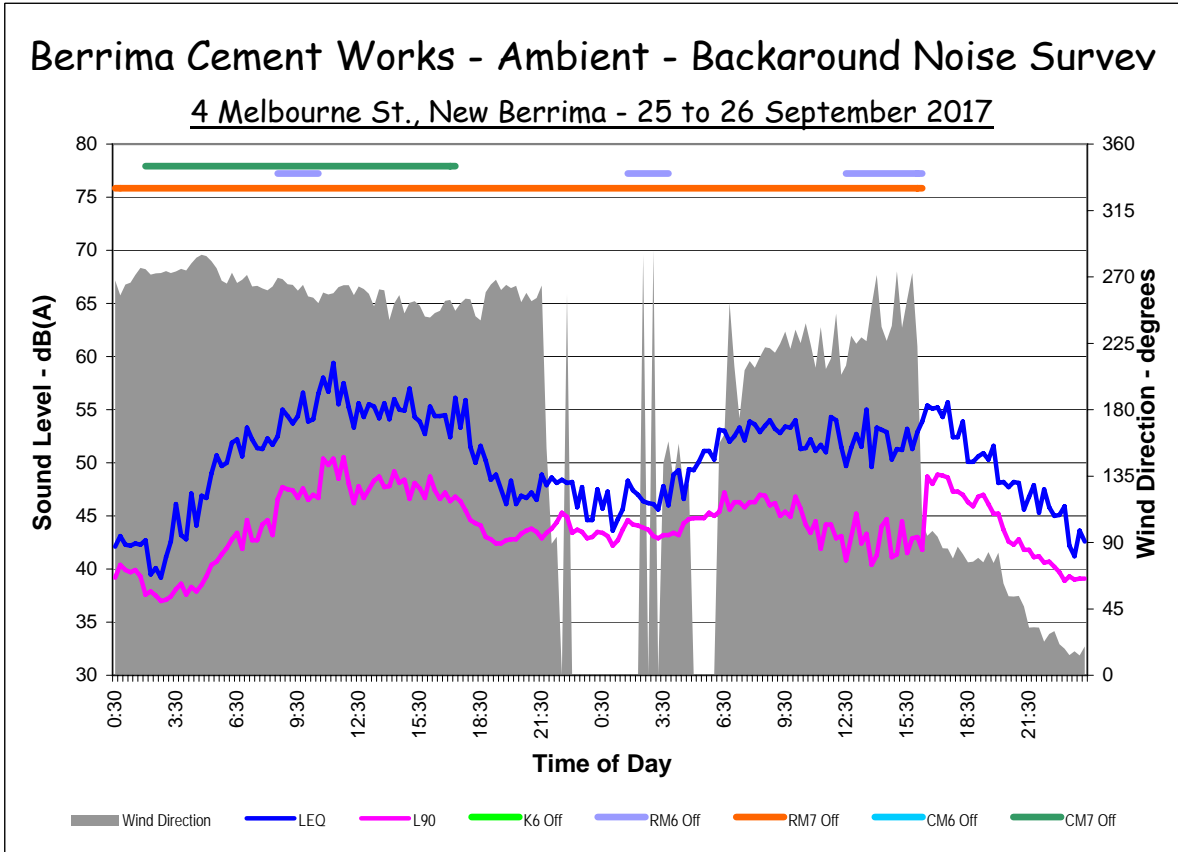
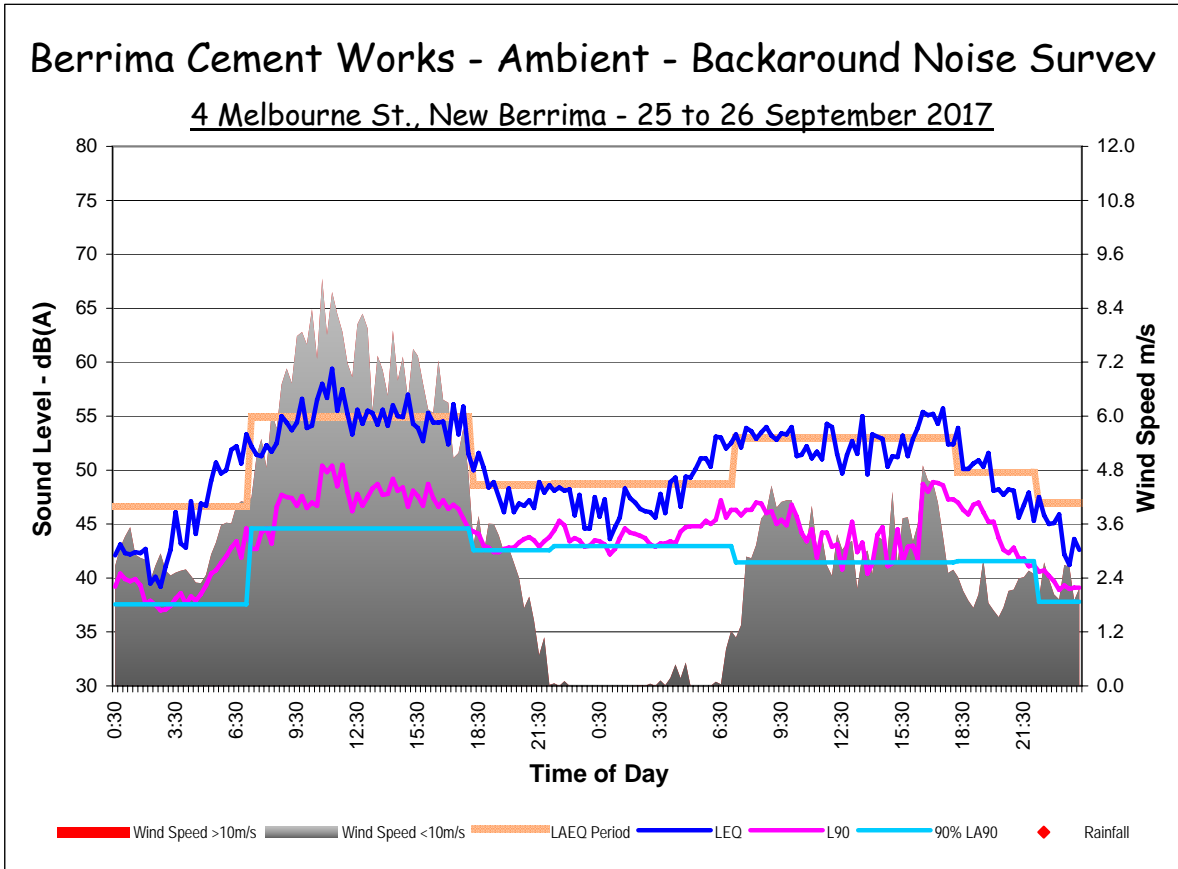
4 Melbourne St., New Berrima - 23 to 24 September 2017



Berrima Cement Works - Ambient - Background Noise Survey

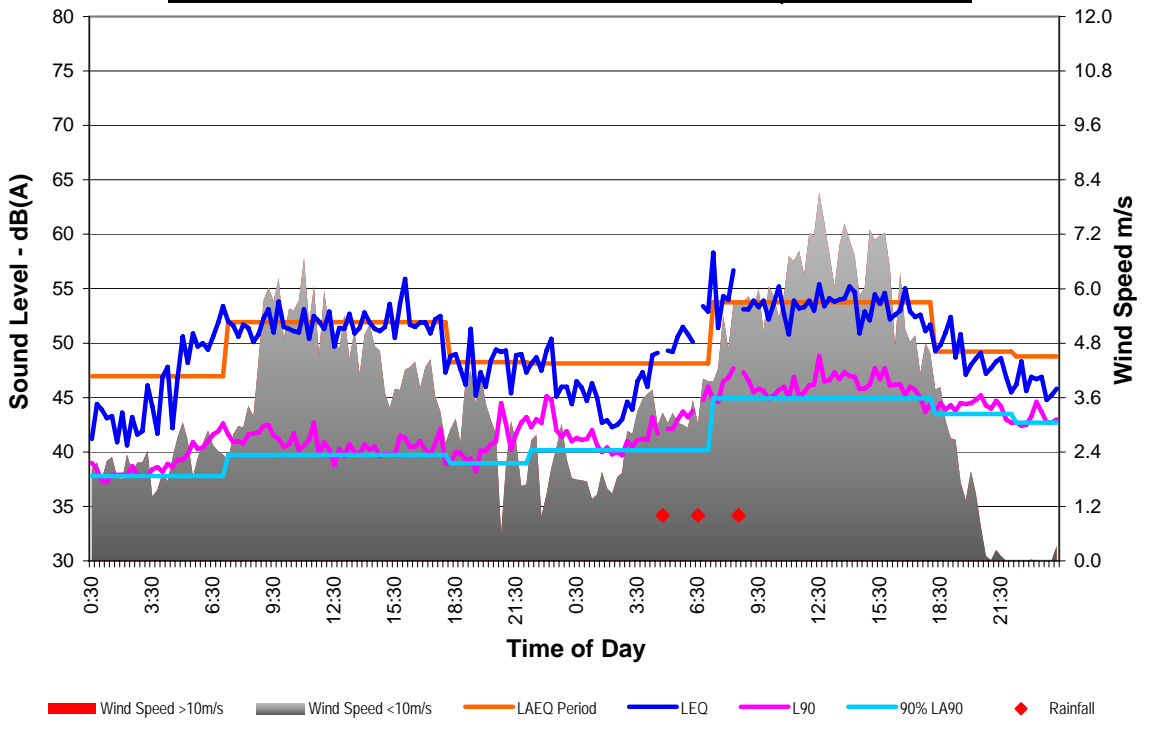
4 Melbourne St., New Berrima - 23 to 24 September 2017





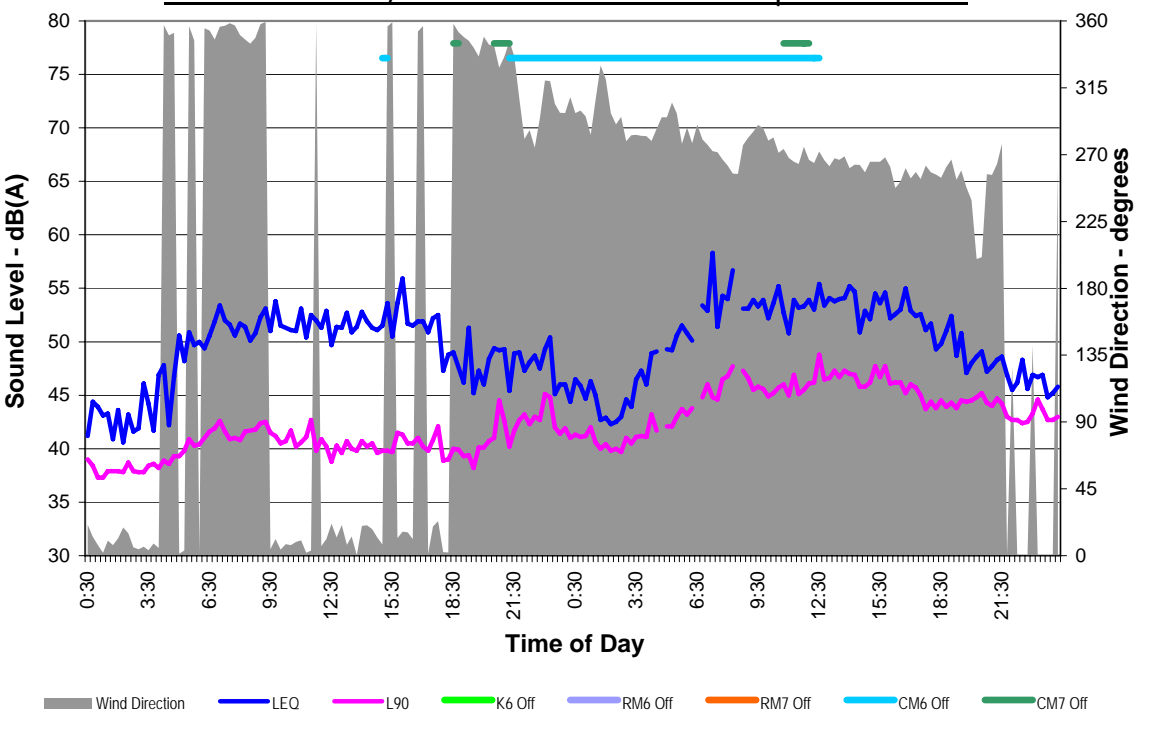
Berrima Cement Works - Ambient - Background Noise Survey

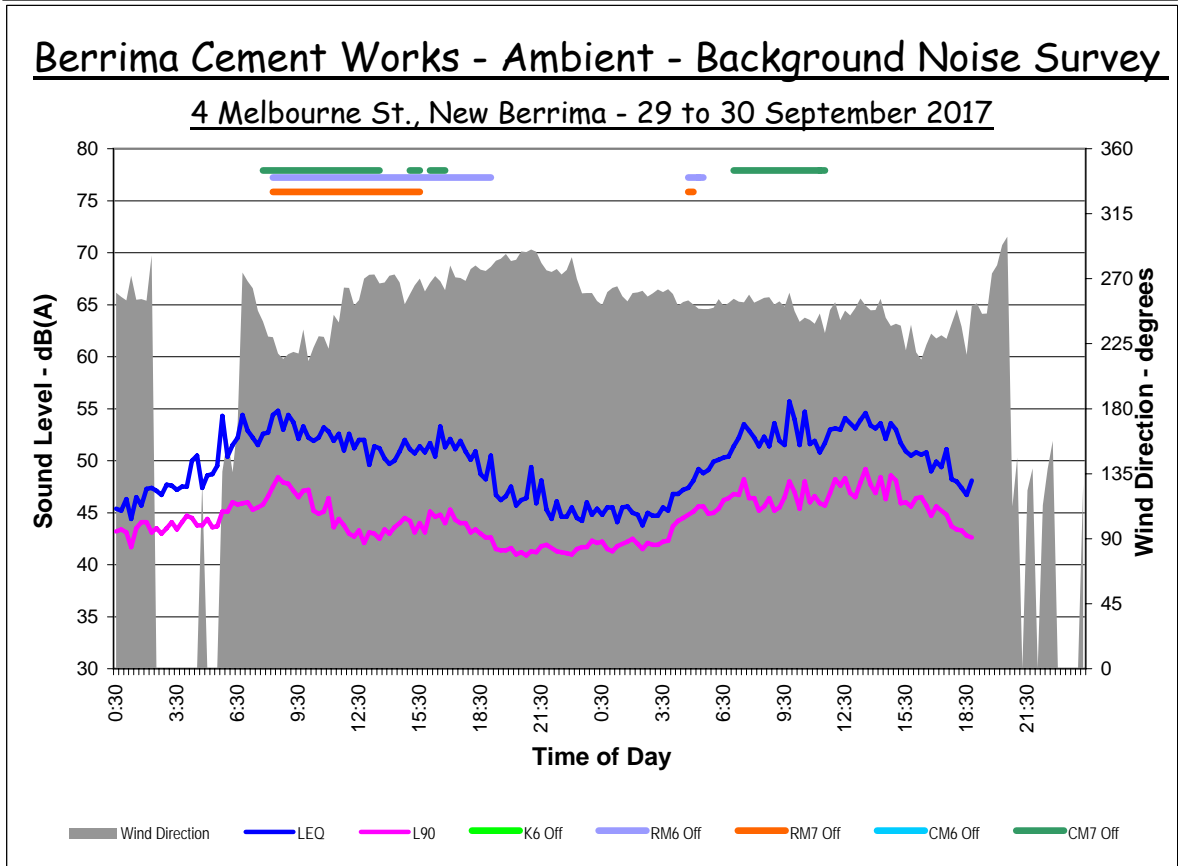
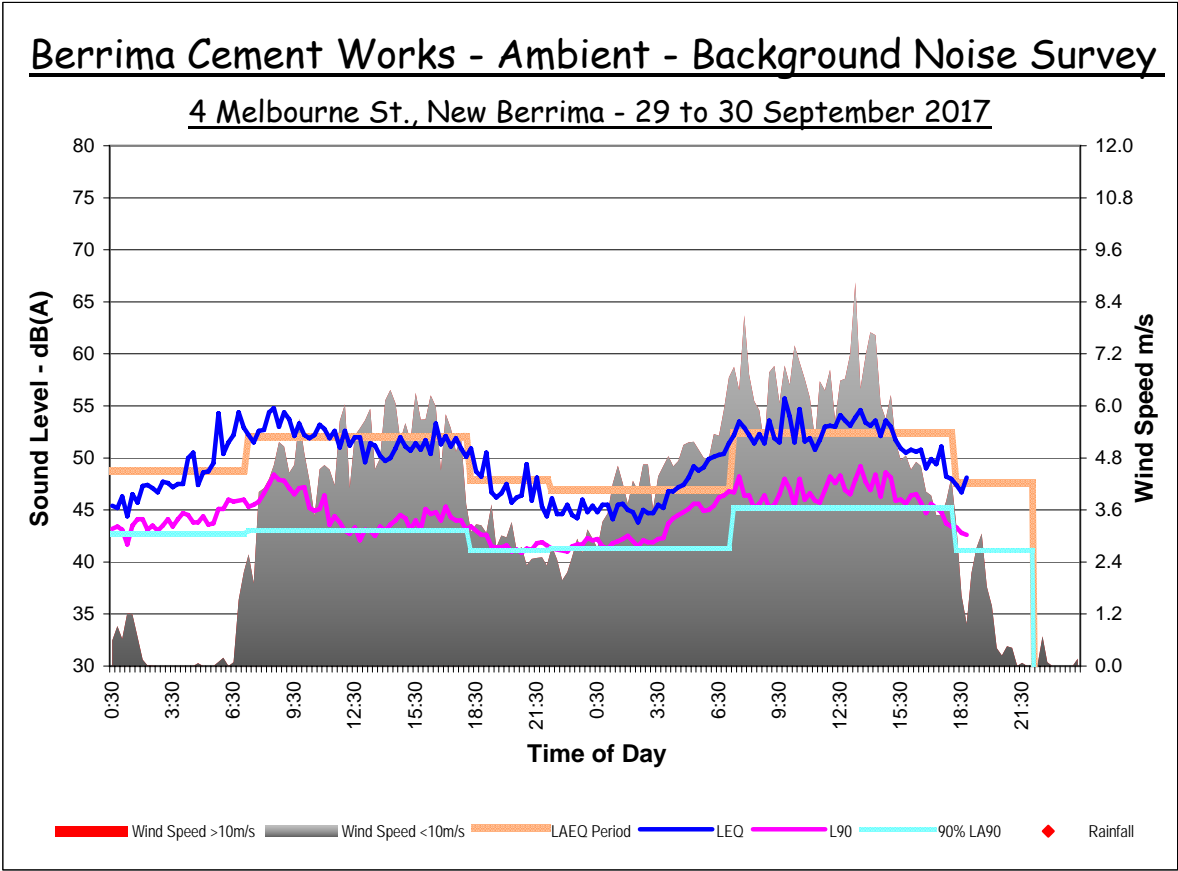
4 Melbourne St., New Berrima - 27 to 28 September 2017



Berrima Cement Works - Ambient - Background Noise Survey

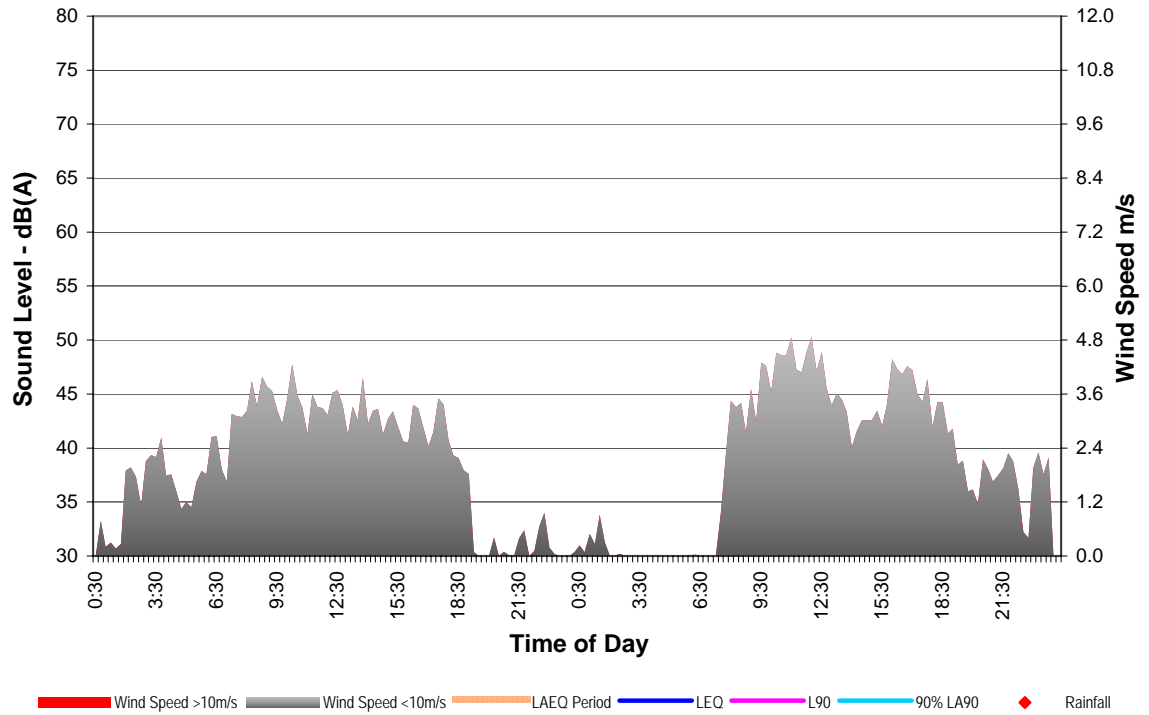
4 Melbourne St., New Berrima - 27 to 28 September 2017





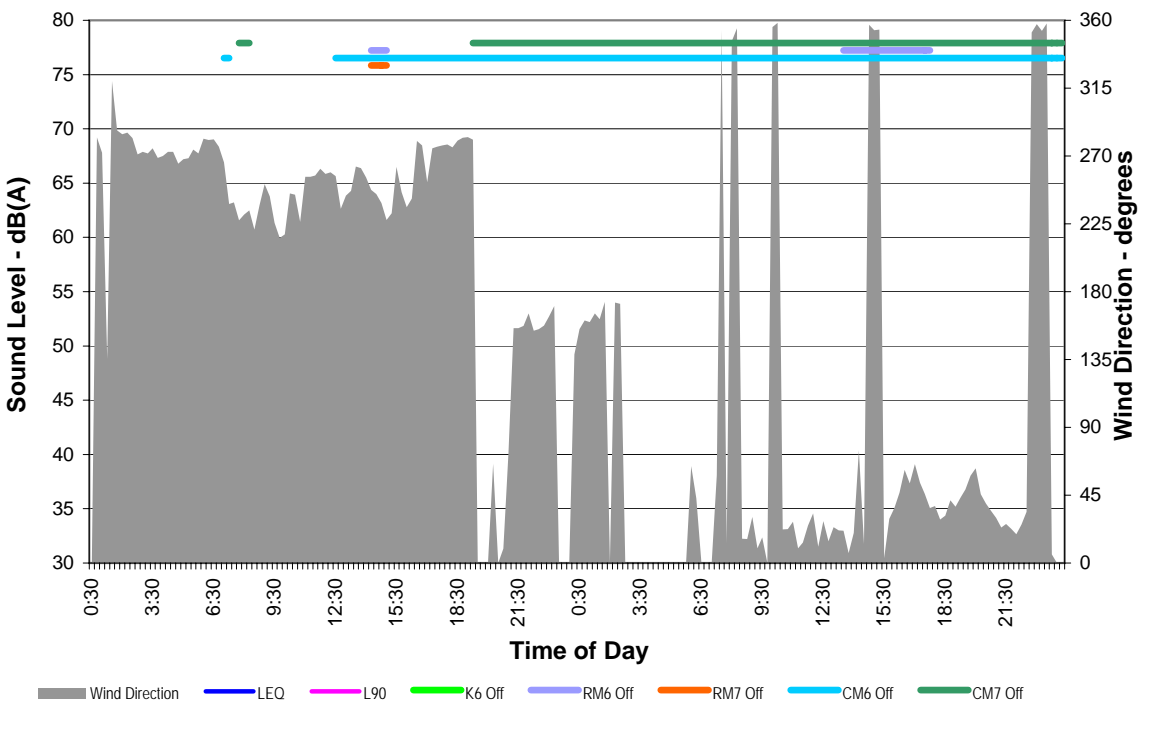
Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St., New Berrima - 1 to 2 October 2017

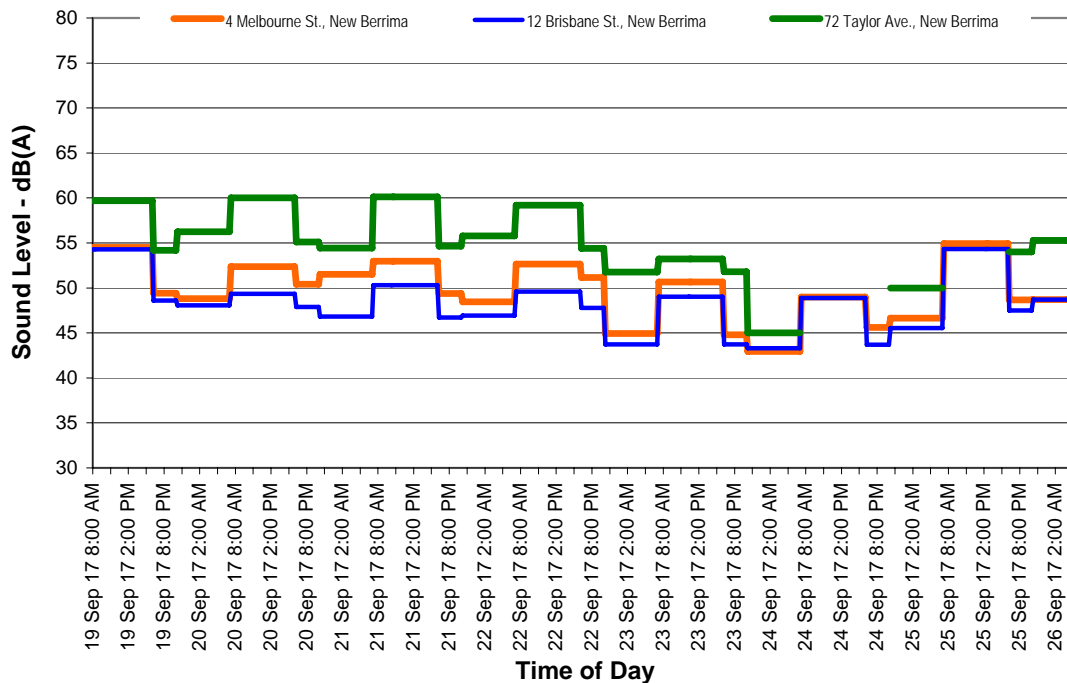


Berrima Cement Works - Ambient - Background Noise Survey

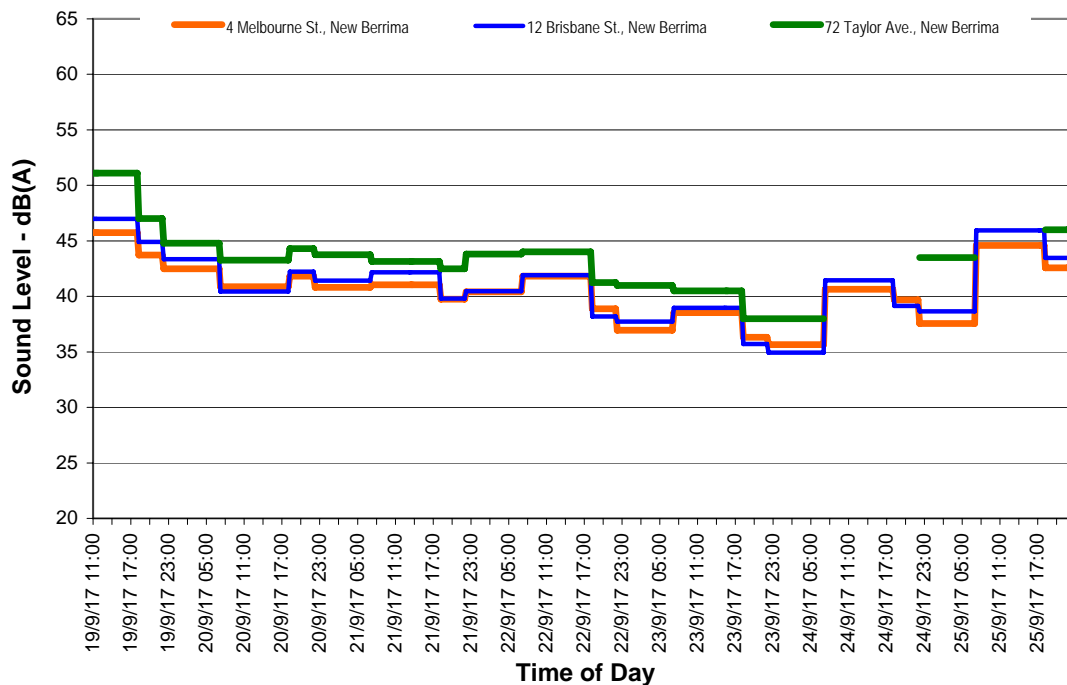
4 Melbourne St., New Berrima - 1 to 2 October 2017

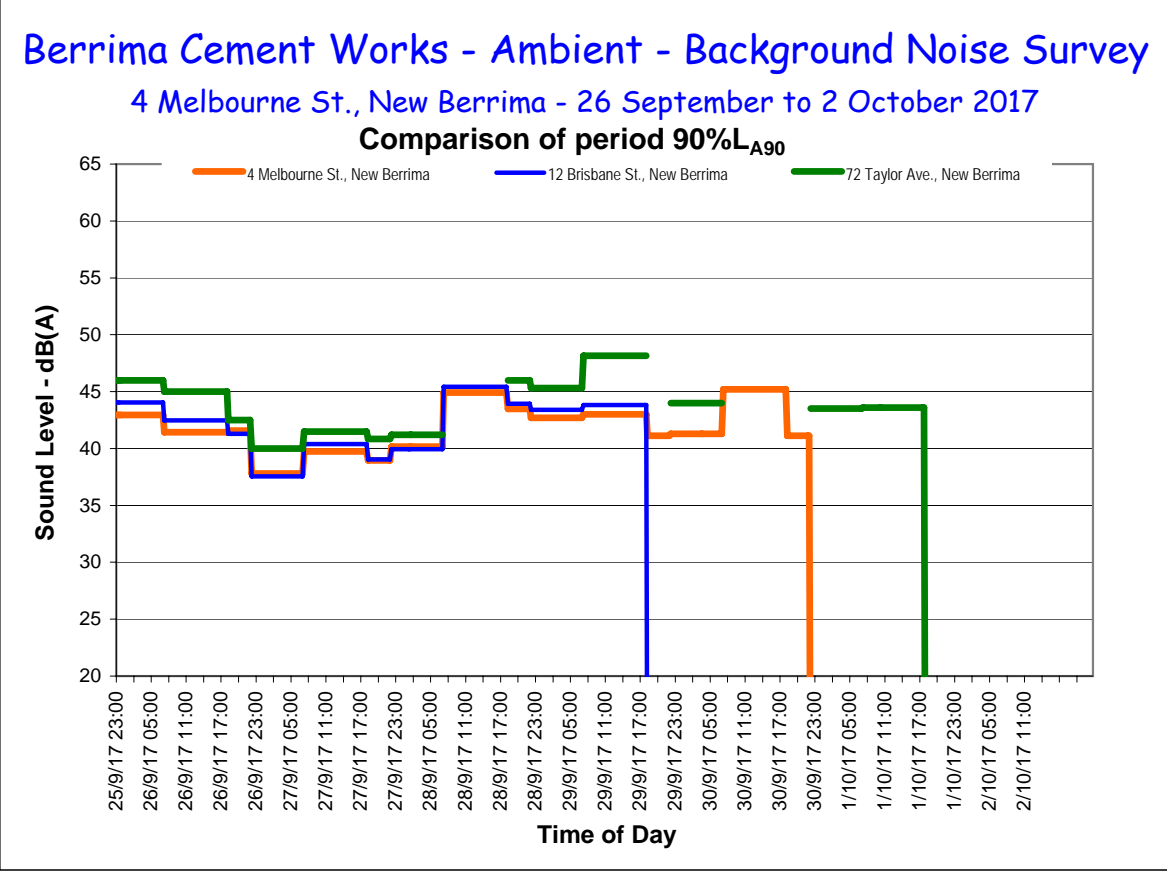
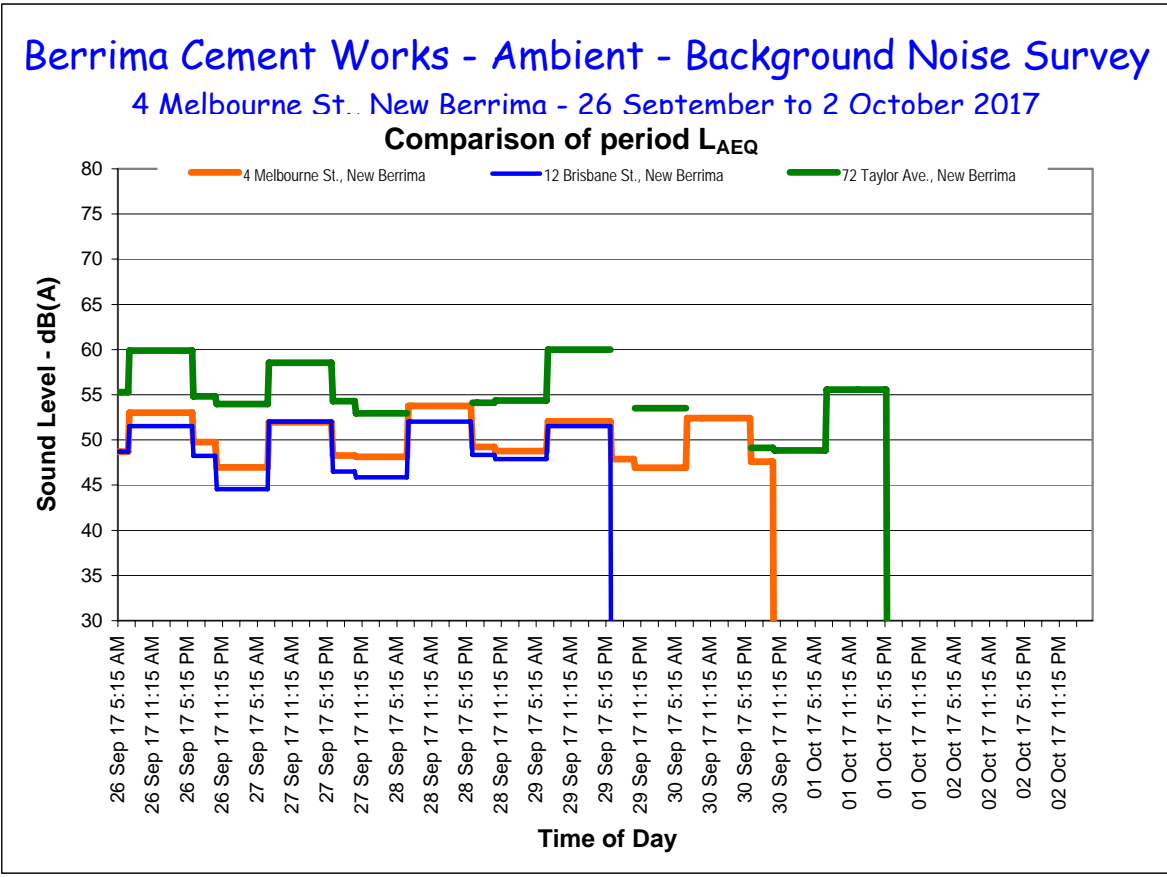


Berrima Cement Works - Ambient - Background Noise Survey
 4 Melbourne St., New Berrima - 19 to 25 September 2017
 Comparison of period LAEQ



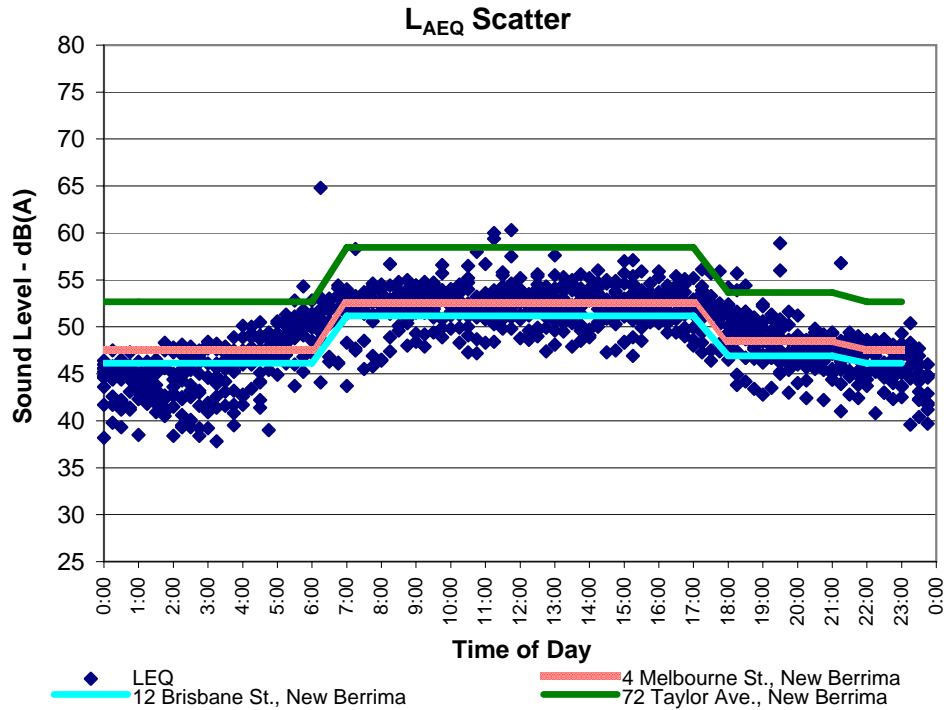
Berrima Cement Works - Ambient - Background Noise Survey
 4 Melbourne St., New Berrima - 19 to 25 September 2017
 Comparison of period 90%LA90





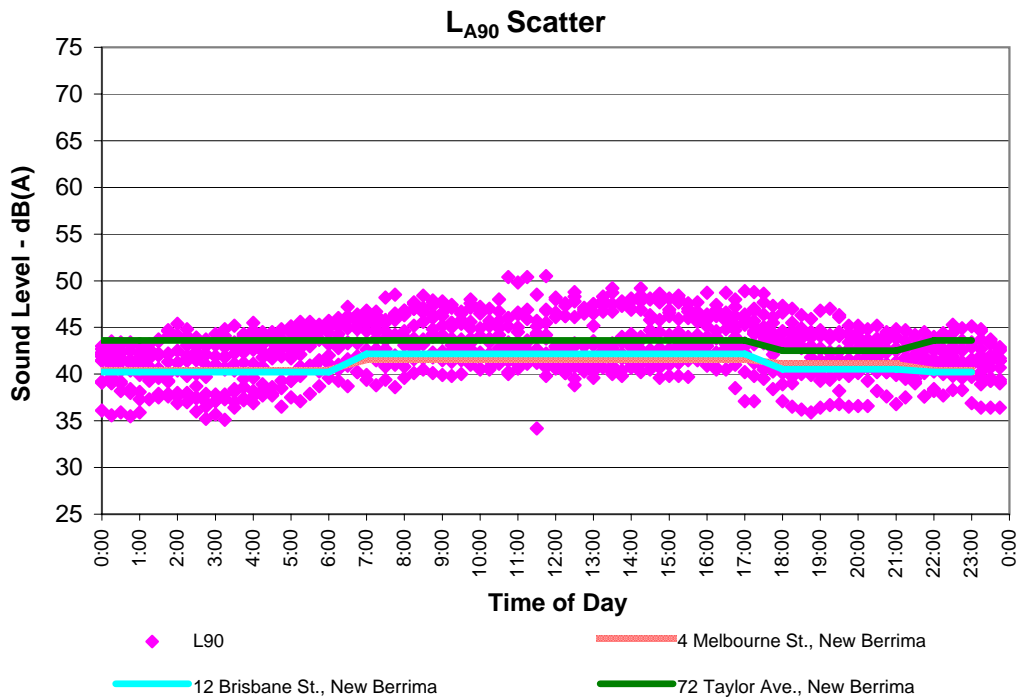
Berrima Cement Works - Ambient - Background Noise

4 Melbourne St., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

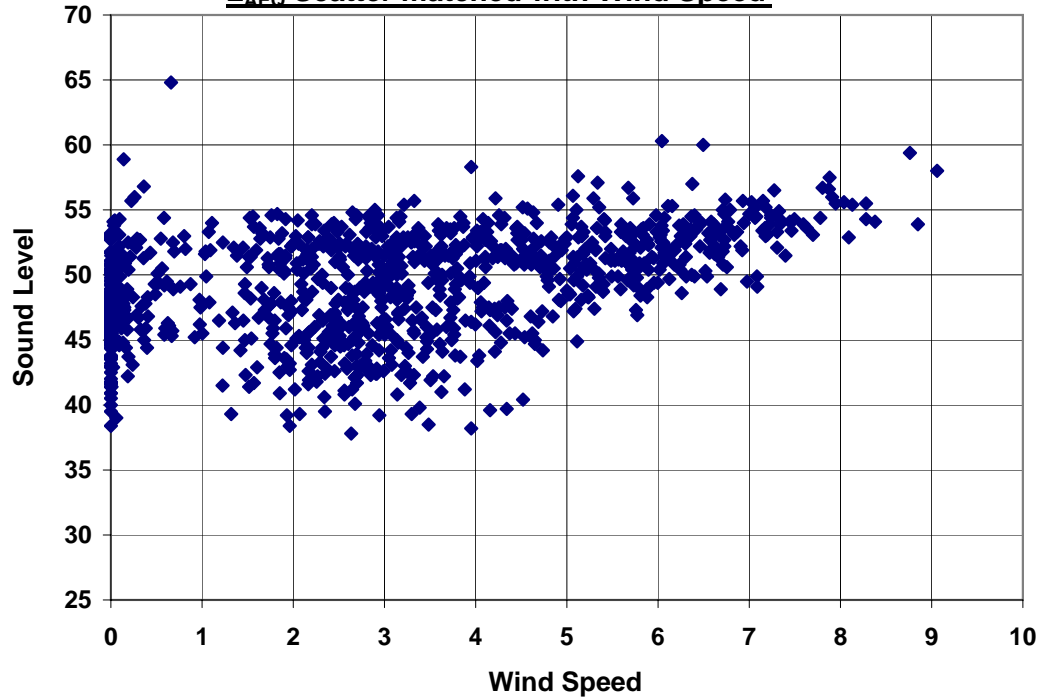
4 Melbourne St., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

4 Melbourne St., New Berrima - 19 September to 1 October 2017

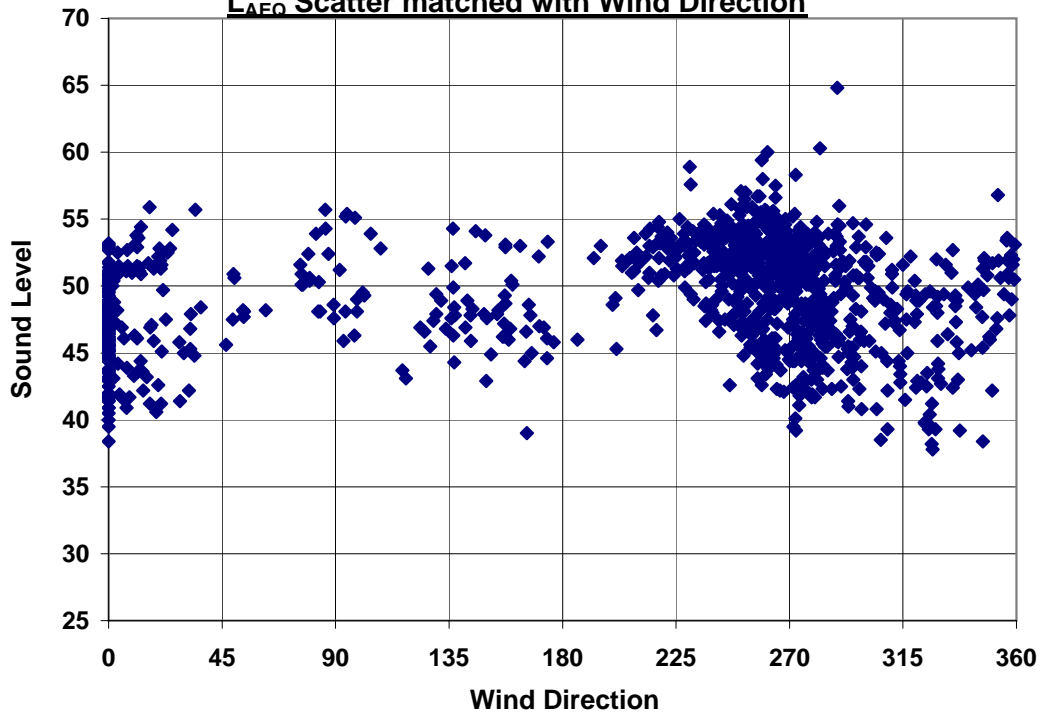
L_{AEQ} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

4 Melbourne St., New Berrima - 19 September to 1 October 2017

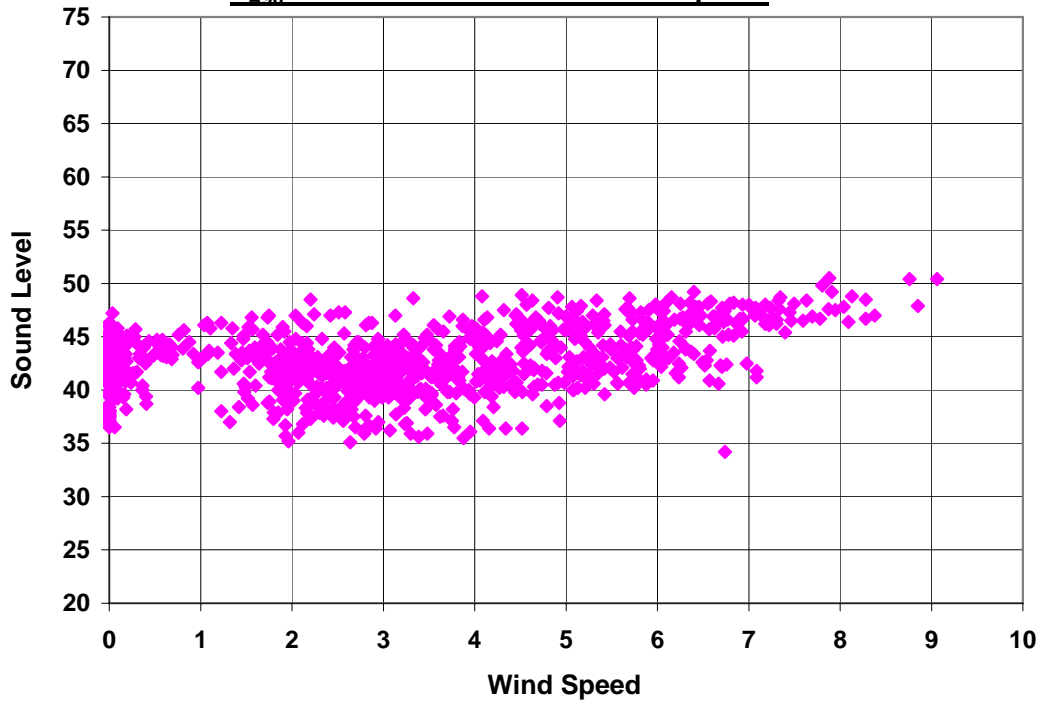
L_{AEQ} Scatter matched with Wind Direction



Berrima Cement Works - Ambient - Background Noise

4 Melbourne St., New Berrima - 19 September to 1 October 2017

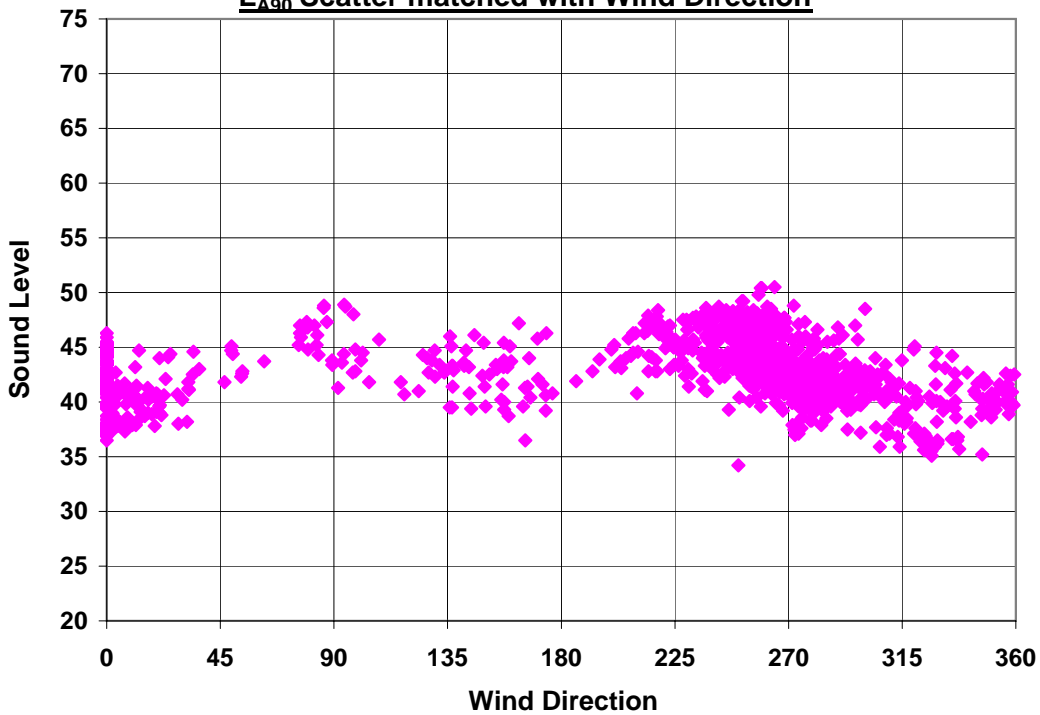
L_{A90} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

4 Melbourne St., New Berrima - 19 September to 1 October 2017

L_{A90} Scatter matched with Wind Direction



Appendix C: Unattended environmental sound level results for 72 Taylor Avenue (near Adelaide St)

72 Taylor Ave., New Berrima - 19 September to 1 October 2017

Comparison of Period LAEQ, Period Average LA90 and Period 90% LA90 Results

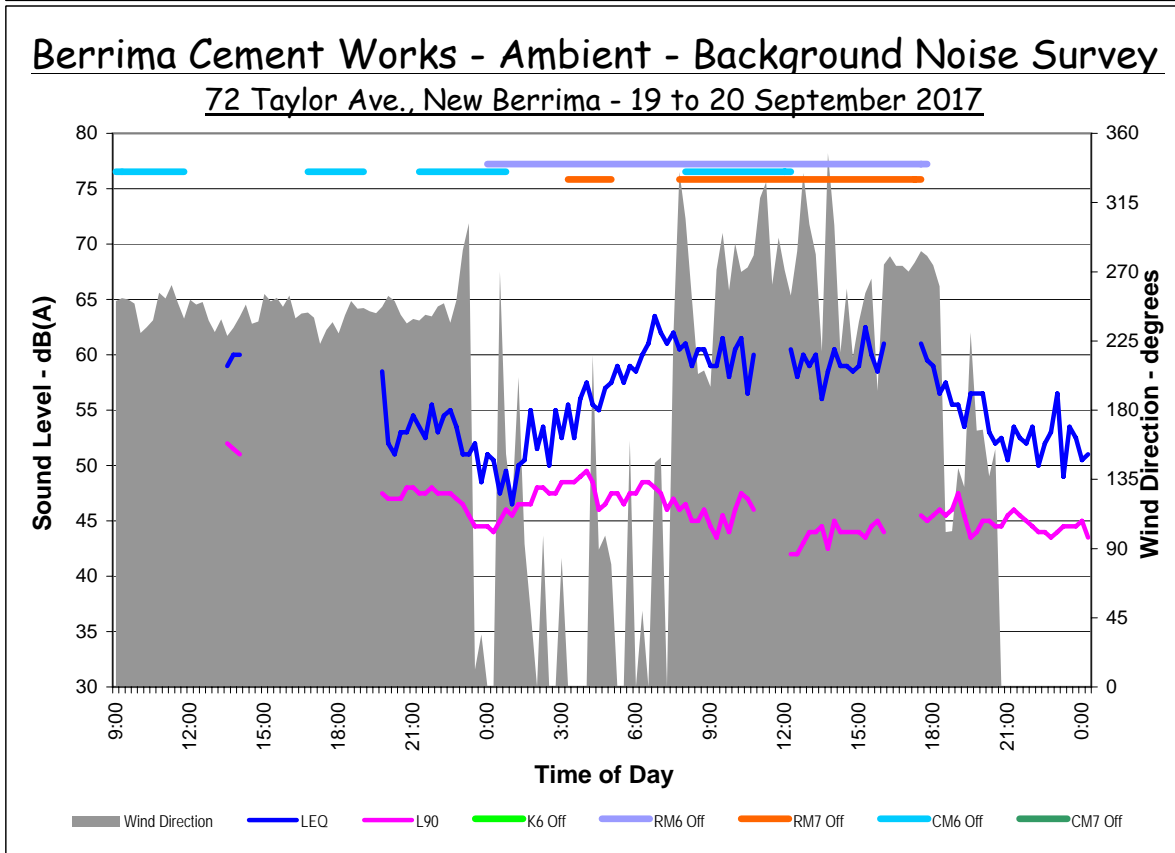
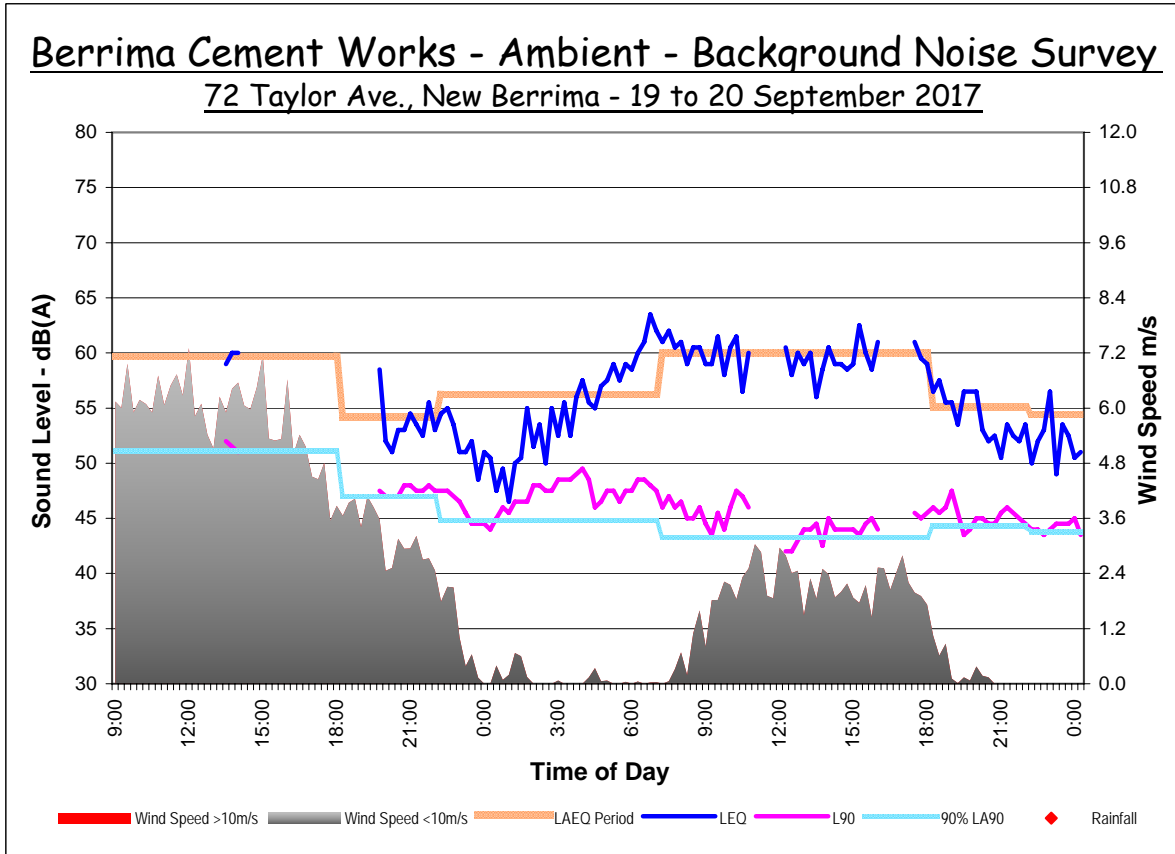
Summary of Statistical Data

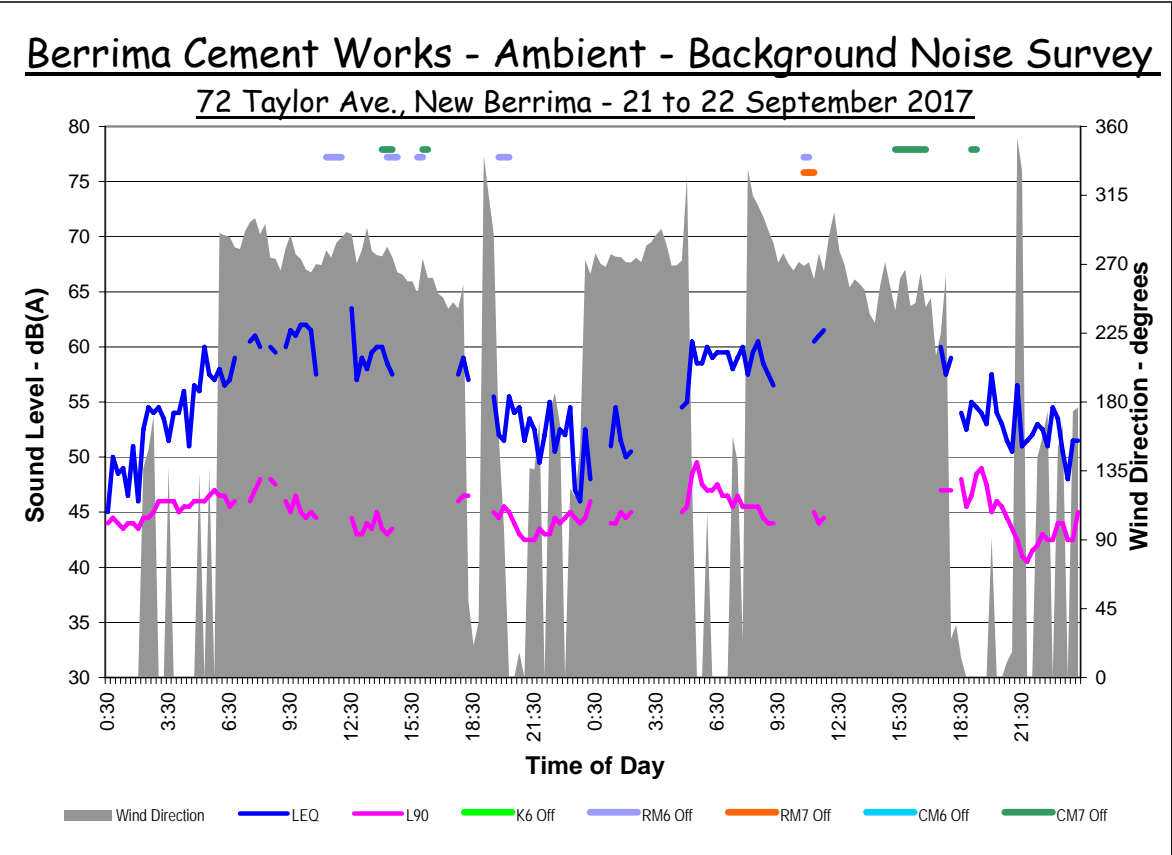
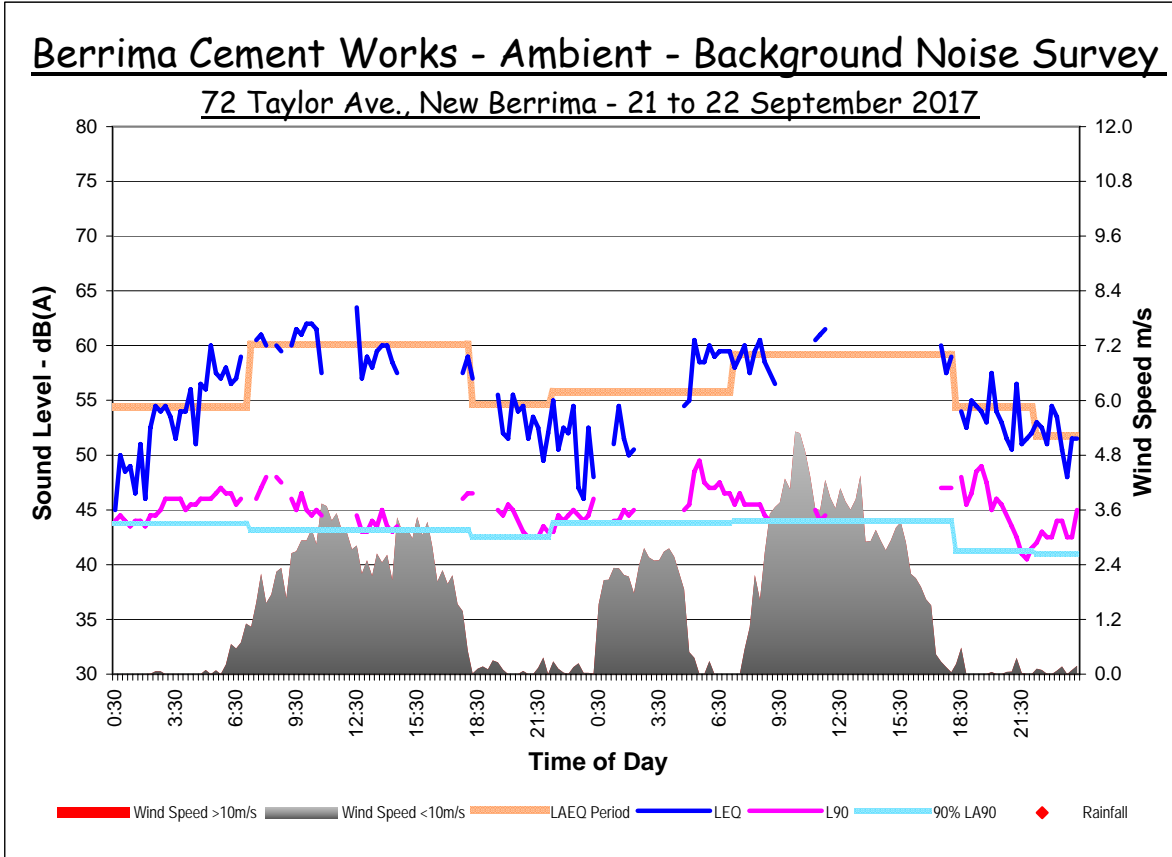
LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
72 Taylor Ave., New Berrima	60	53	58	55	49	54	56	45	53	59	45	54
4 Melbourne St., New Berrima	55	49	53	51	45	49	51	43	48	58	42	51
12 Brisbane St., New Berrima	54	49	51	49	44	47	49	43	46	55	41	49

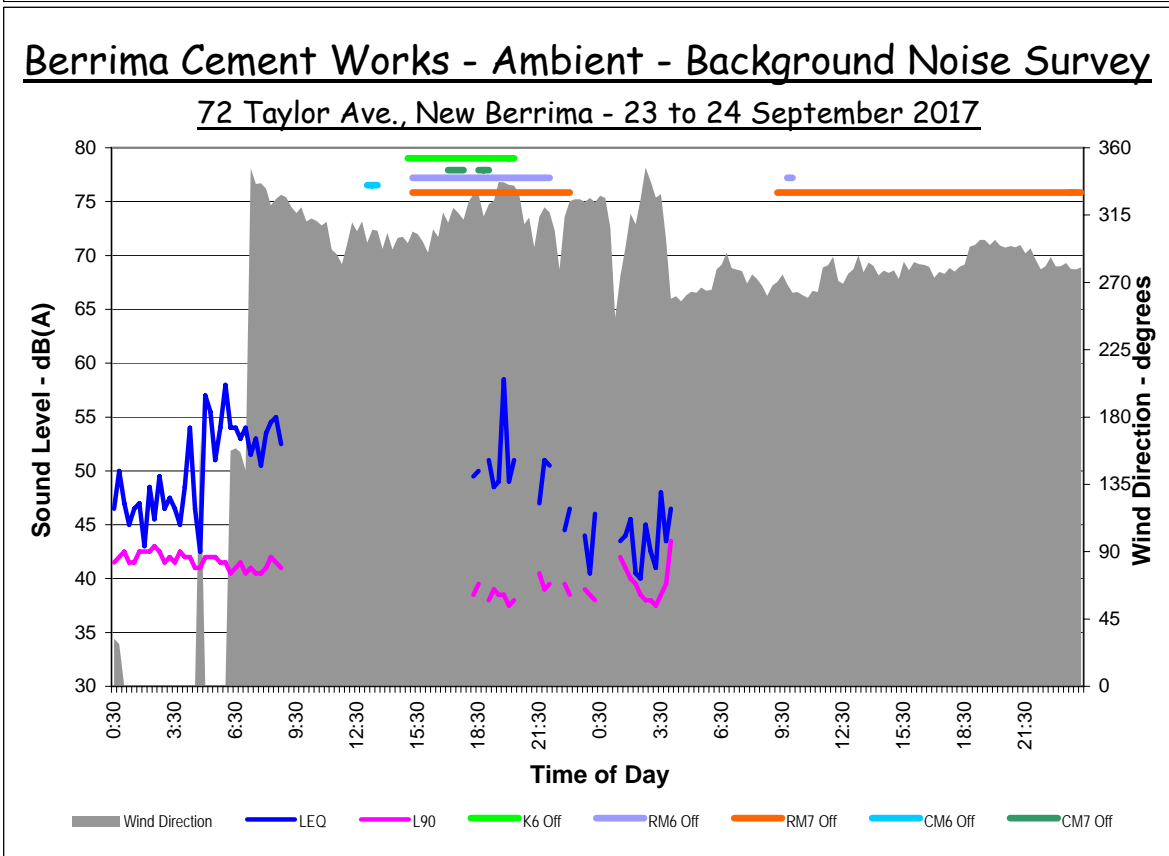
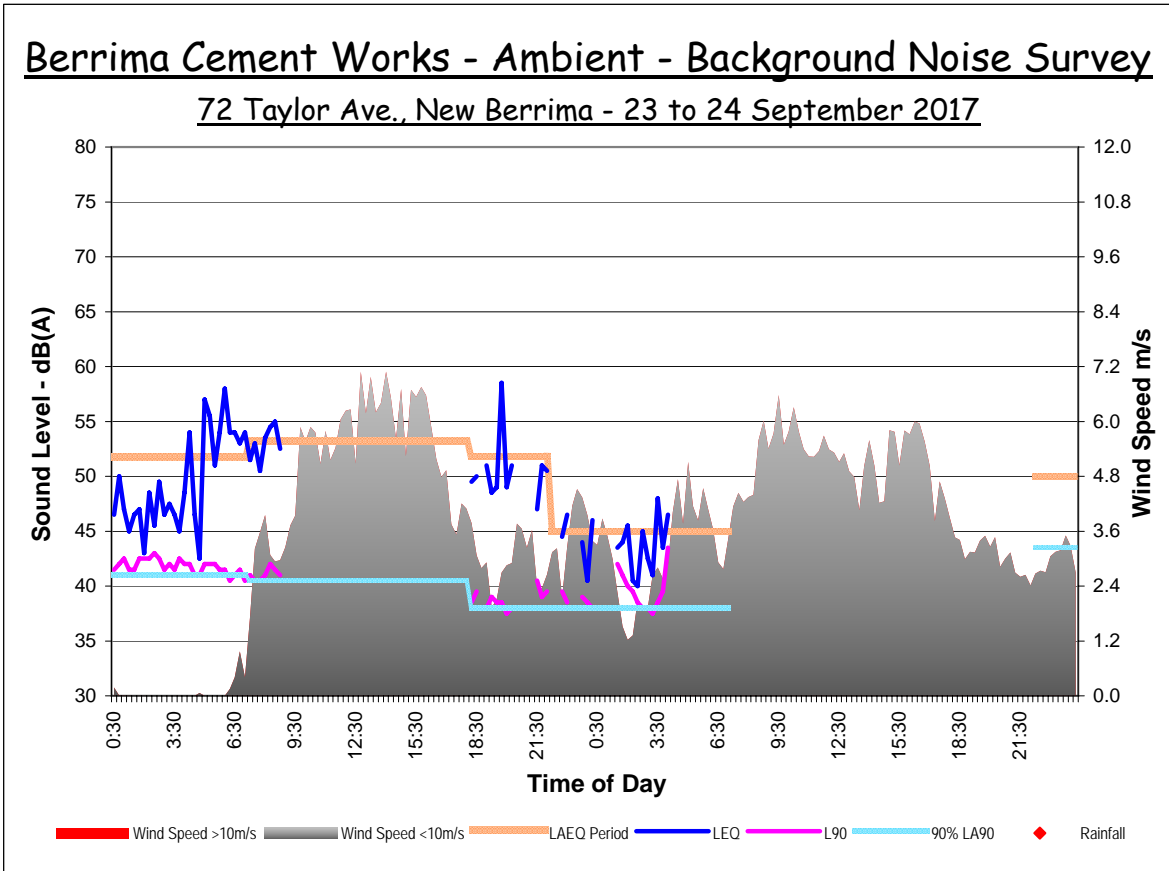
L90.15-min 10%	Day				Evening			Night				
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
72 Taylor Ave., New Berrima	51	41	44	44	47	38	43	43	46	38	43	44
4 Melbourne St., New Berrima	46	39	42	42	44	36	41	41	43	36	40	40
12 Brisbane St., New Berrima	47	39	43	42	45	36	41	41	44	35	40	40

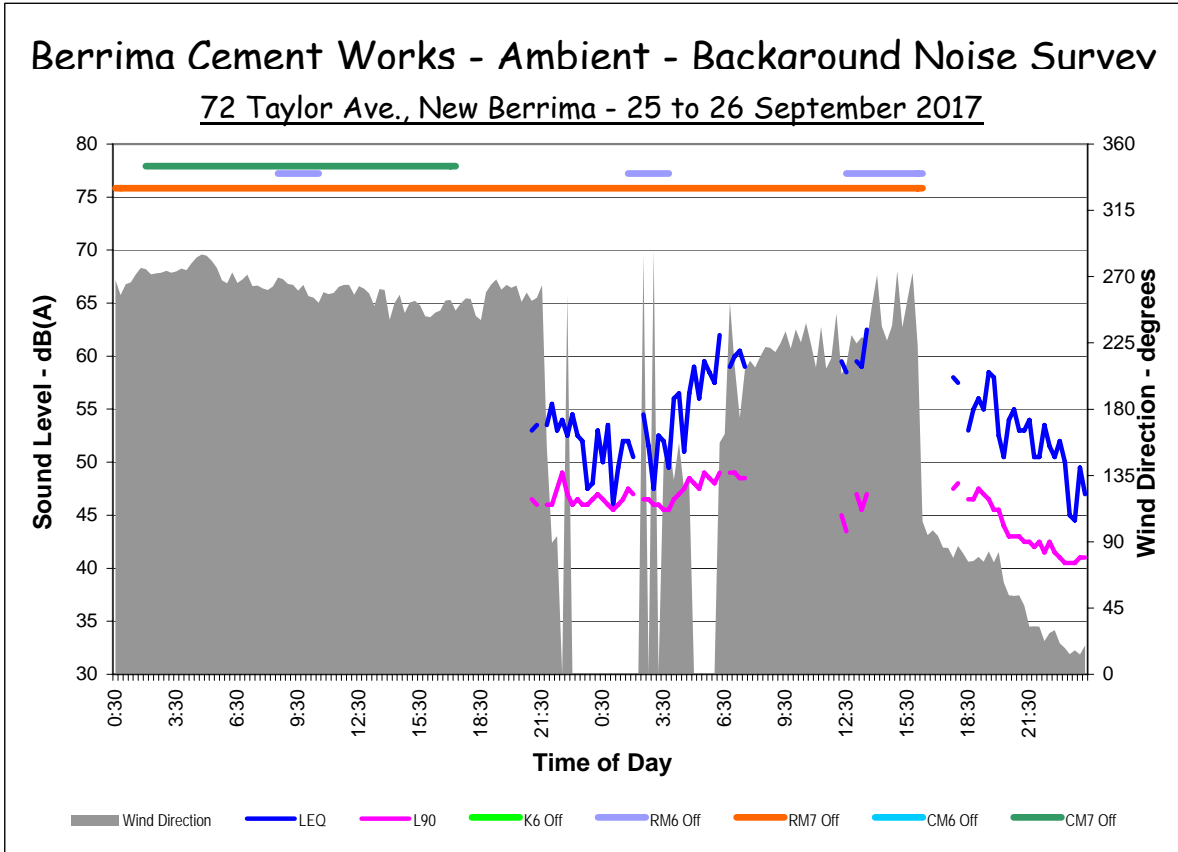
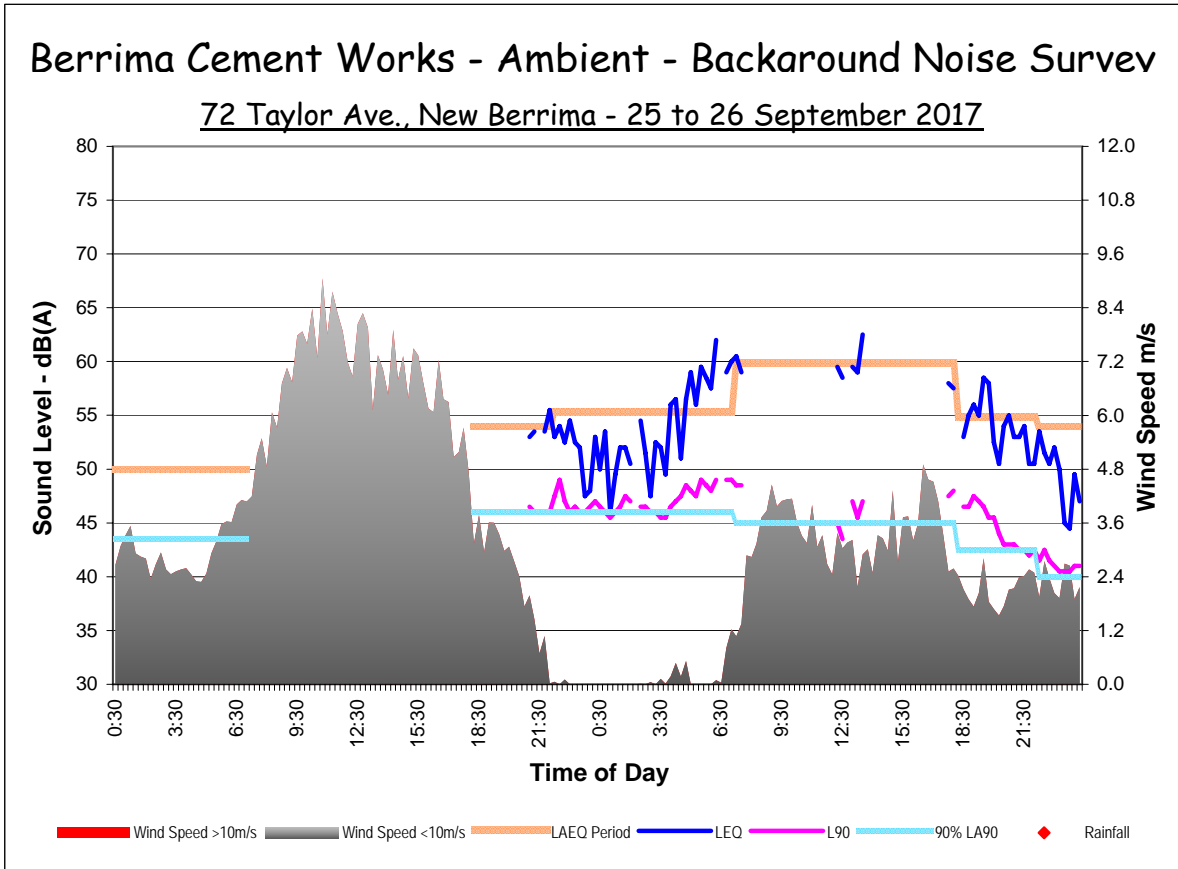
L90.15-min	Day				Evening			Night				
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
72 Taylor Ave., New Berrima	52	41	46	45	48	39	44	45	47	39	44	44
4 Melbourne St., New Berrima	47	41	44	44	44	37	42	42	44	38	42	42
12 Brisbane St., New Berrima	49	41	45	44	46	37	42	43	46	39	42	42

Two Day Results of Ambient Noise Monitoring



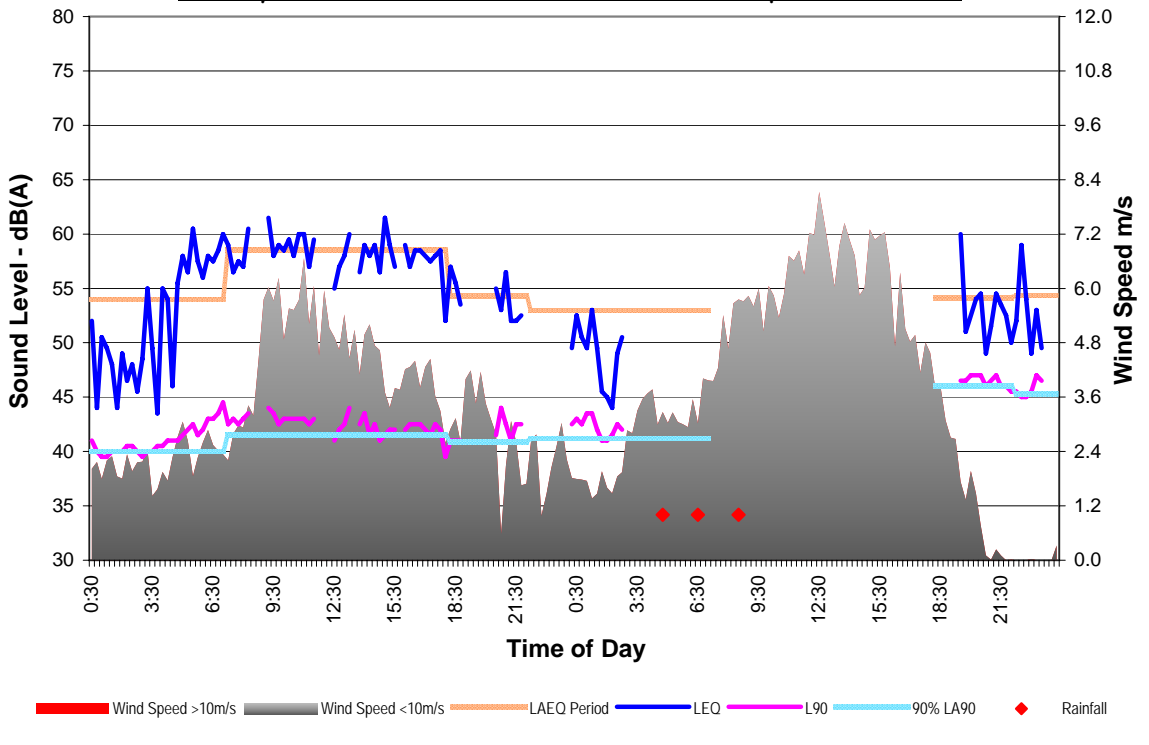






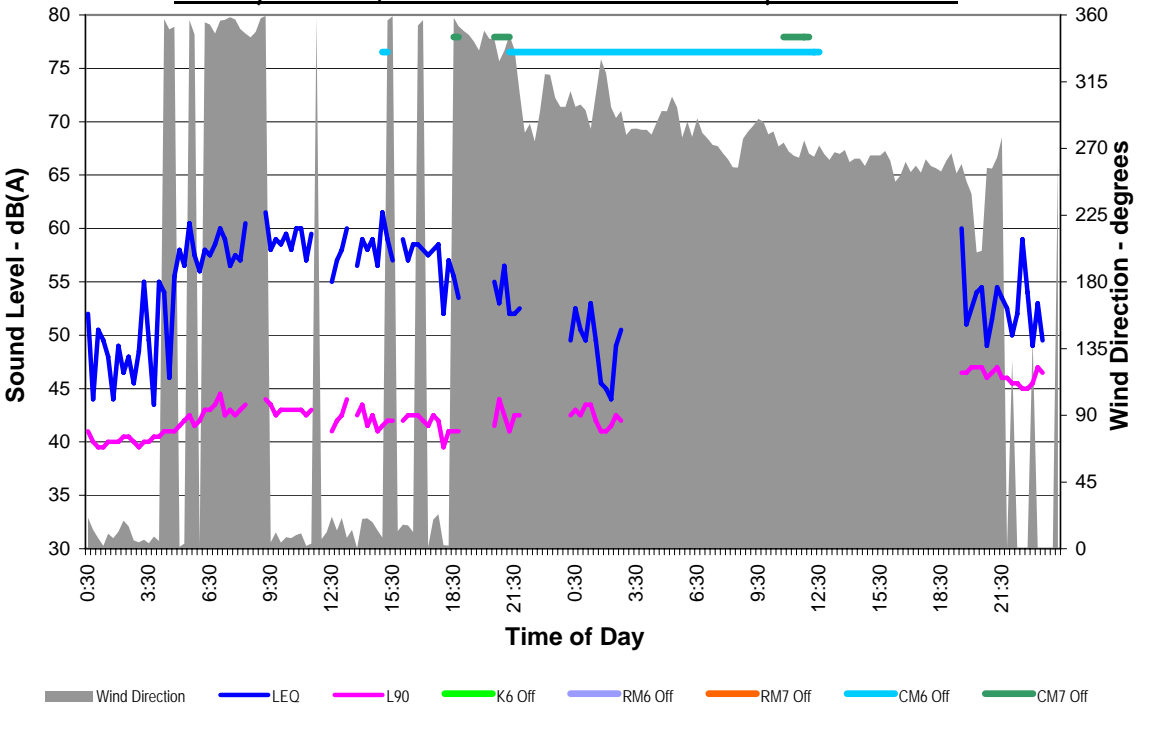
Berrima Cement Works - Ambient - Background Noise Survey

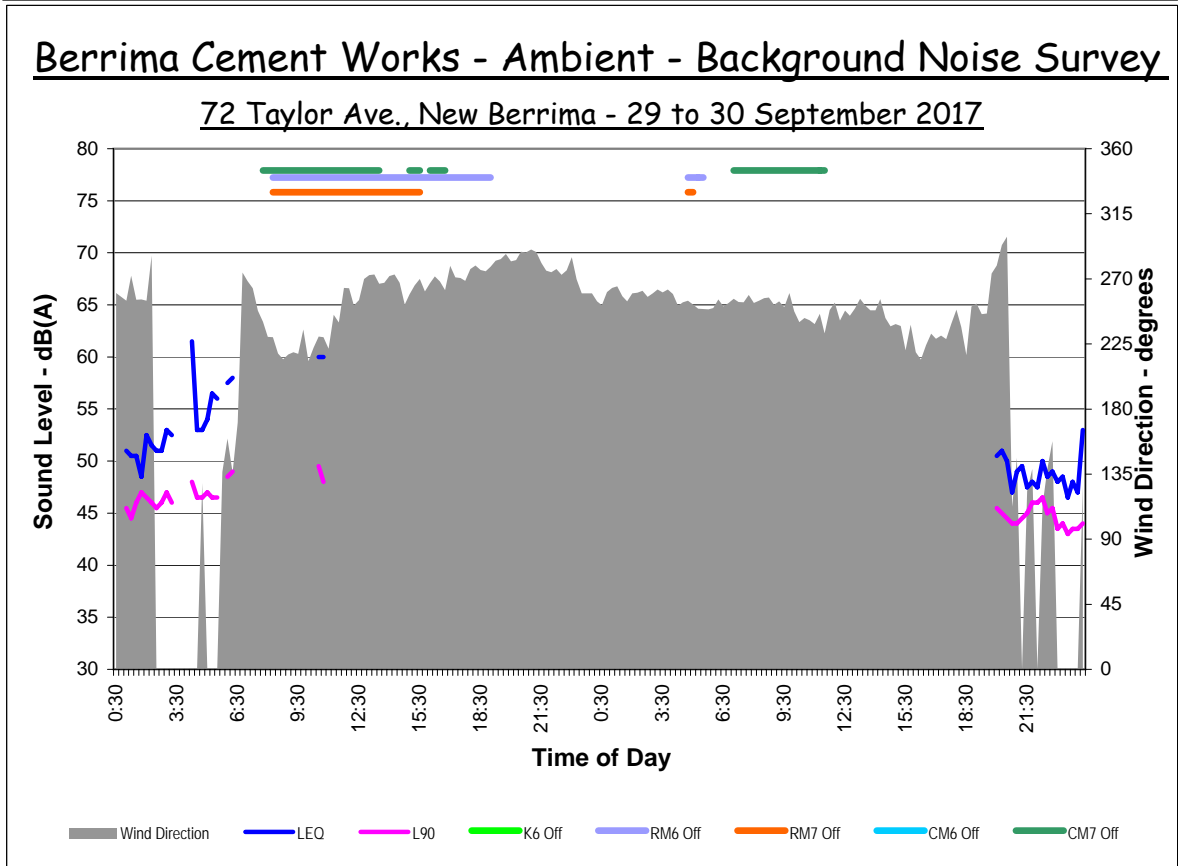
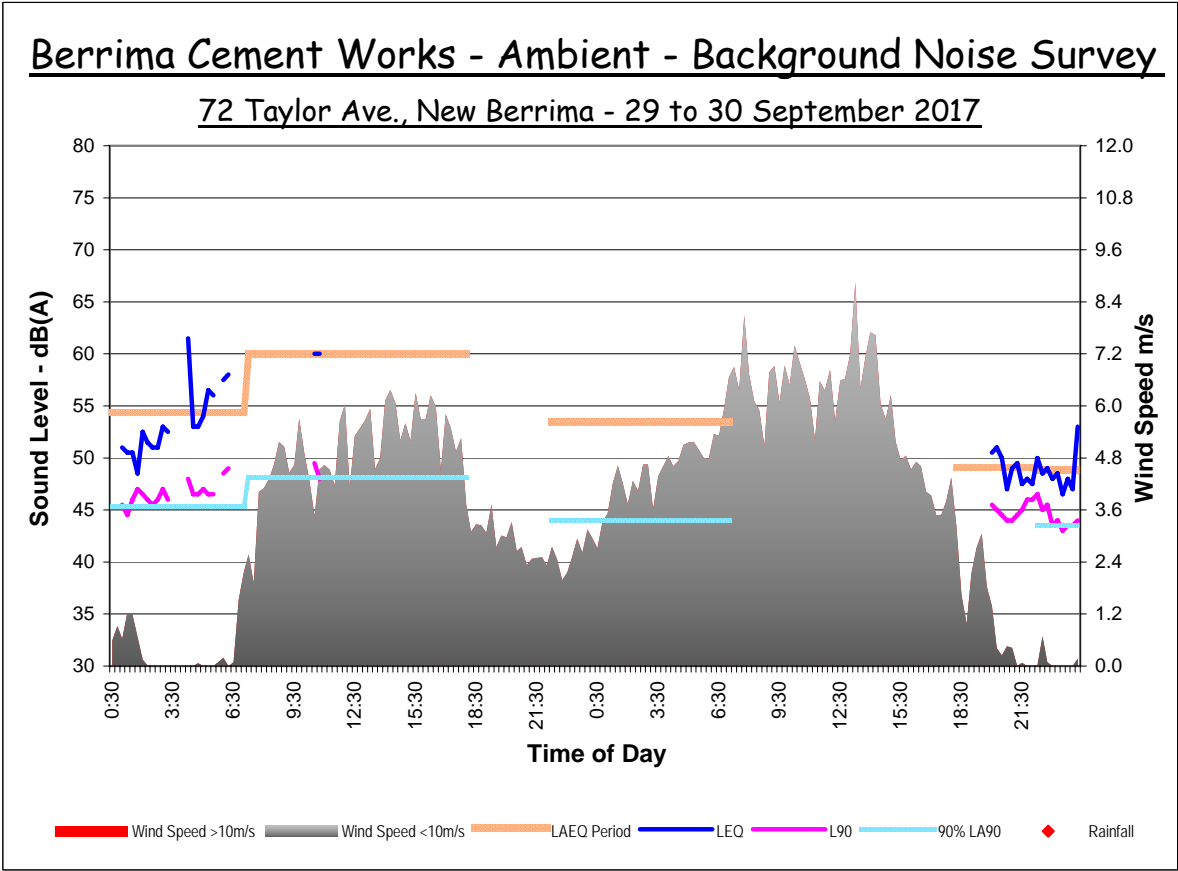
72 Taylor Ave., New Berrima - 27 to 28 September 2017



Berrima Cement Works - Ambient - Background Noise Survey

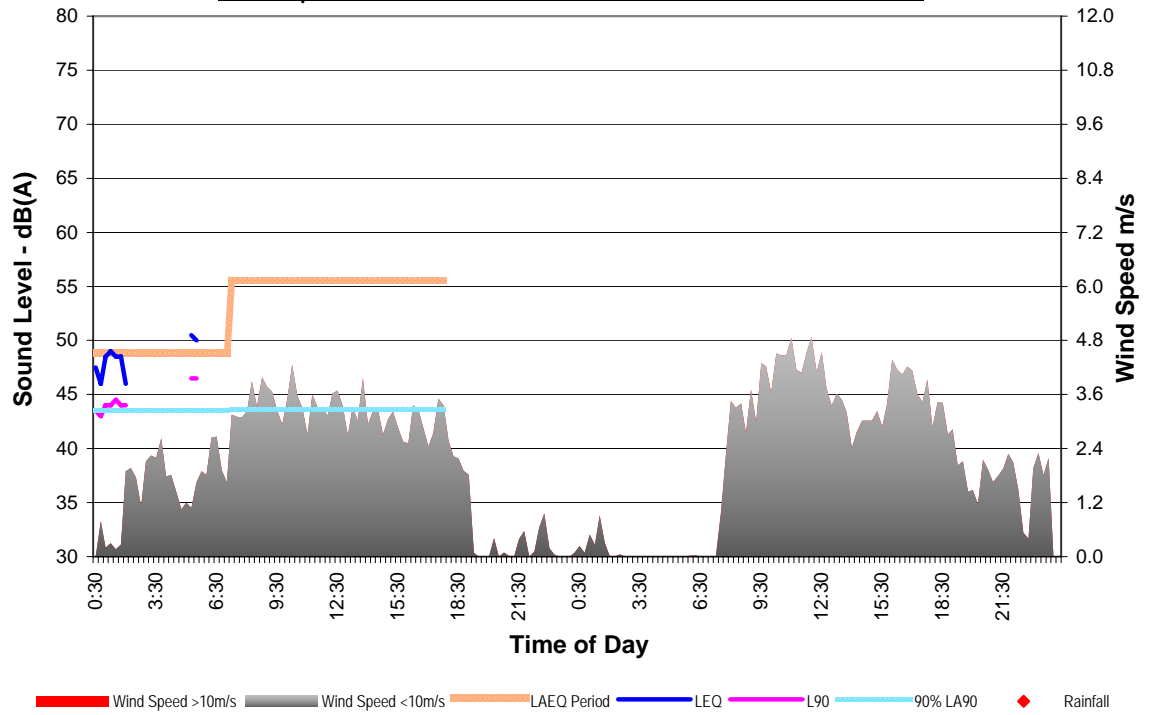
72 Taylor Ave., New Berrima - 27 to 28 September 2017





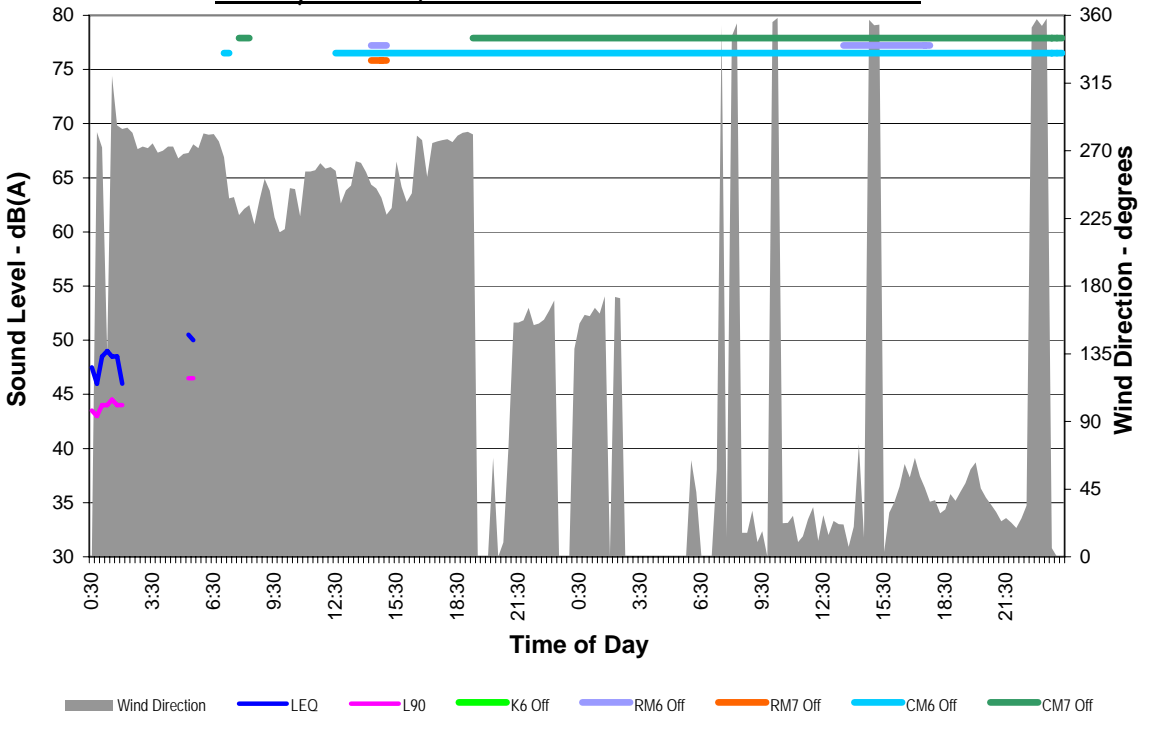
Berrima Cement Works - Ambient - Background Noise Survey

72 Taylor Ave., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

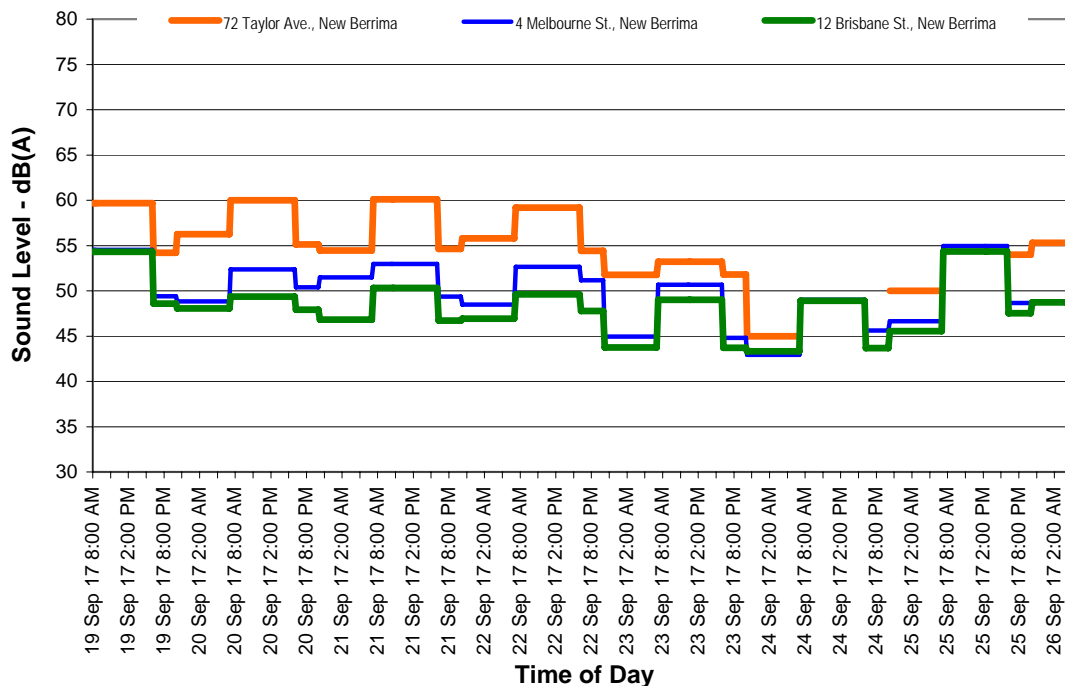
72 Taylor Ave., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

72 Taylor Ave., New Berrima - 19 to 25 September 2017

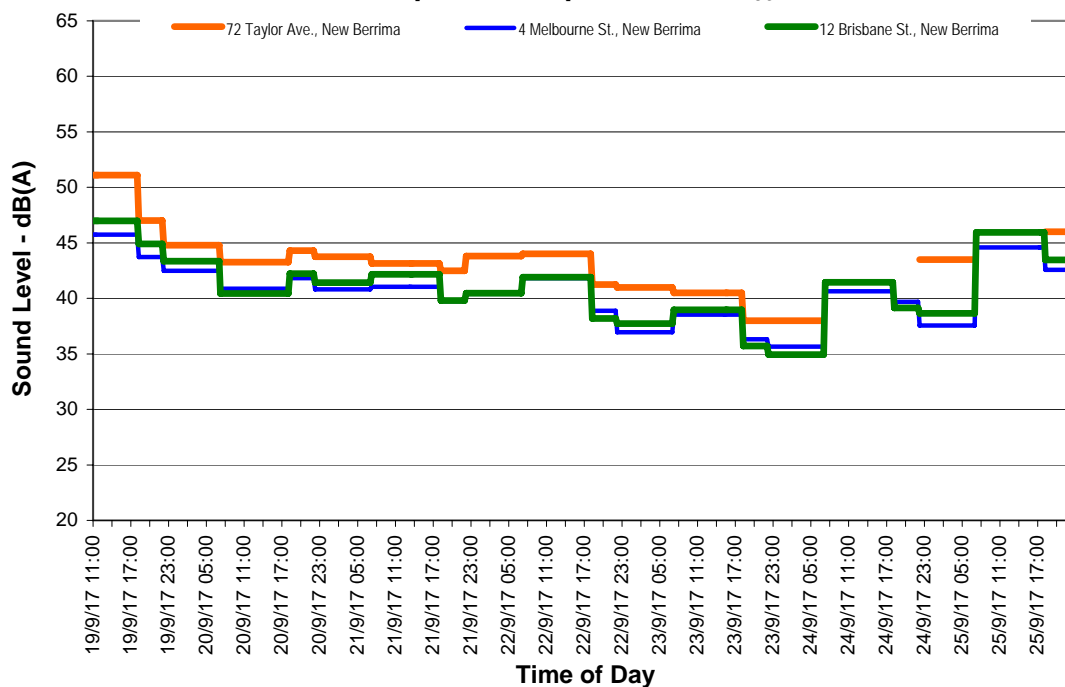
Comparison of period L_{Aeq}



Berrima Cement Works - Ambient - Background Noise Survey

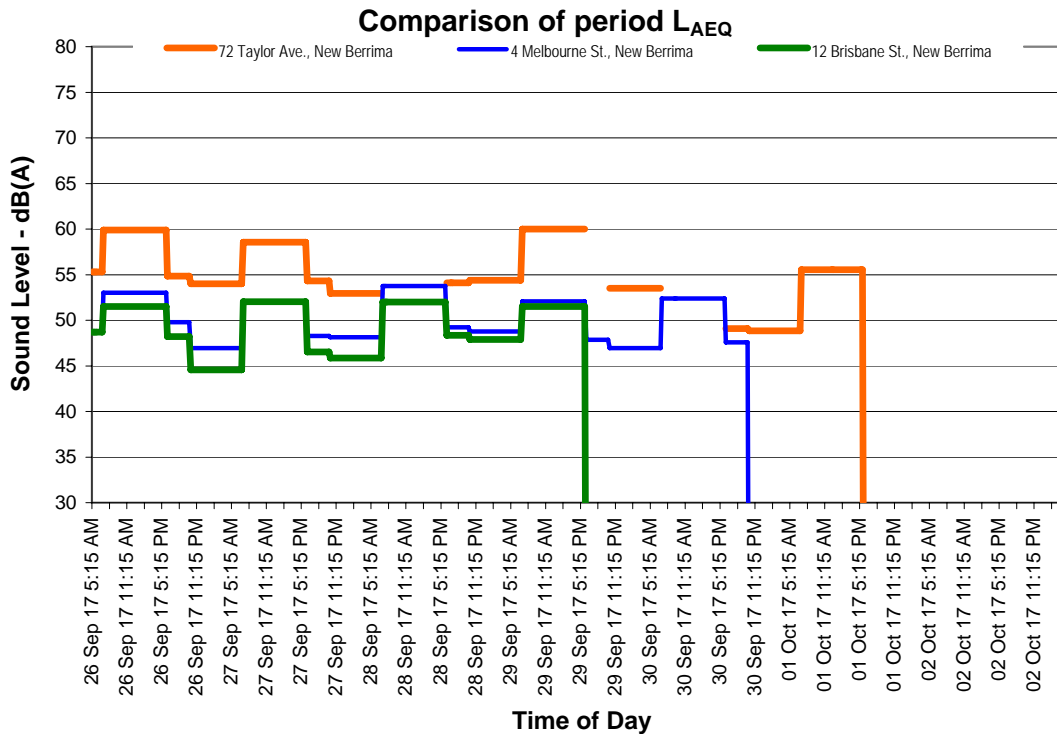
72 Taylor Ave., New Berrima - 19 to 25 September 2017

Comparison of period $90\%L_{A90}$



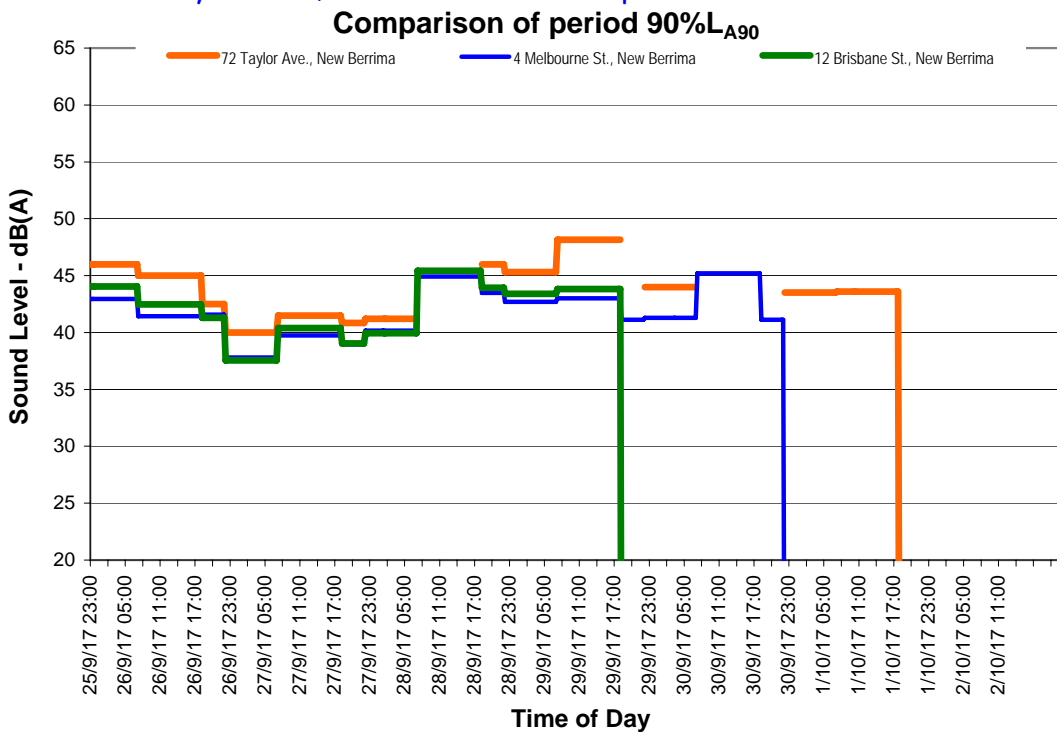
Berrima Cement Works - Ambient - Background Noise Survey

72 Taylor Ave. New Berrima - 26 September to 2 October 2017



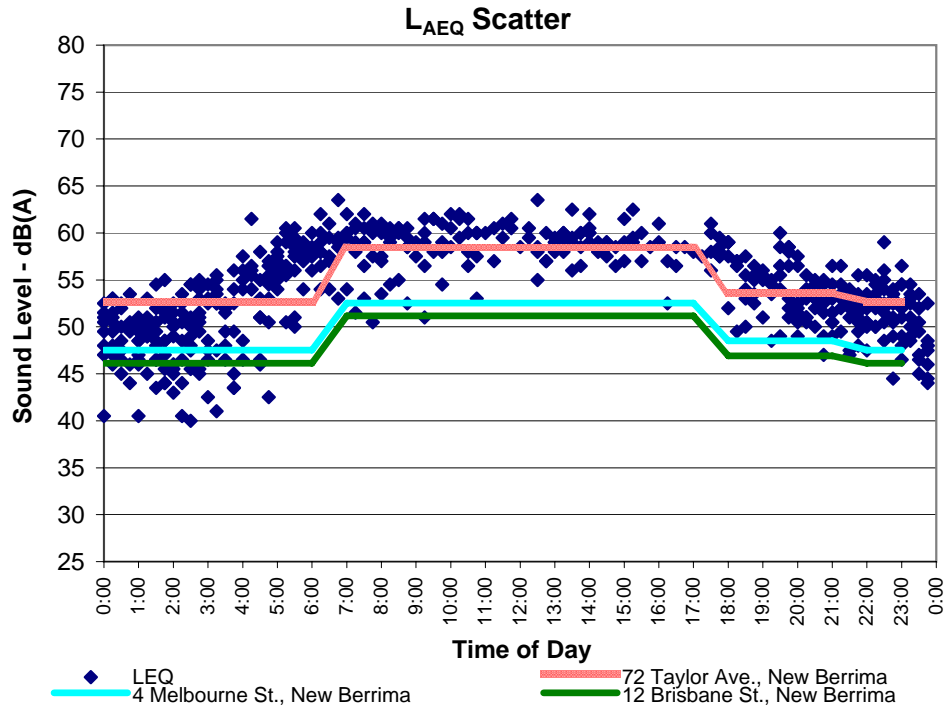
Berrima Cement Works - Ambient - Background Noise Survey

72 Taylor Ave., New Berrima - 26 September to 2 October 2017



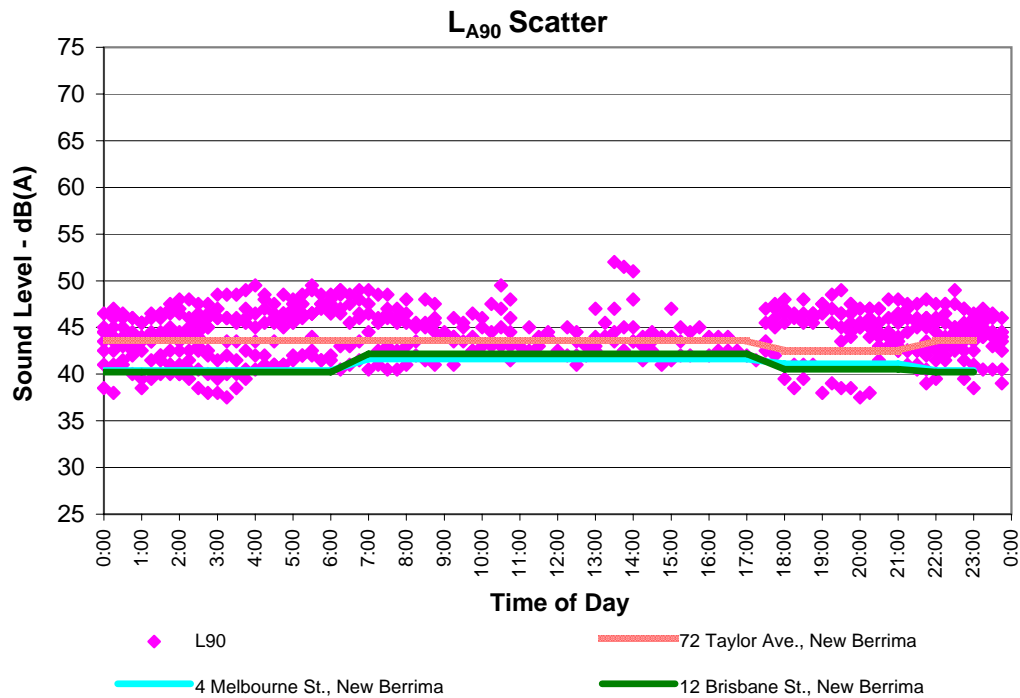
Berrima Cement Works - Ambient - Background Noise

72 Taylor Ave., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

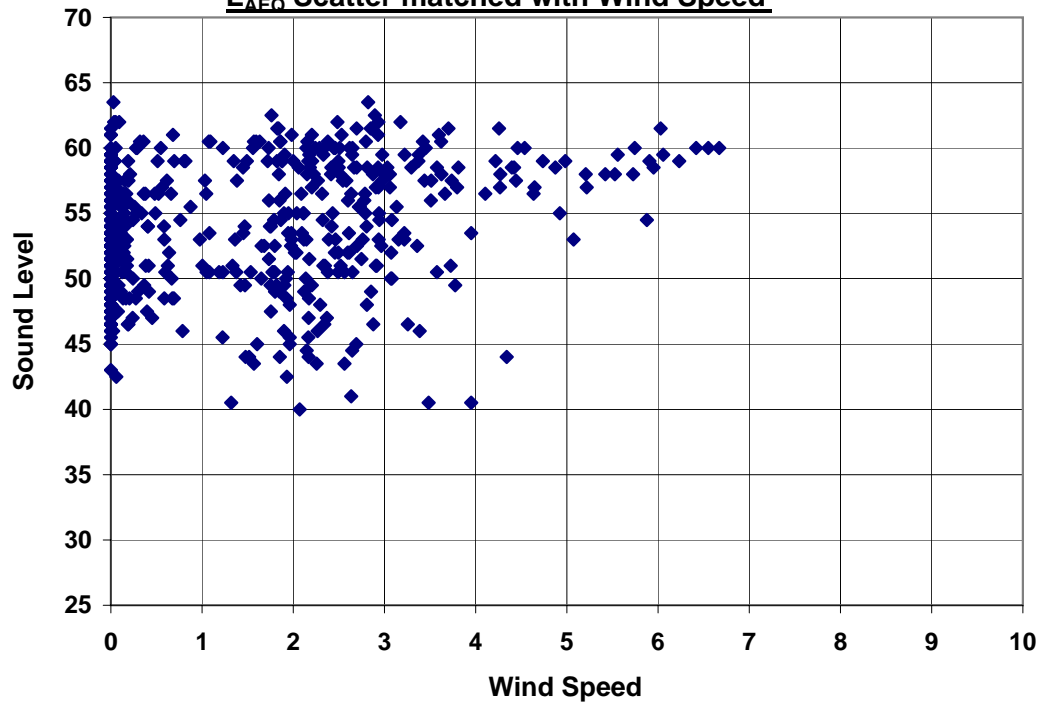
72 Taylor Ave., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

72 Taylor Ave., New Berrima - 19 September to 1 October 2017

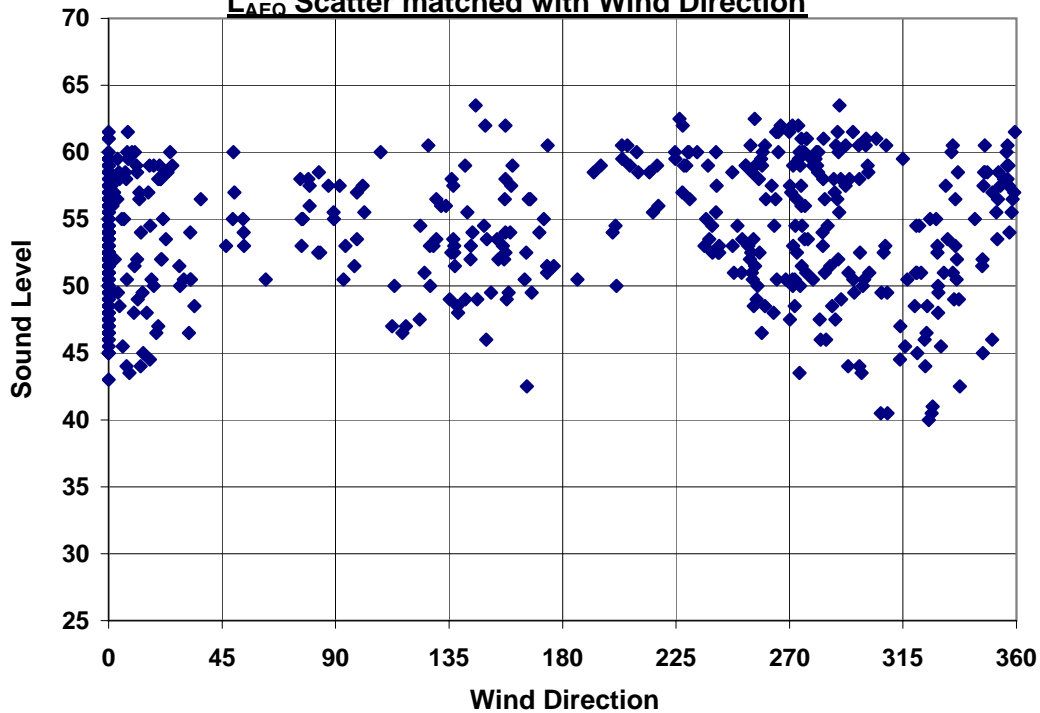
L_AEQ Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

72 Taylor Ave., New Berrima - 19 September to 1 October 2017

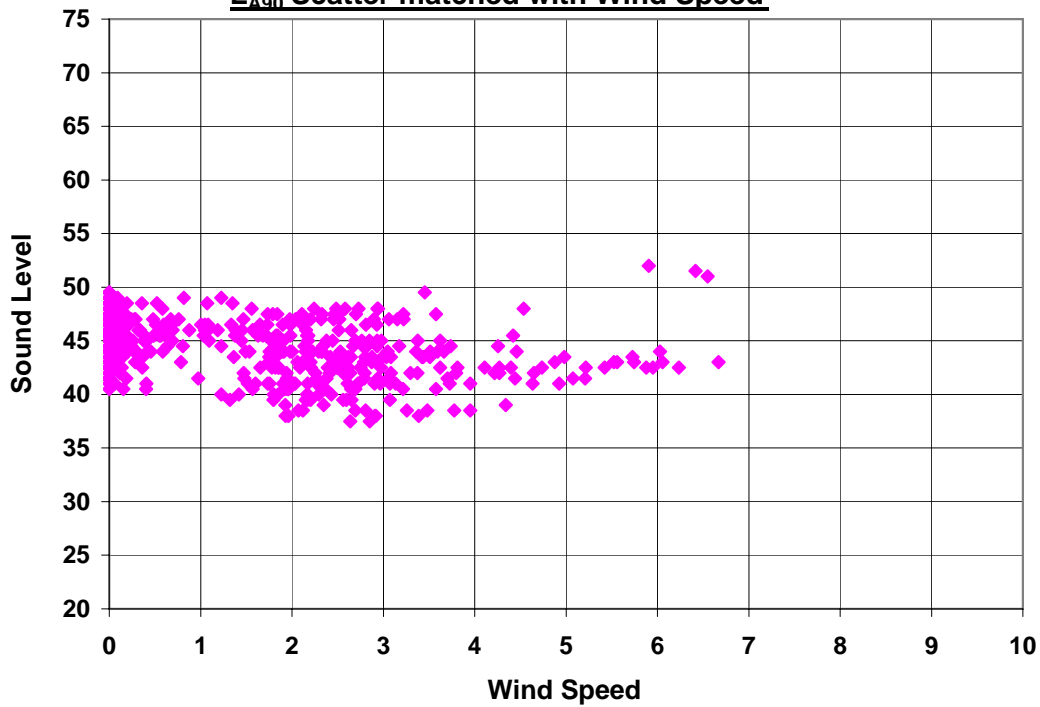
L_AEQ Scatter matched with Wind Direction



Berrima Cement Works - Ambient - Background Noise

72 Taylor Ave., New Berrima - 19 September to 1 October 2017

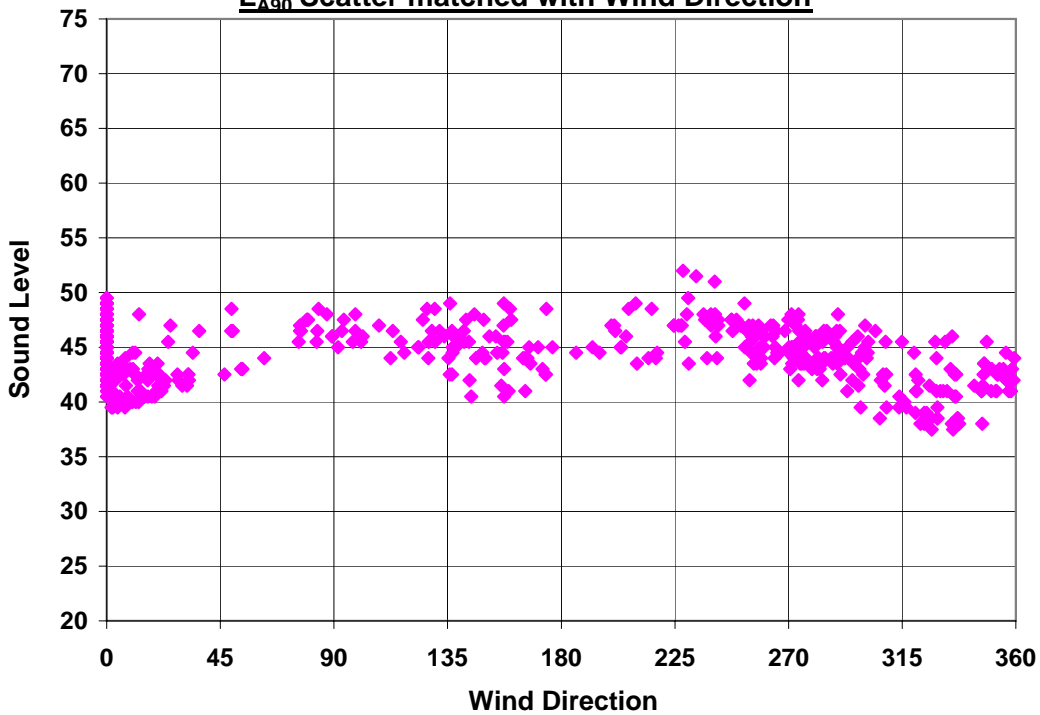
L_{A90} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

72 Taylor Ave., New Berrima - 19 September to 1 October 2017

L_{A90} Scatter matched with Wind Direction



Appendix D: Unattended environmental sound level results for 12 Brisbane Street

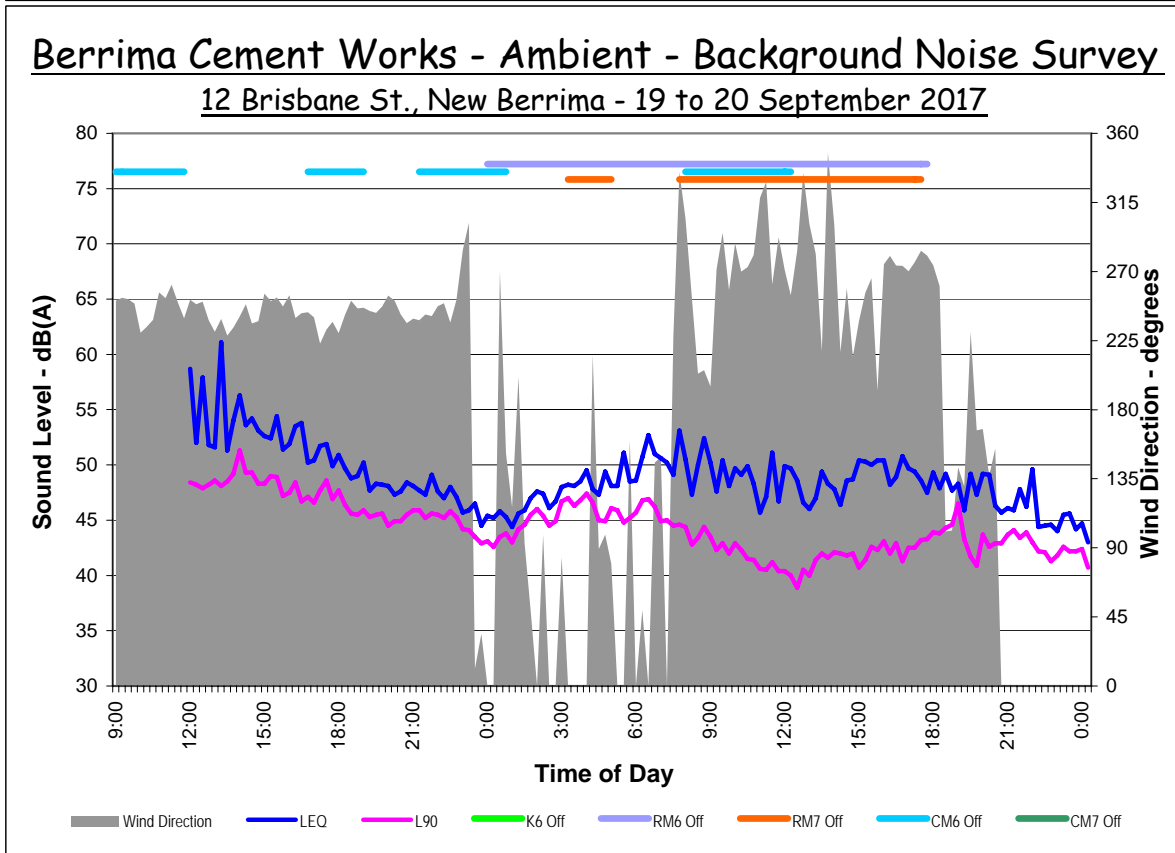
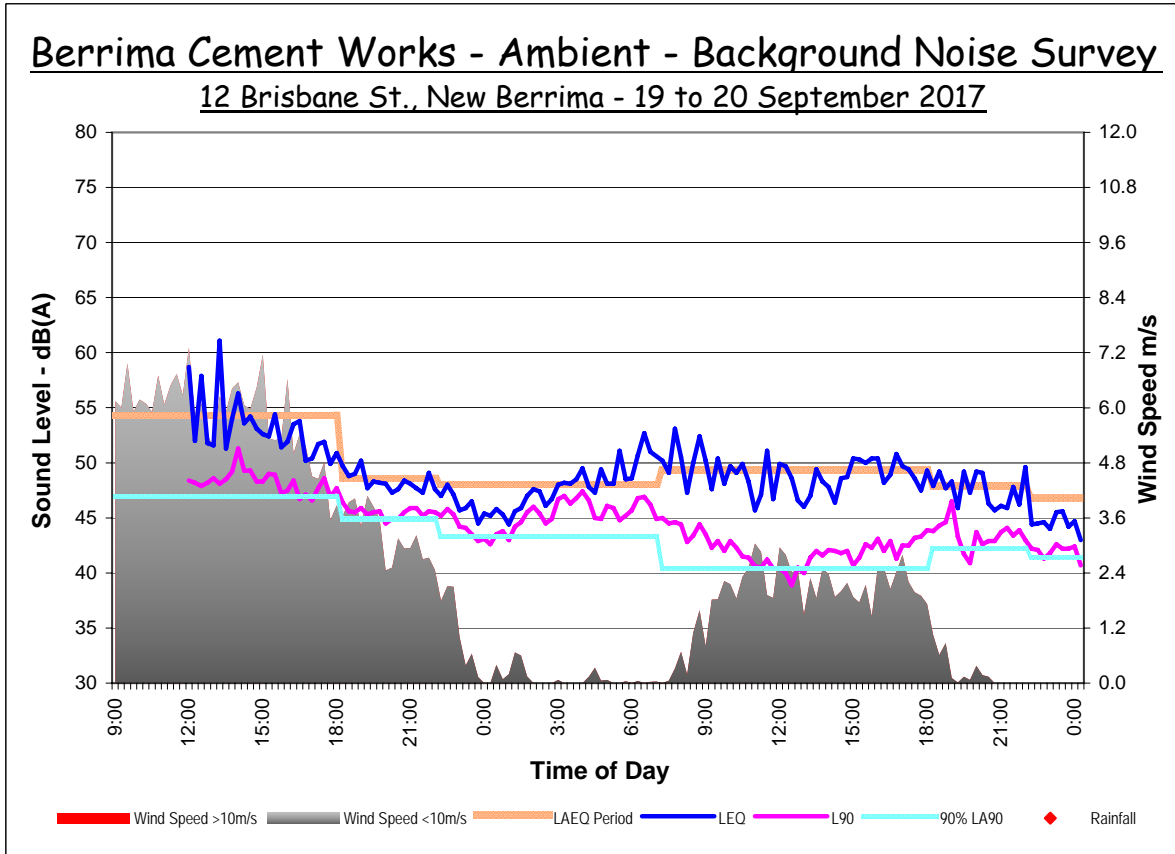
12 Brisbane St., New Berrima - 19 September to 1 October 2017
Comparison of Period LAEQ, Period Average LA10 and Period 90% LA90 Results
Summary of Statistical Data

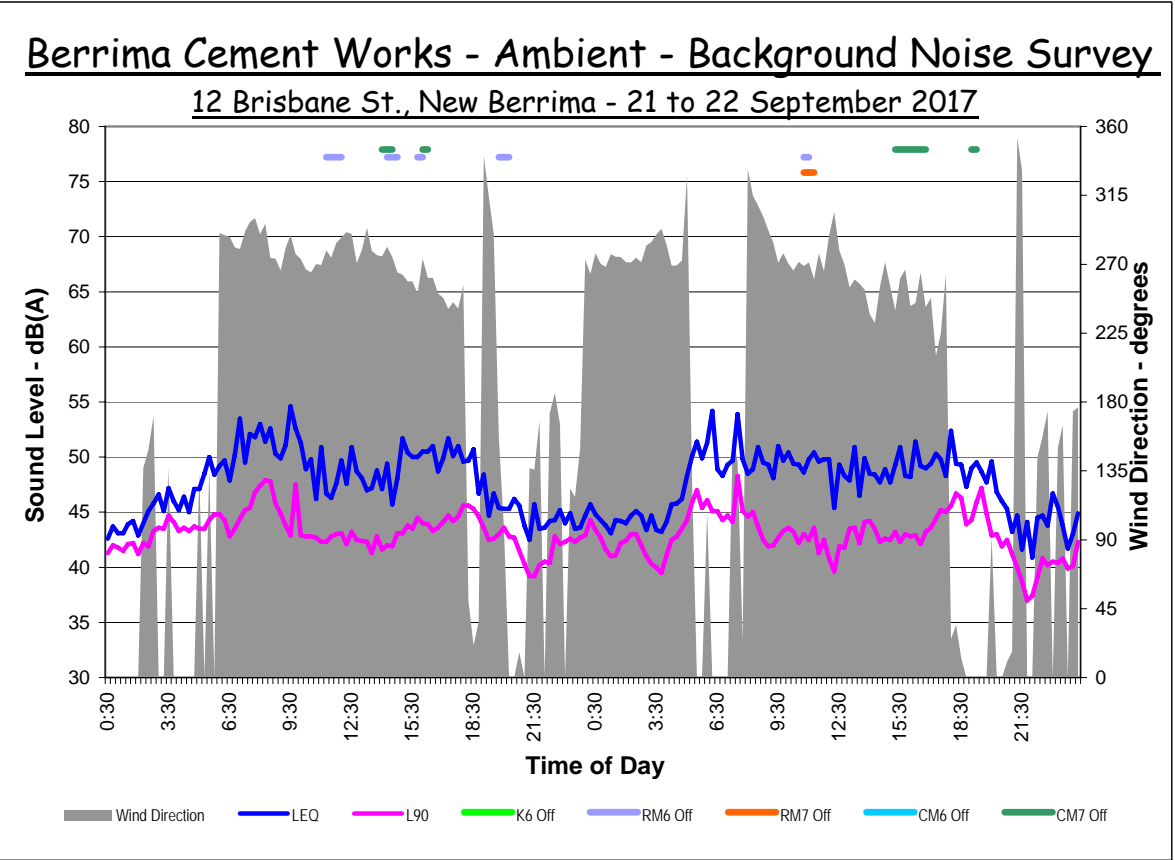
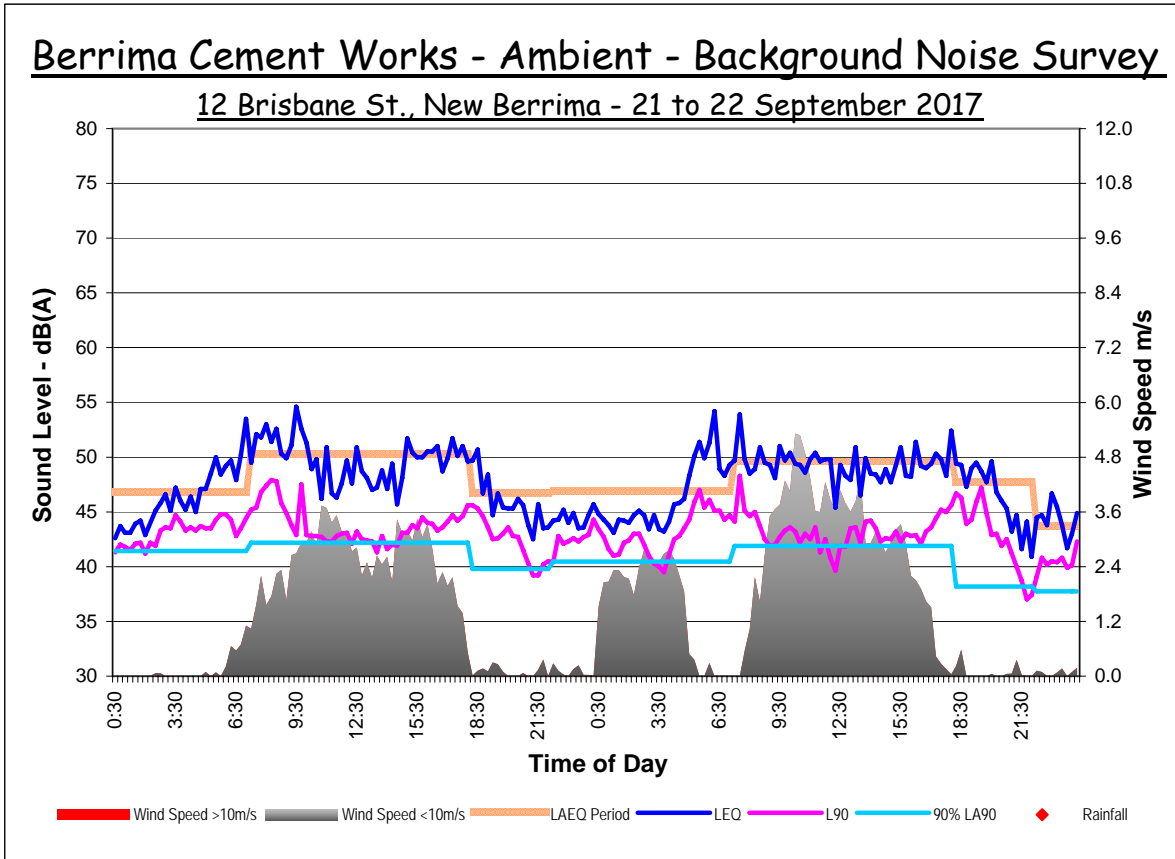
LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
12 Brisbane St., New Berrima	54	49	51	49	44	47	49	43	46	55	41	49
4 Melbourne St., New Berrima	55	49	53	51	45	49	51	43	48	58	42	51
72 Taylor Ave., New Berrima	60	53	58	55	49	54	56	45	53	59	45	54

L90.15-min 10%	Day				Evening			Night				
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
12 Brisbane St., New Berrima	47	39	43	42	45	36	41	41	44	35	40	40
4 Melbourne St., New Berrima	46	39	42	42	44	36	41	41	43	36	40	40
72 Taylor Ave., New Berrima	51	41	44	44	47	38	43	43	46	38	43	44

L90.15-min	Day				Evening			Night				
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
12 Brisbane St., New Berrima	49	41	45	44	46	37	42	43	46	39	42	42
4 Melbourne St., New Berrima	47	41	44	44	44	37	42	42	44	38	42	42
72 Taylor Ave., New Berrima	52	41	46	45	48	39	44	45	47	39	44	44

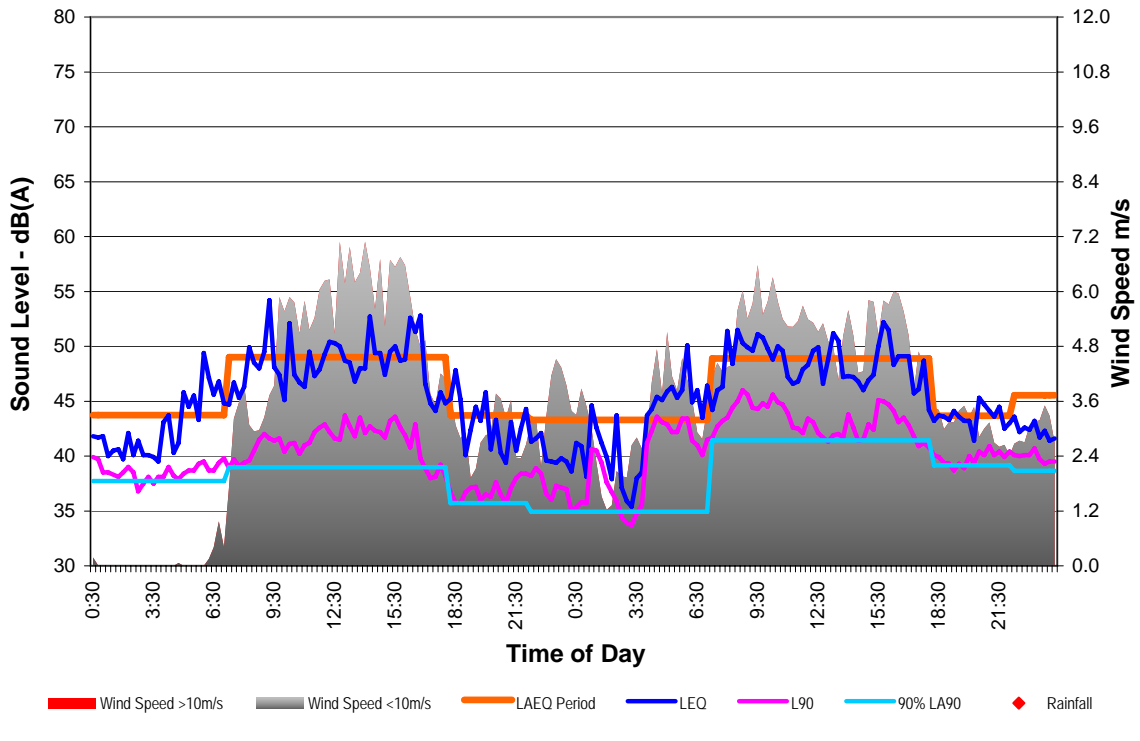
Two Day Results of Ambient Noise Monitoring





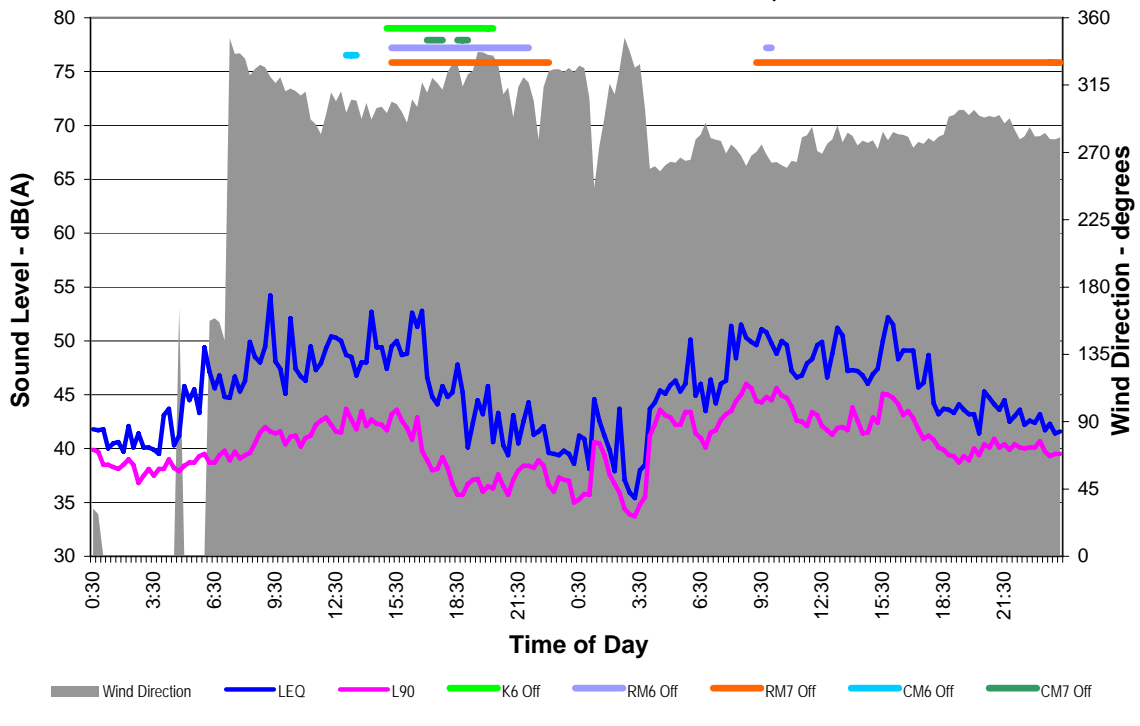
Berrima Cement Works - Ambient - Background Noise Survey

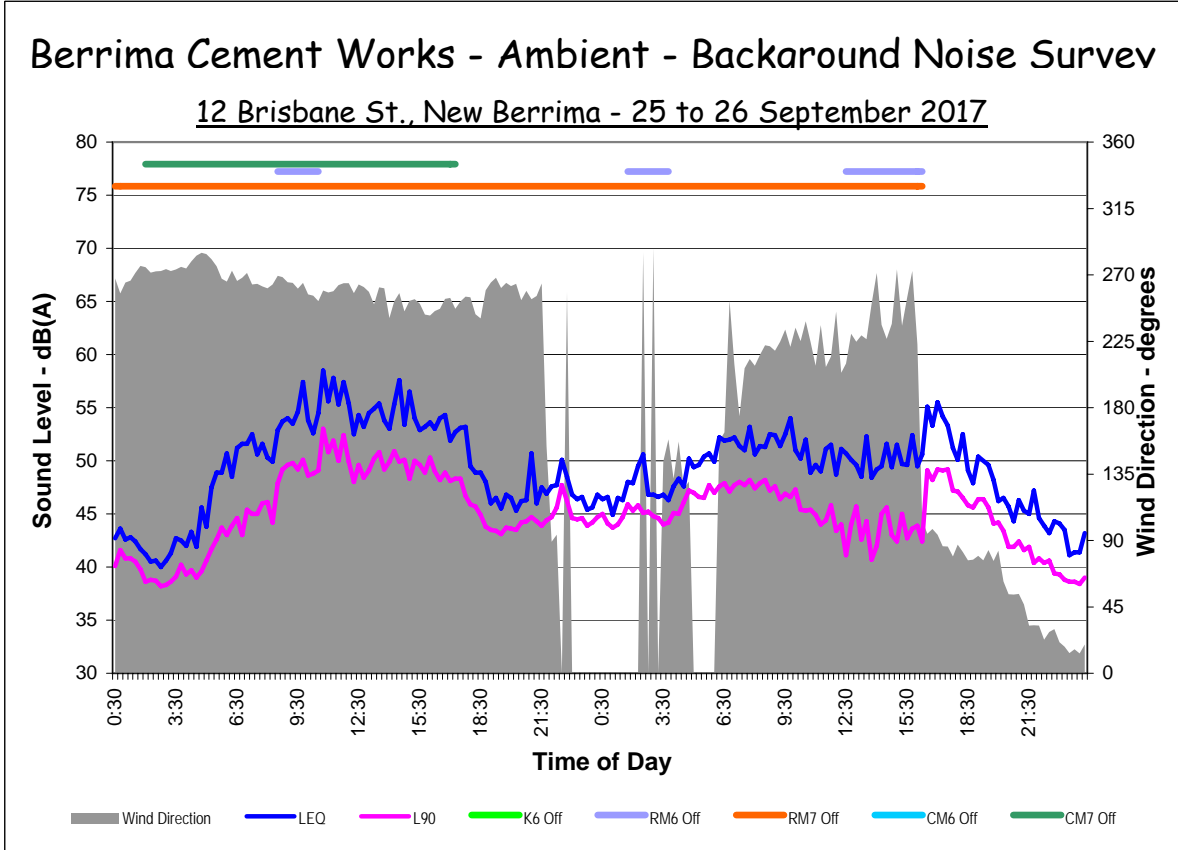
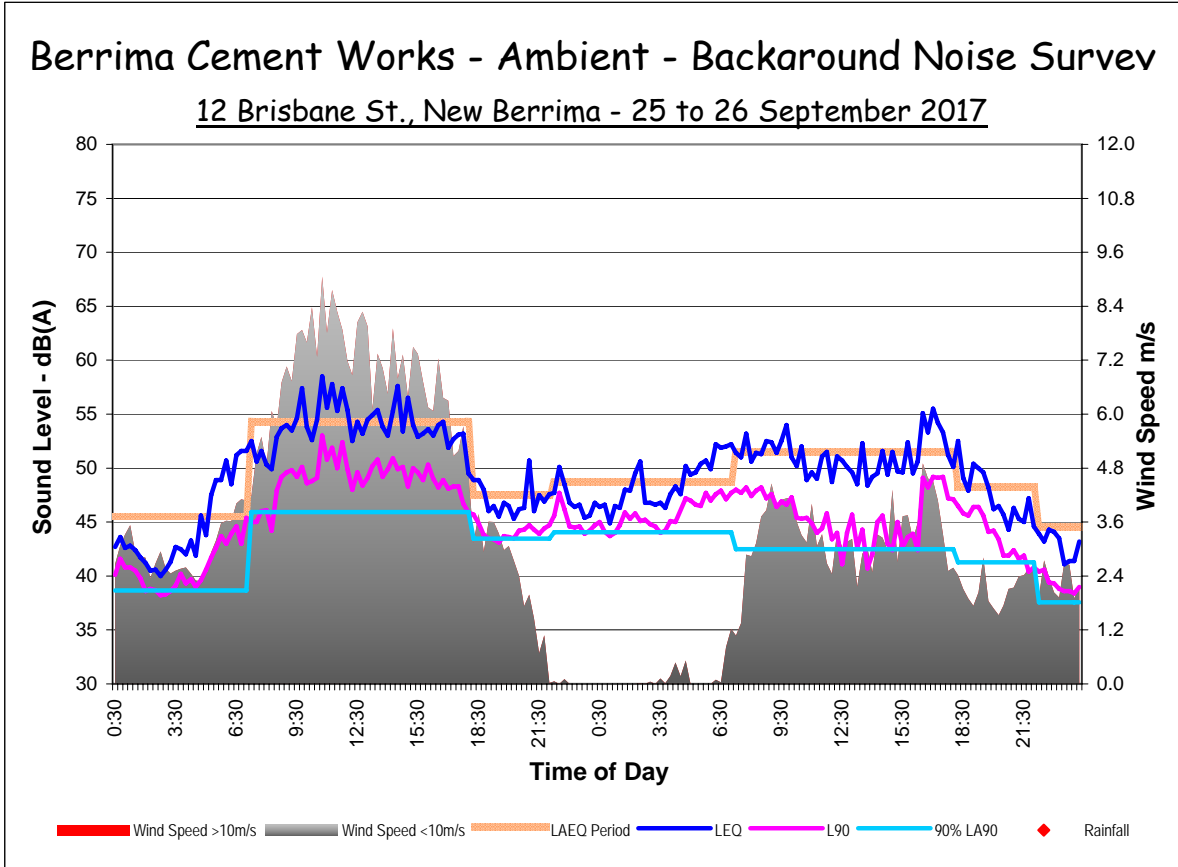
12 Brisbane St., New Berrima - 23 to 24 September 2017



Berrima Cement Works - Ambient - Background Noise Survey

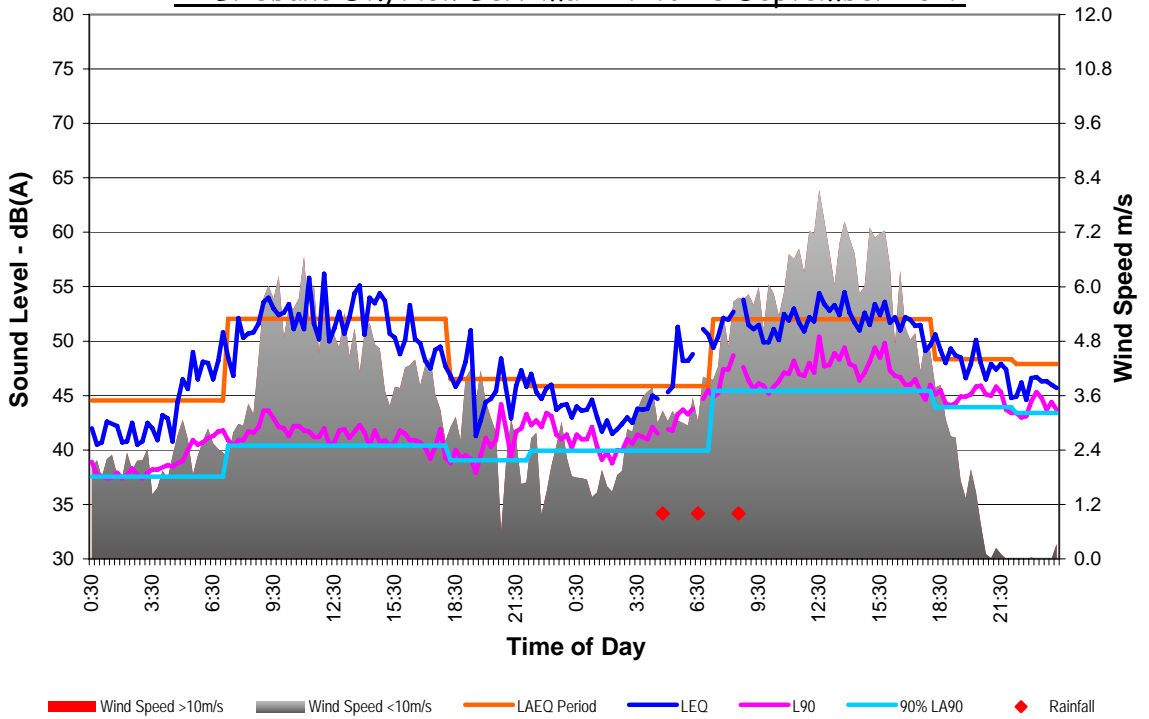
12 Brisbane St., New Berrima - 23 to 24 September 2017





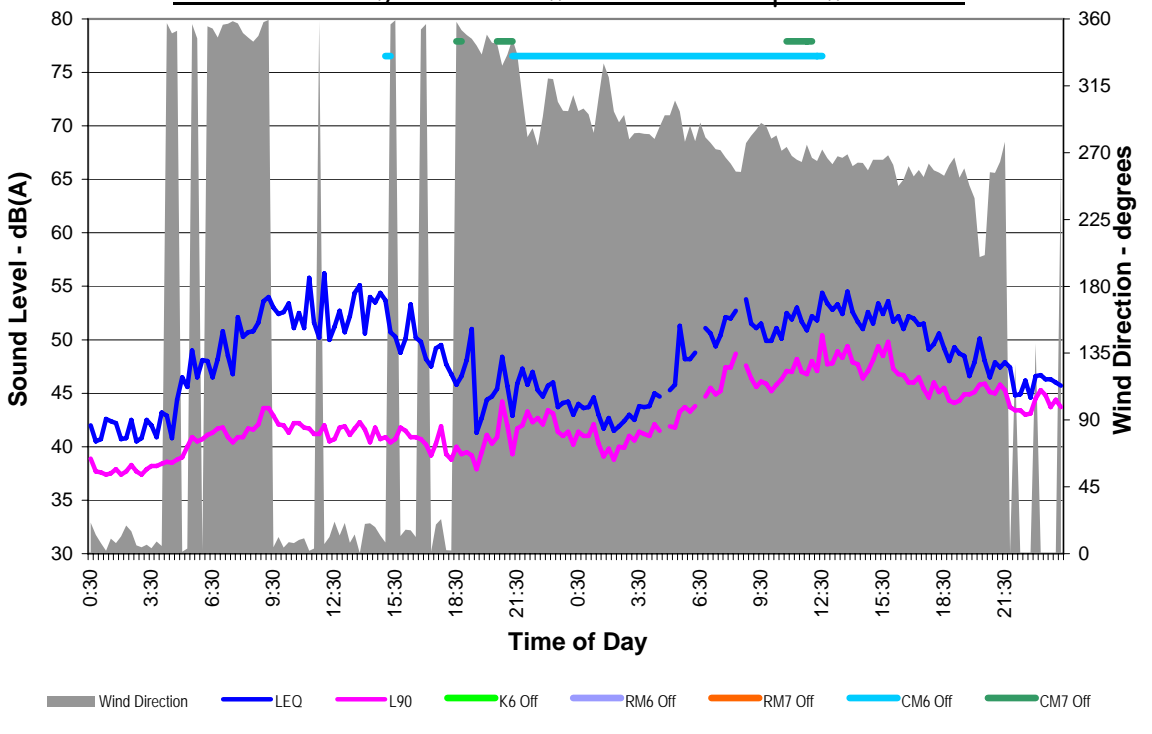
Berrima Cement Works - Ambient - Background Noise Survey

12 Brisbane St., New Berrima - 27 to 28 September 2017



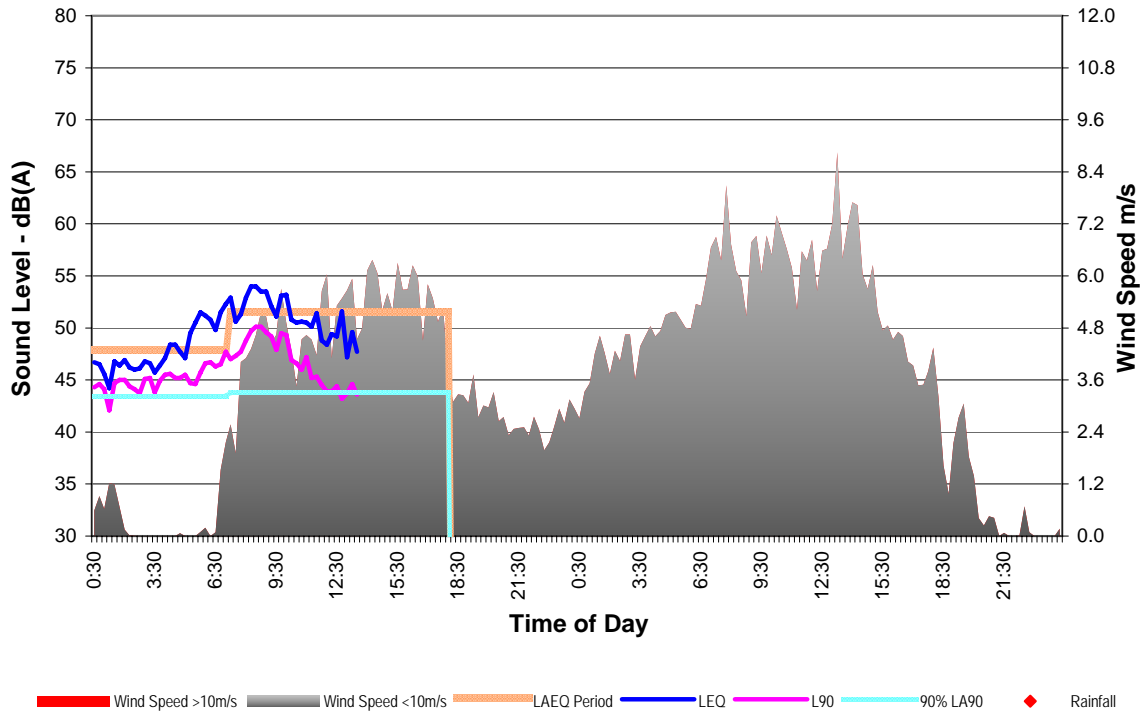
Berrima Cement Works - Ambient - Background Noise Survey

12 Brisbane St., New Berrima - 27 to 28 September 2017



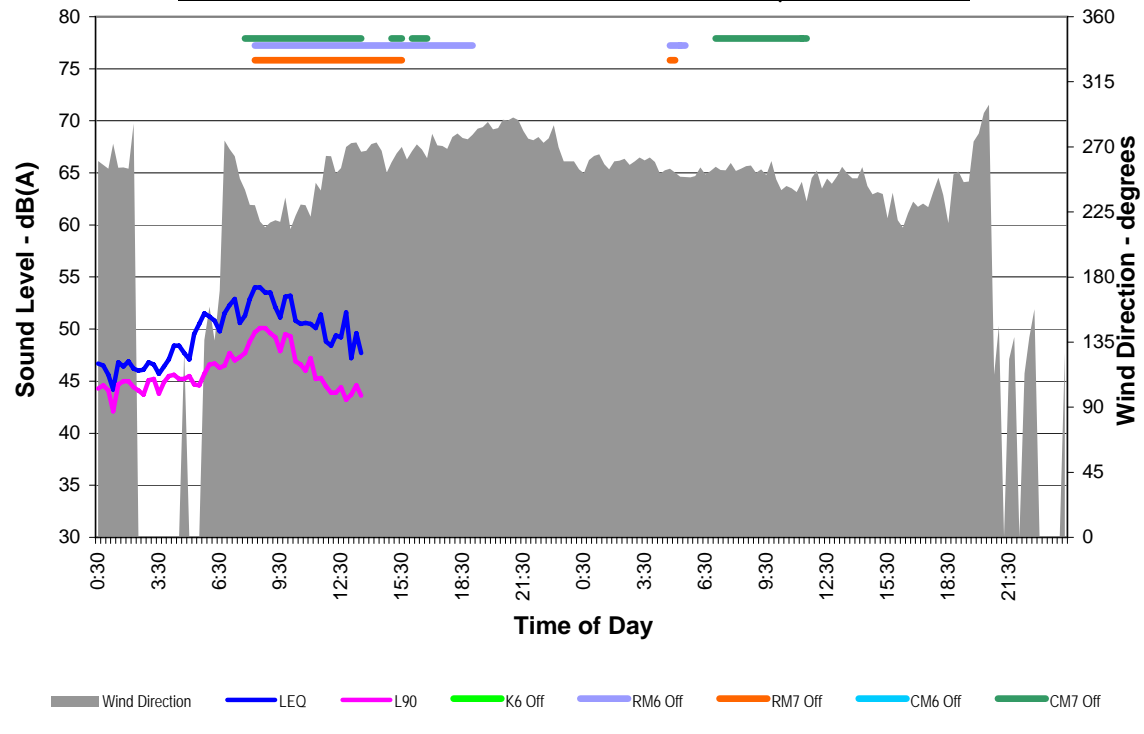
Berrima Cement Works - Ambient - Background Noise Survey

12 Brisbane St., New Berrima - 29 to 30 September 2017



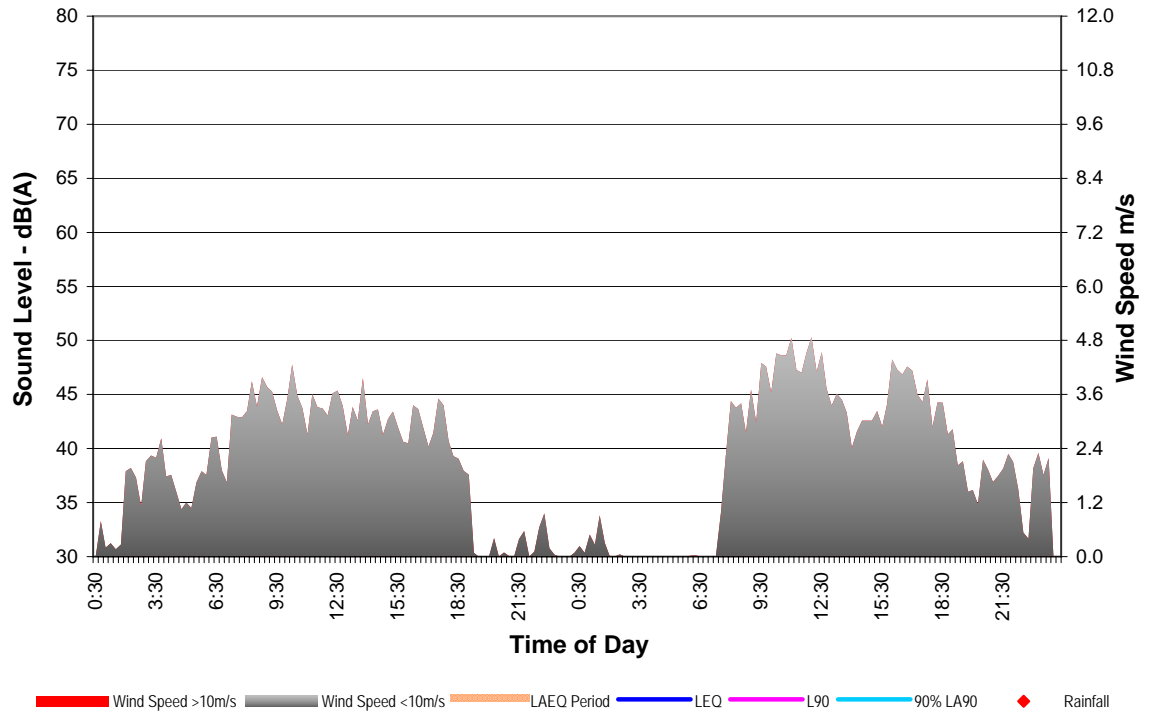
Berrima Cement Works - Ambient - Background Noise Survey

12 Brisbane St., New Berrima - 29 to 30 September 2017



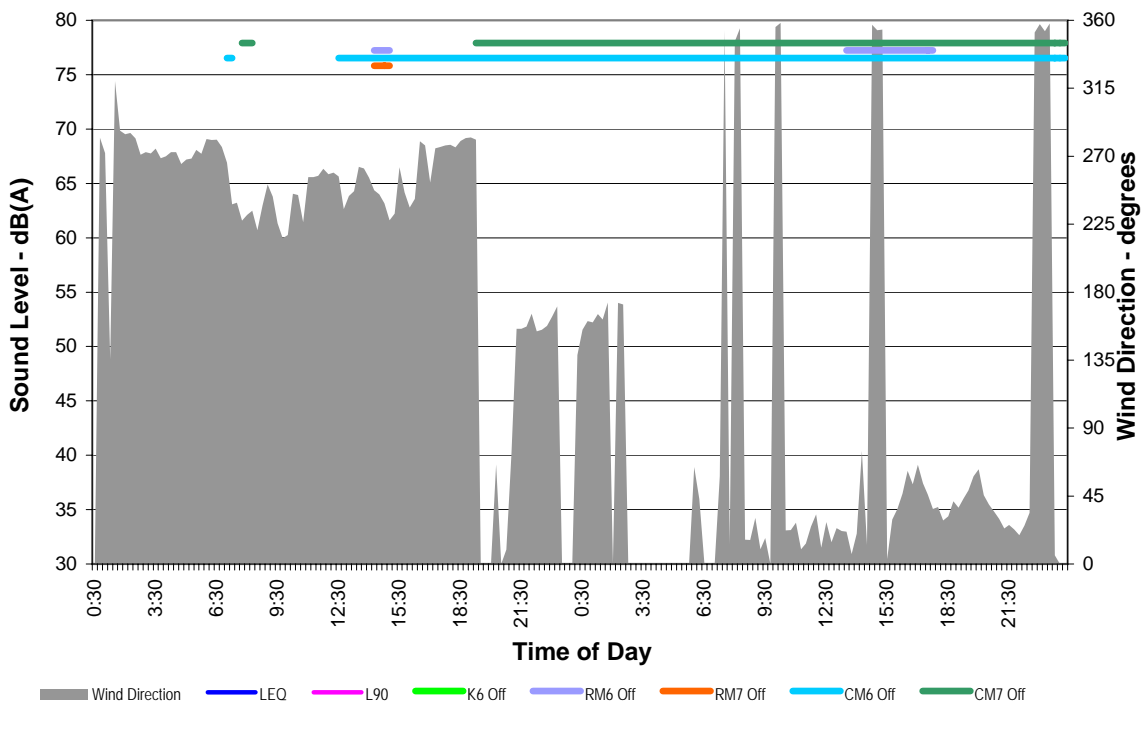
Berrima Cement Works - Ambient - Background Noise Survey

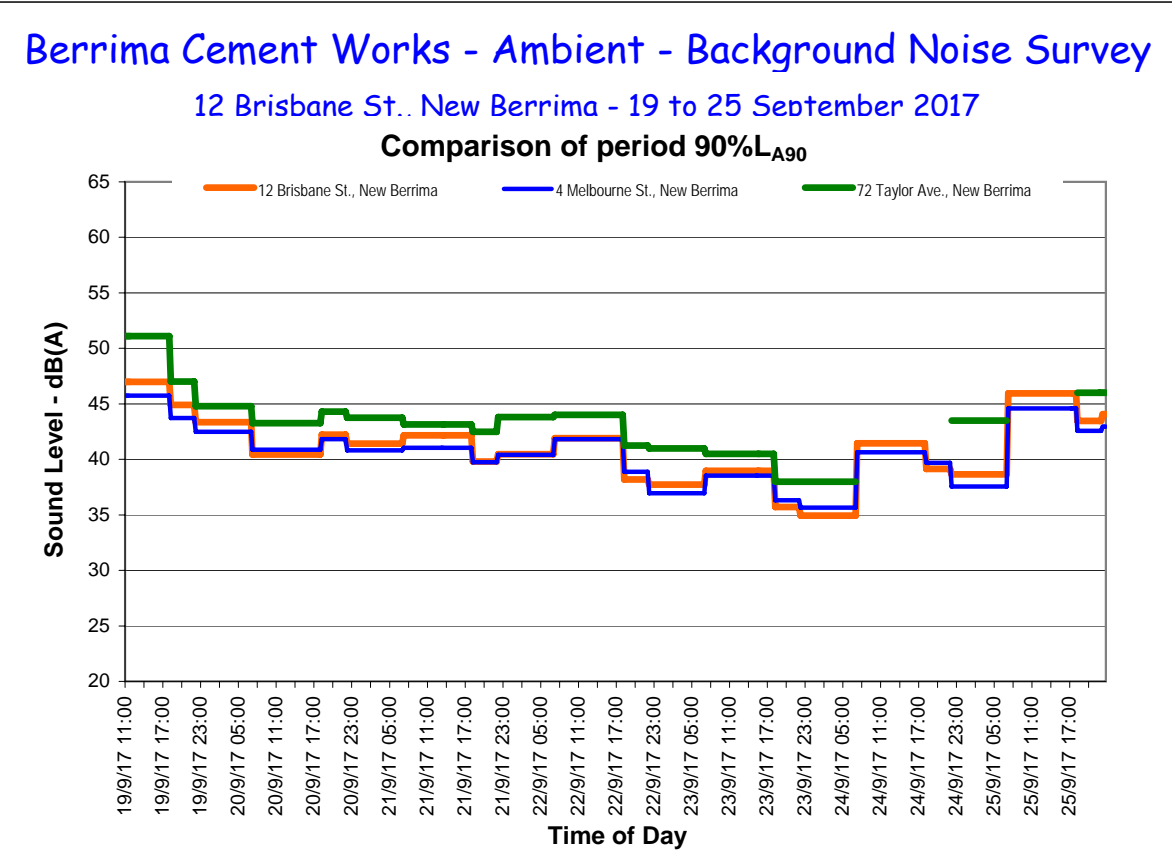
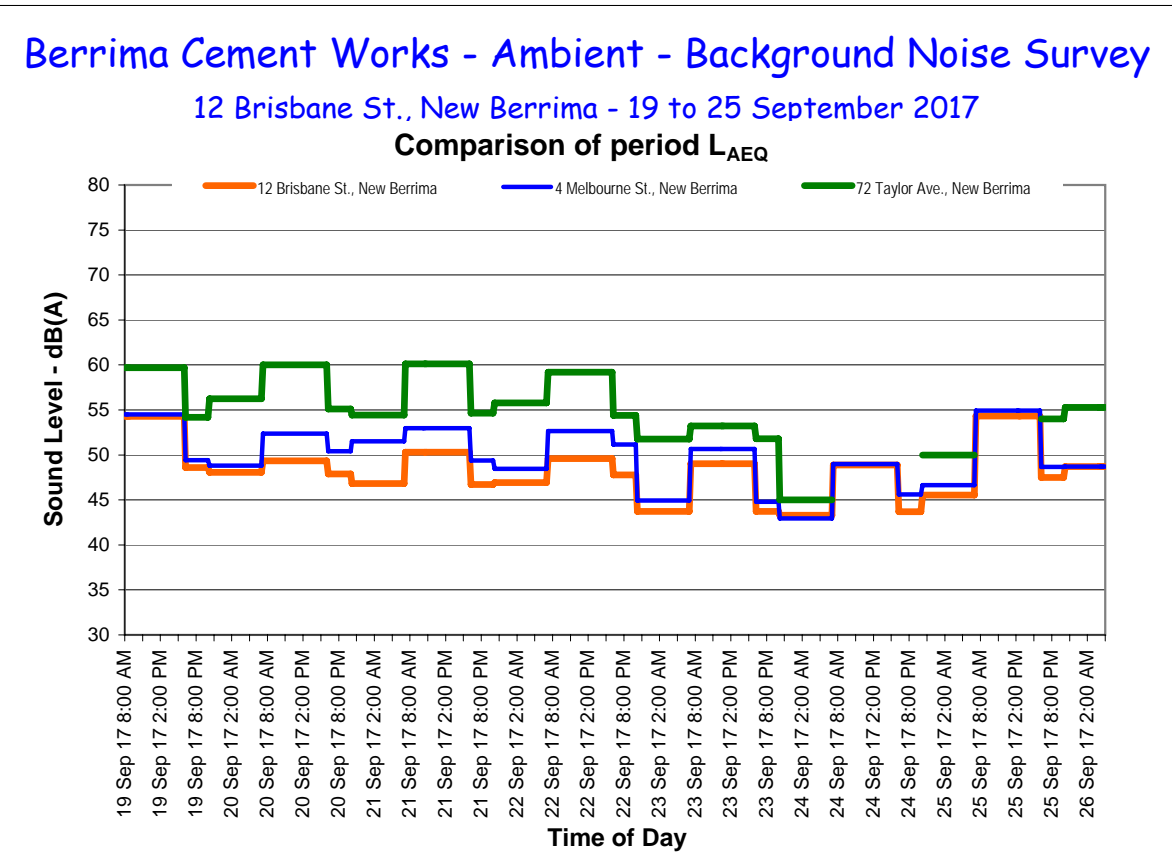
12 Brisbane St., New Berrima - 1 to 2 October 2017

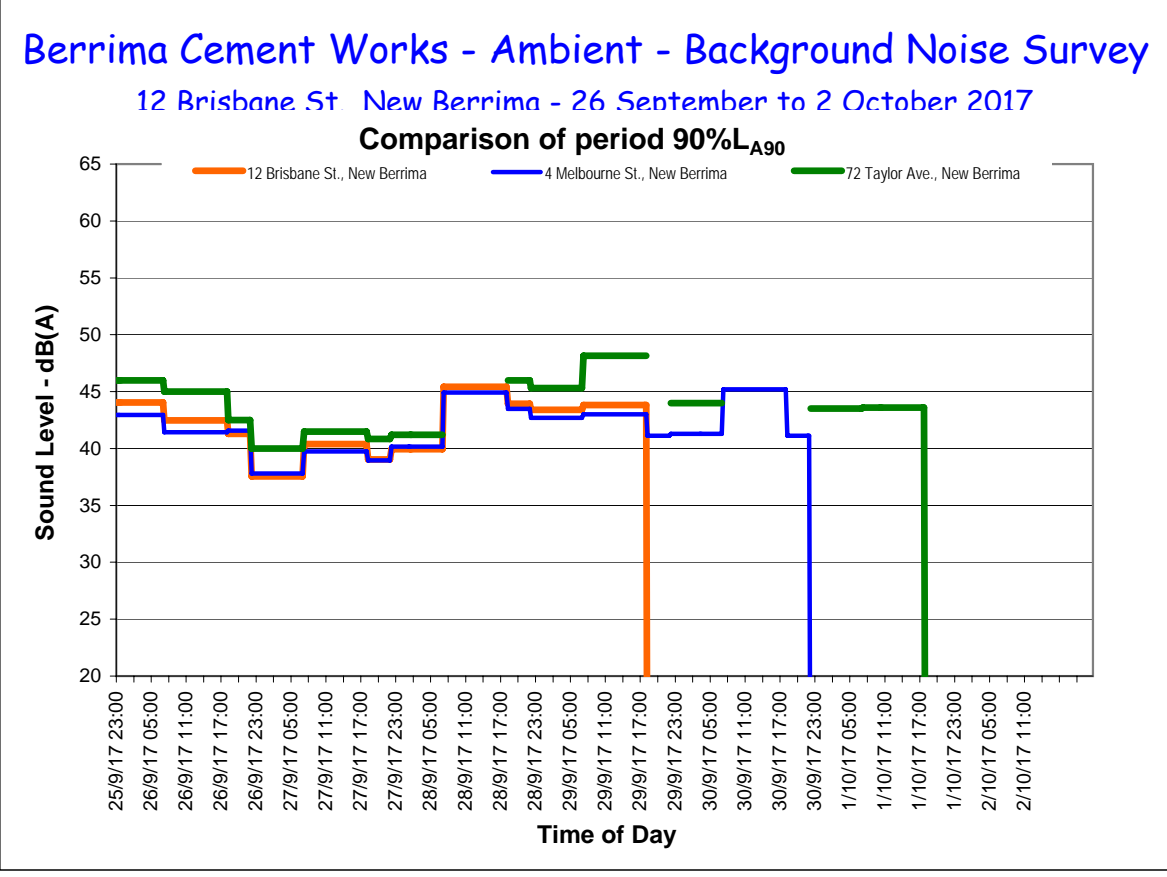
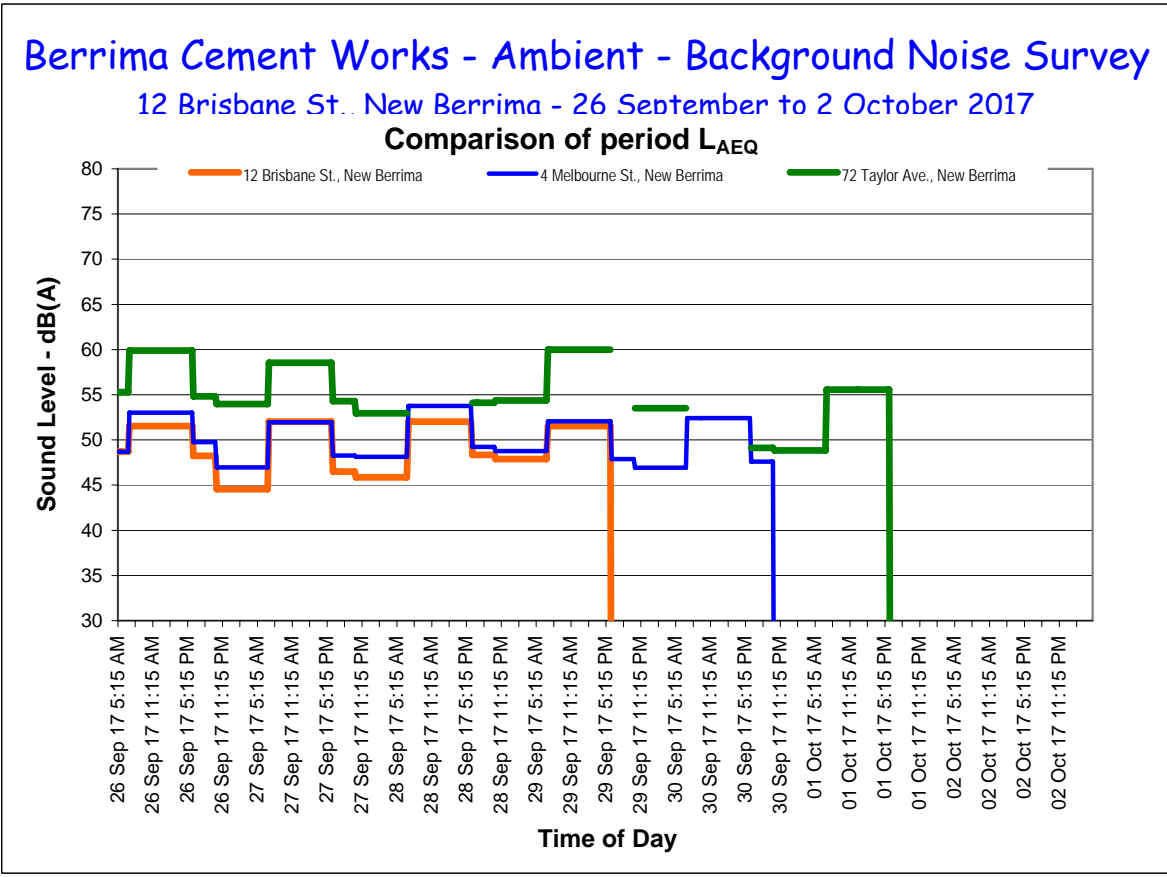


Berrima Cement Works - Ambient - Background Noise Survey

12 Brisbane St., New Berrima - 1 to 2 October 2017

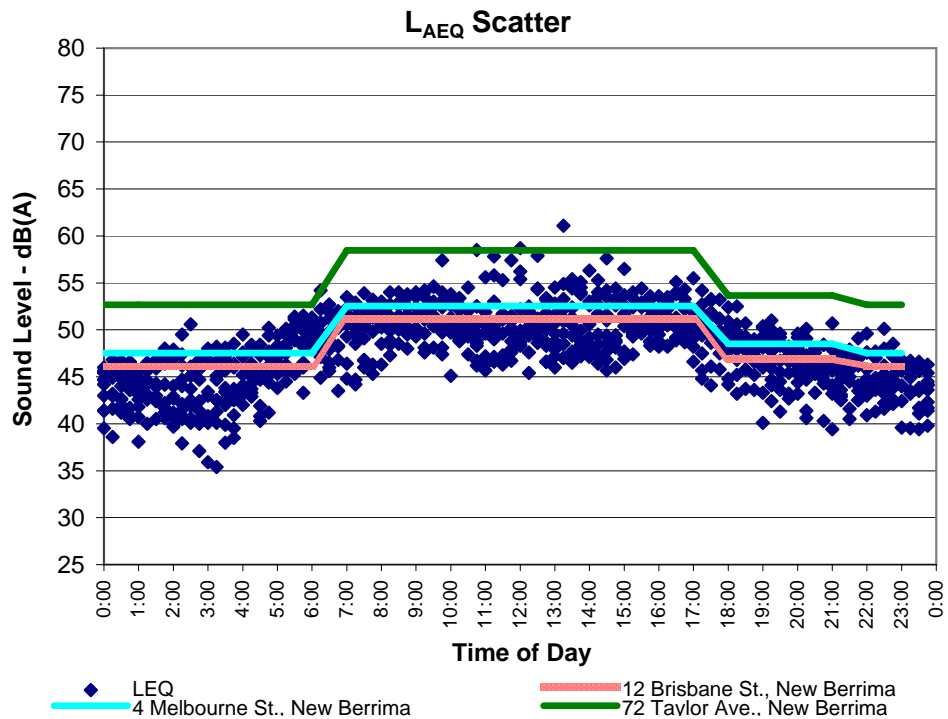






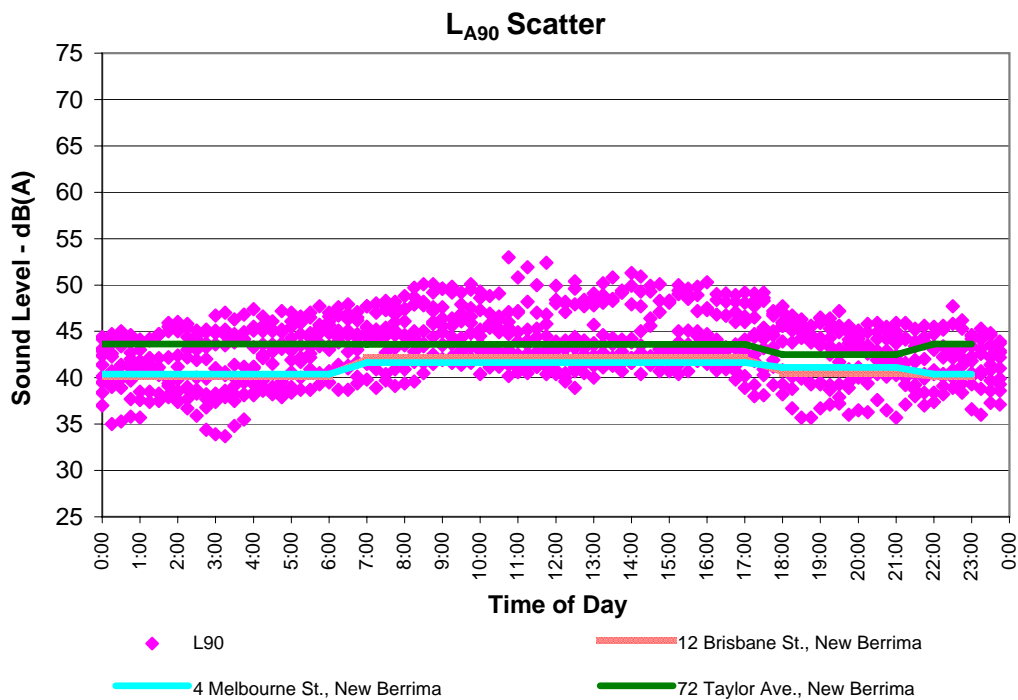
Berrima Cement Works - Ambient - Background Noise

12 Brisbane St., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

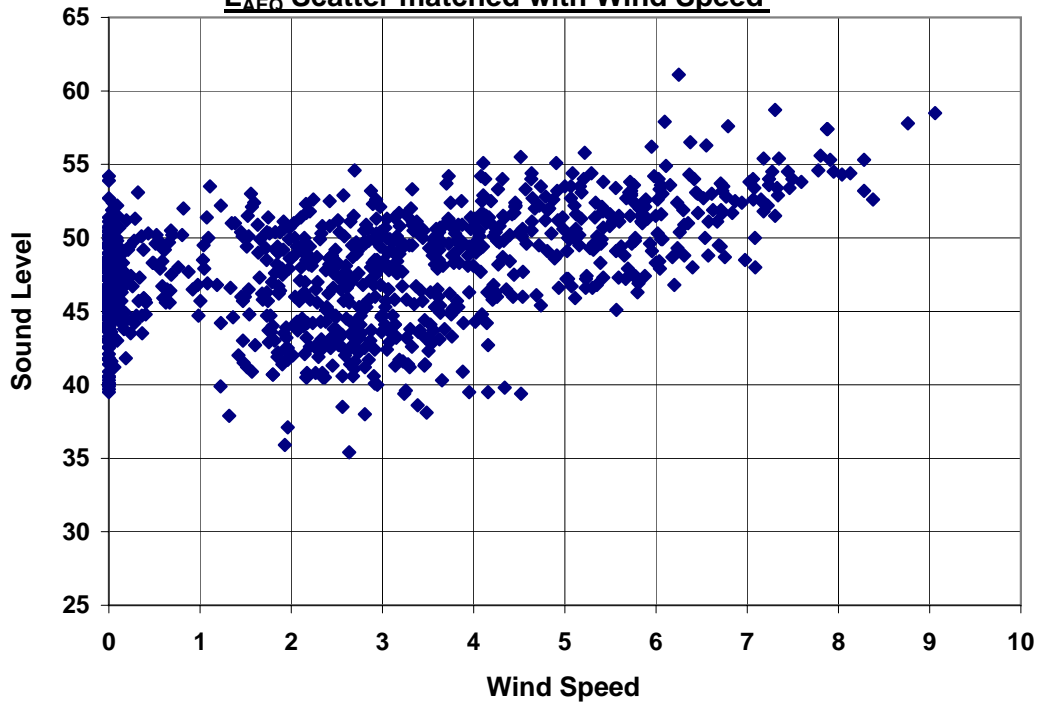
12 Brisbane St., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

12 Brisbane St., New Berrima - 19 September to 1 October 2017

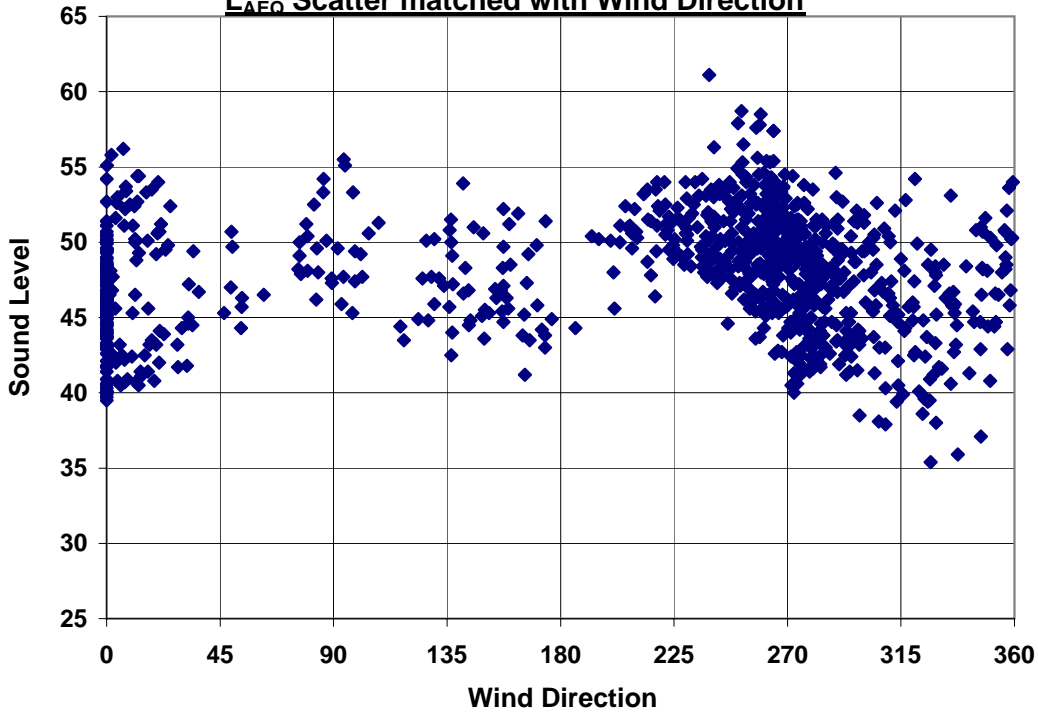
L_{AEQ} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

12 Brisbane St., New Berrima - 19 September to 1 October 2017

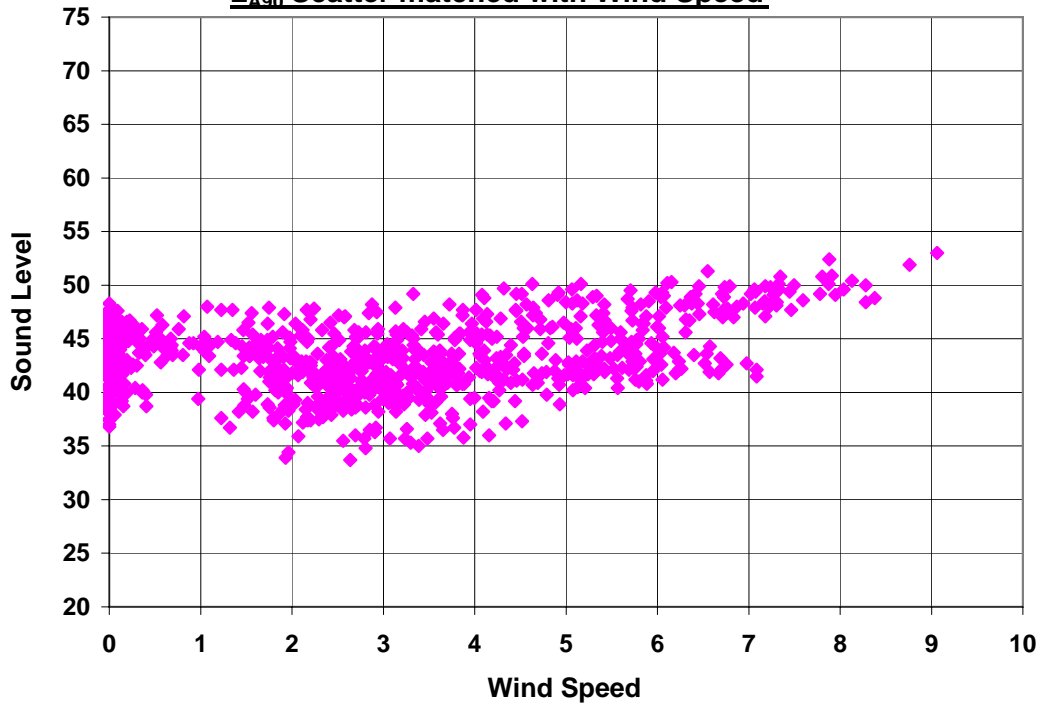
L_{AEQ} Scatter matched with Wind Direction



Berrima Cement Works - Ambient - Background Noise

12 Brisbane St., New Berrima - 19 September to 1 October 2017

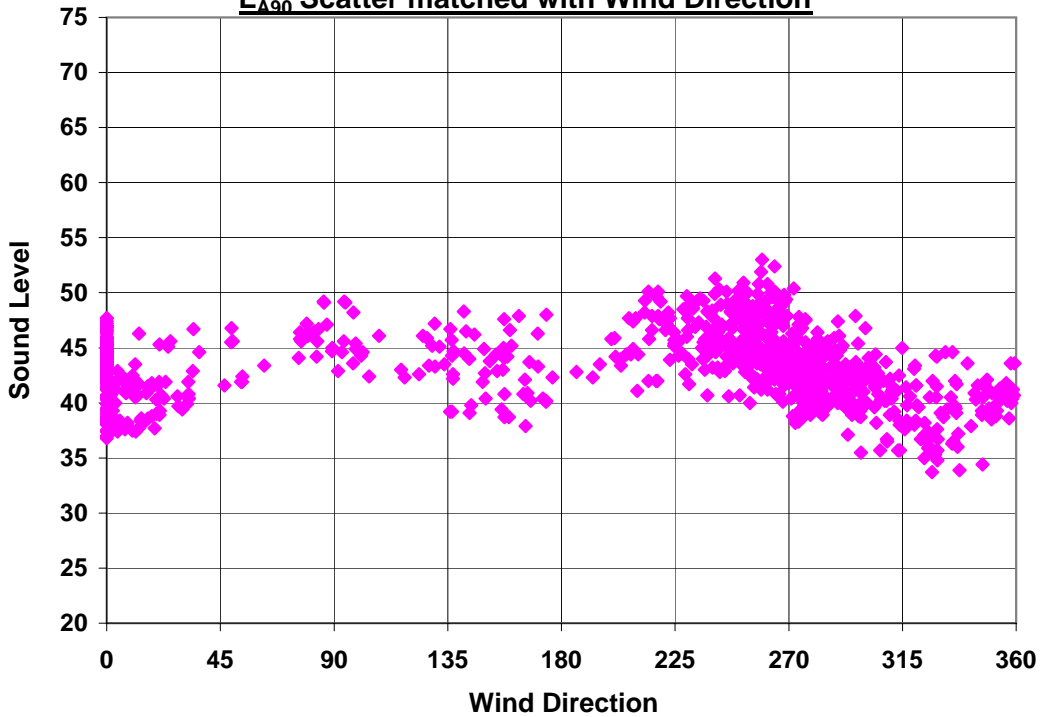
L_{A90} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

12 Brisbane St., New Berrima - 19 September to 1 October 2017

L_{A90} Scatter matched with Wind Direction



Appendix E: Unattended environmental sound level results for Cement Plant Northern Boundary

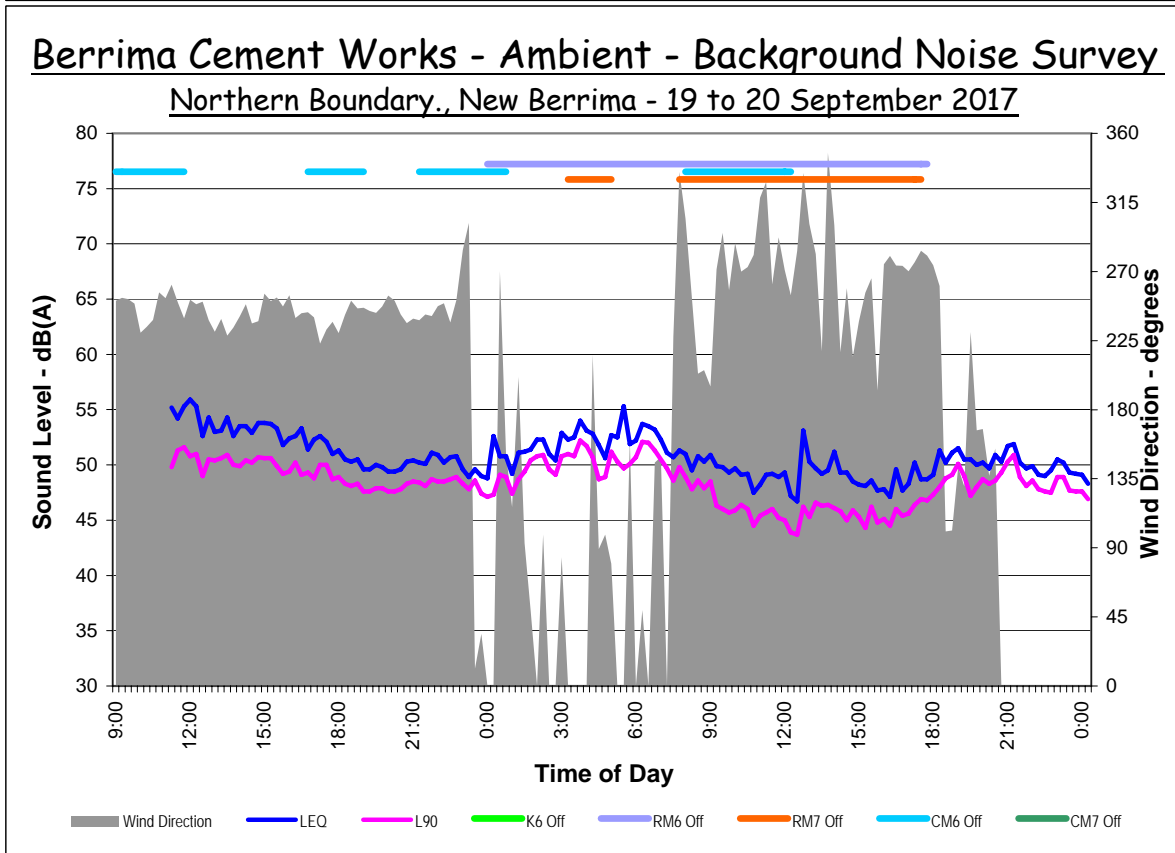
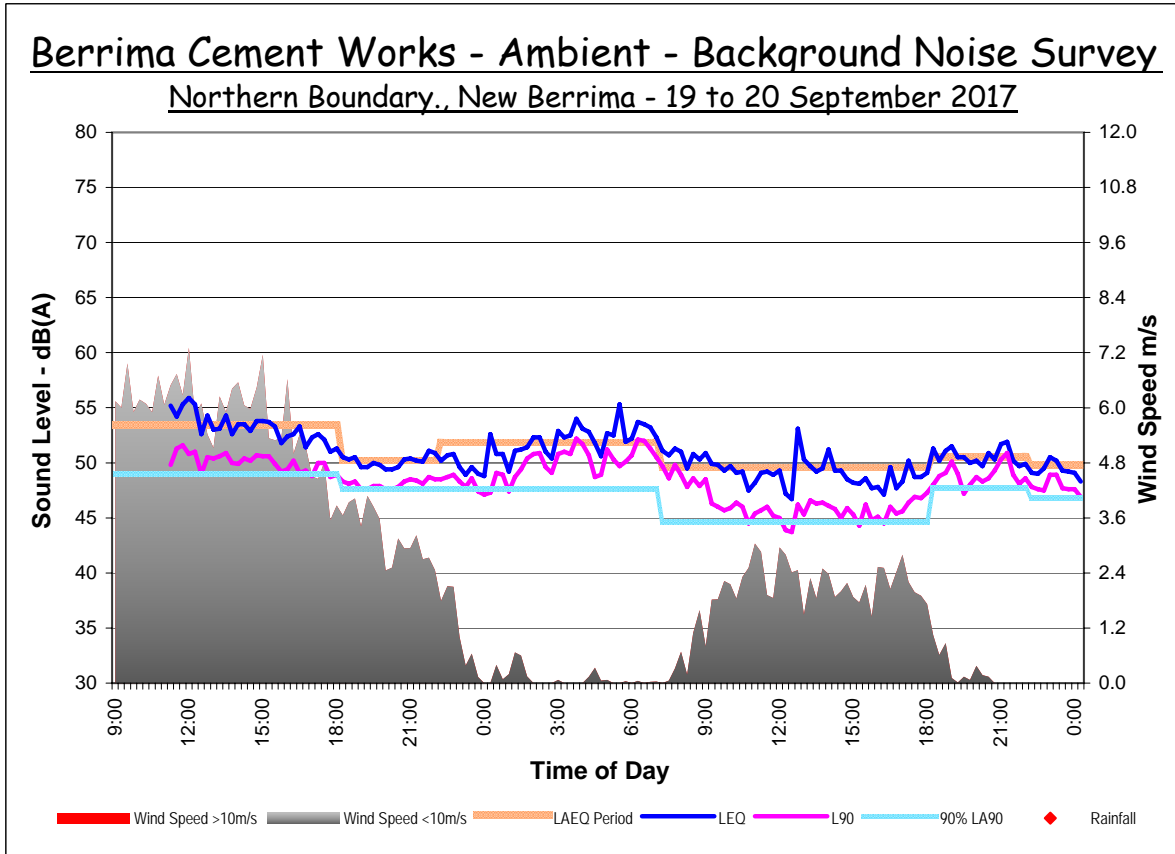
Northern Boundary., New Berrima - 19 September to 1 October 2017
Comparison of Period LAEQ, Period Average LA10 and Period 90% LA90 Results
Summary of Statistical Data

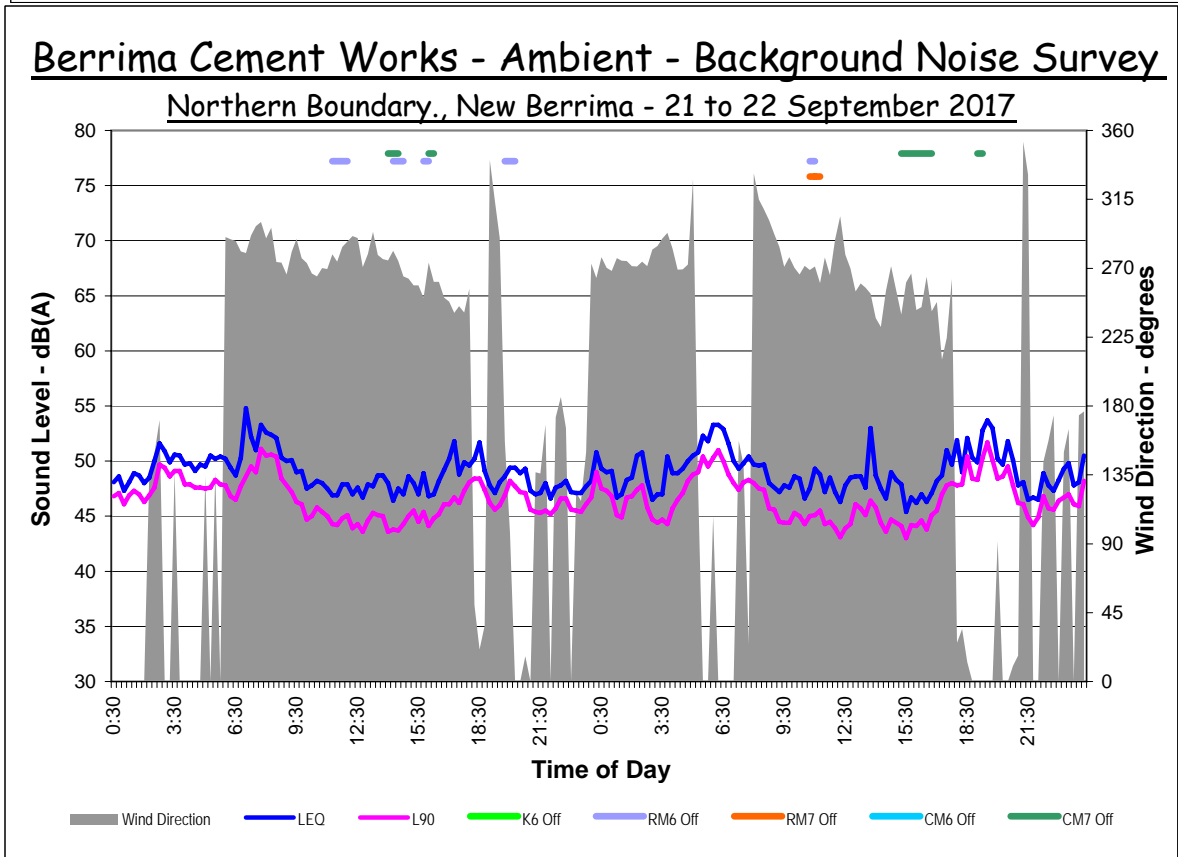
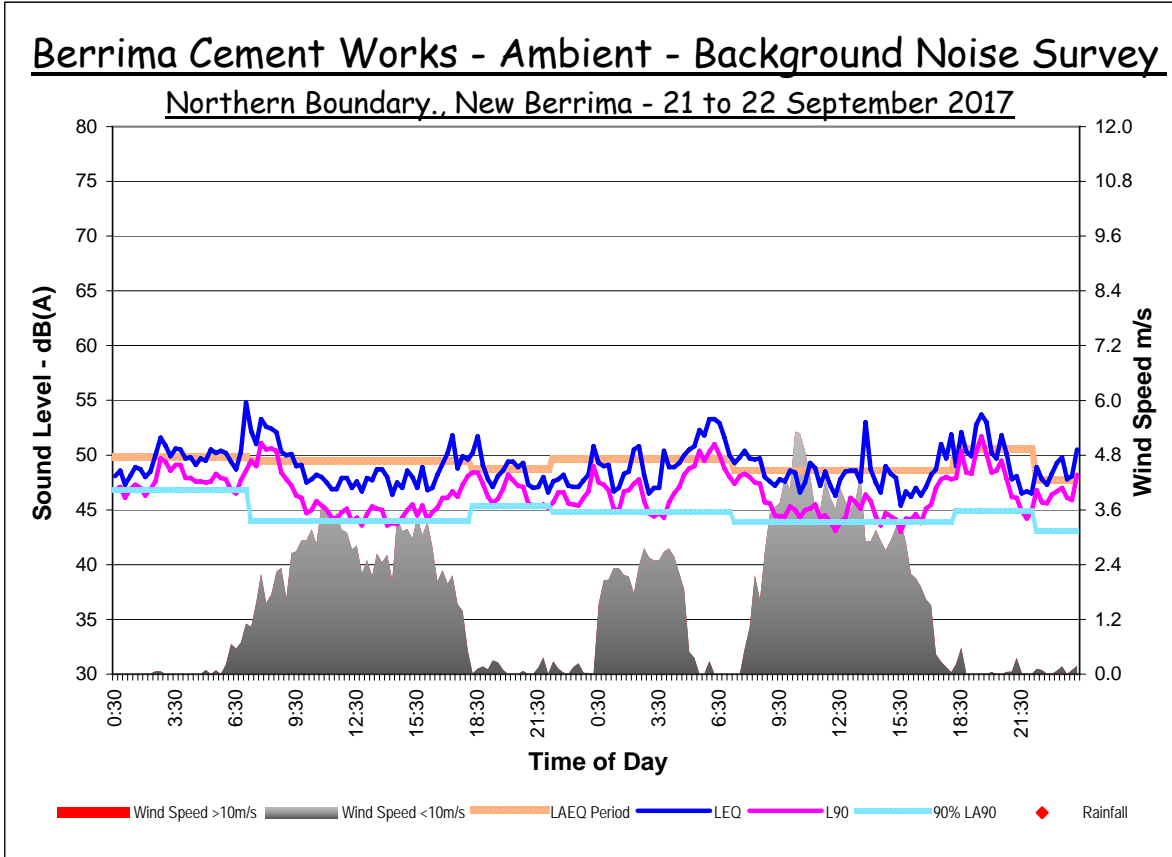
LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
Northern Boundary., New Berrima	56	48	51	51	44	49	52	46	49	55	46	50
Stock Yard., New Berrima	62	56	59	57	52	55	59	54	57	63	53	58
72 Taylor Ave., New Berrima	60	53	58	55	49	54	56	45	53	59	45	54

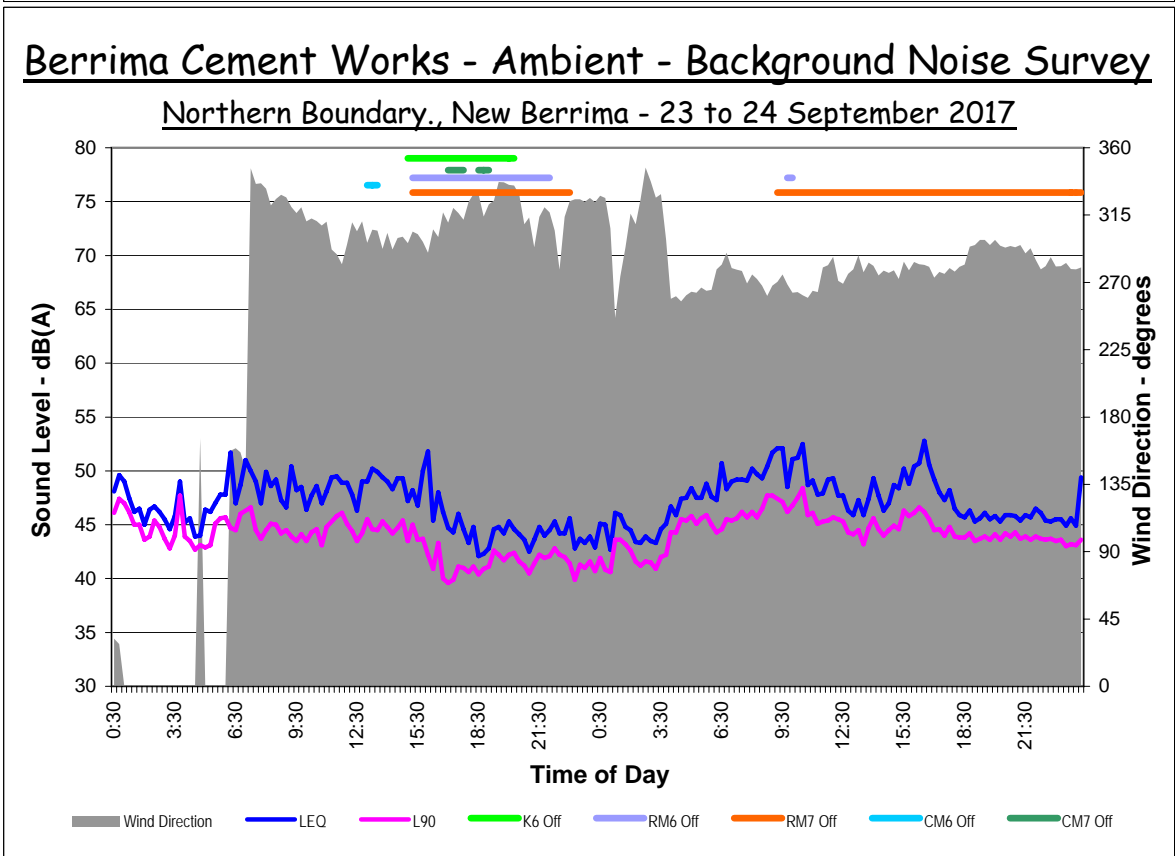
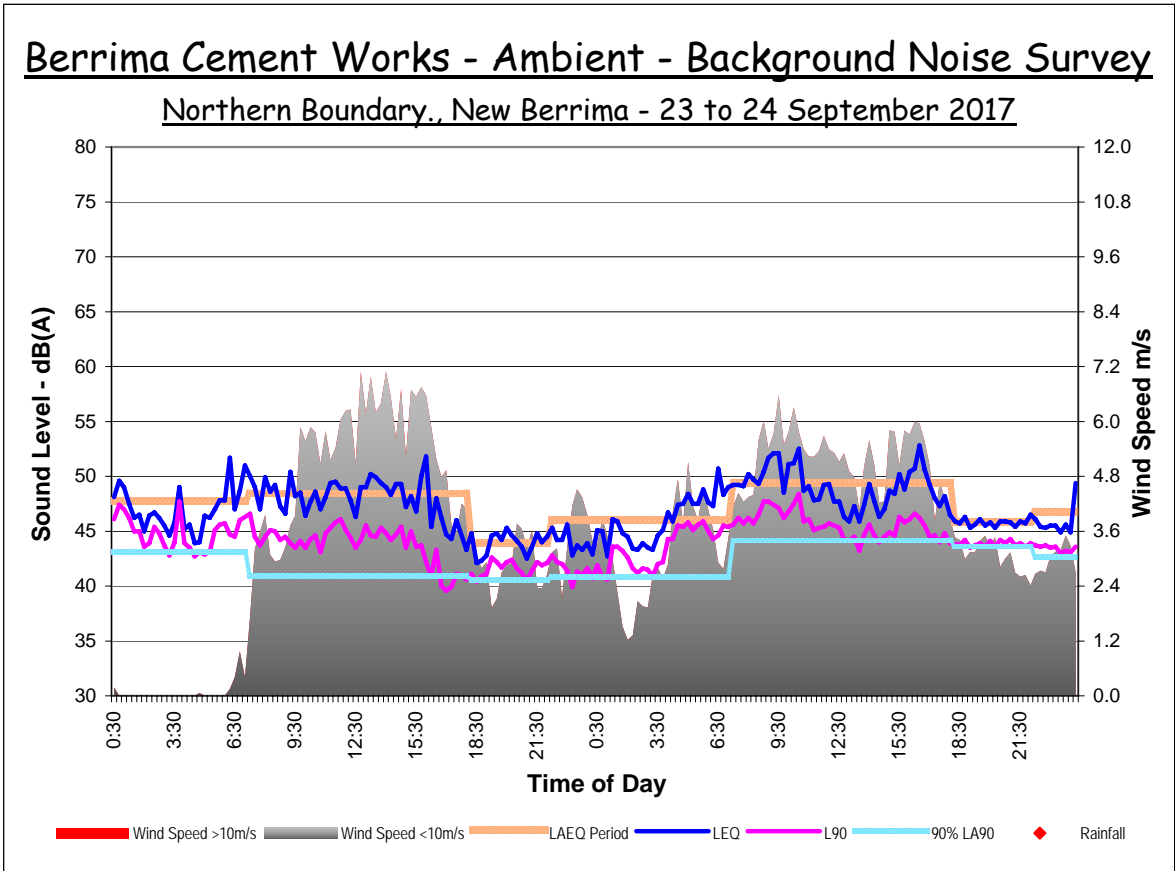
L90.15-min 10%	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
Northern Boundary., New Berrima	49	41	45	45	48	41	45	45	49	41	45	45
Stock Yard., New Berrima	54	48	52	52	54	48	52	53	54	49	53	53
72 Taylor Ave., New Berrima	51	33	43	43	47	38	43	43	46	38	43	44

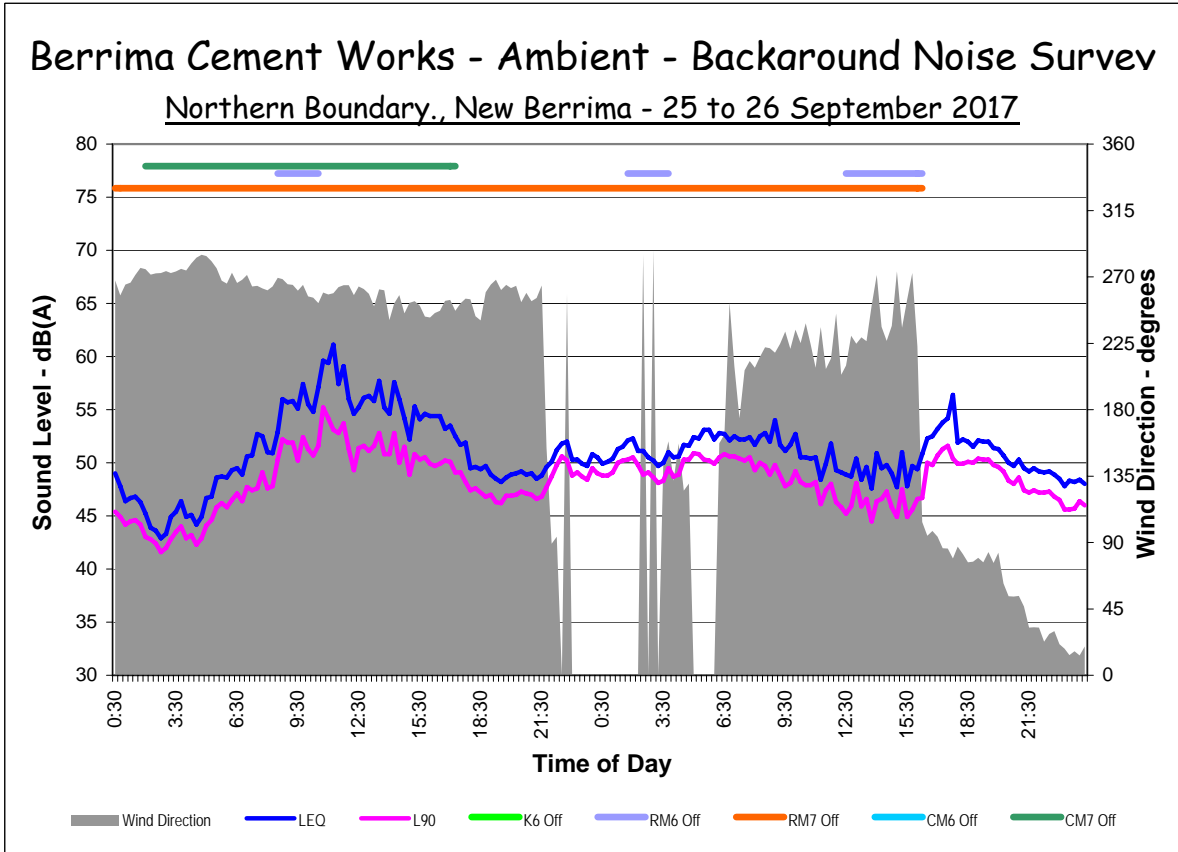
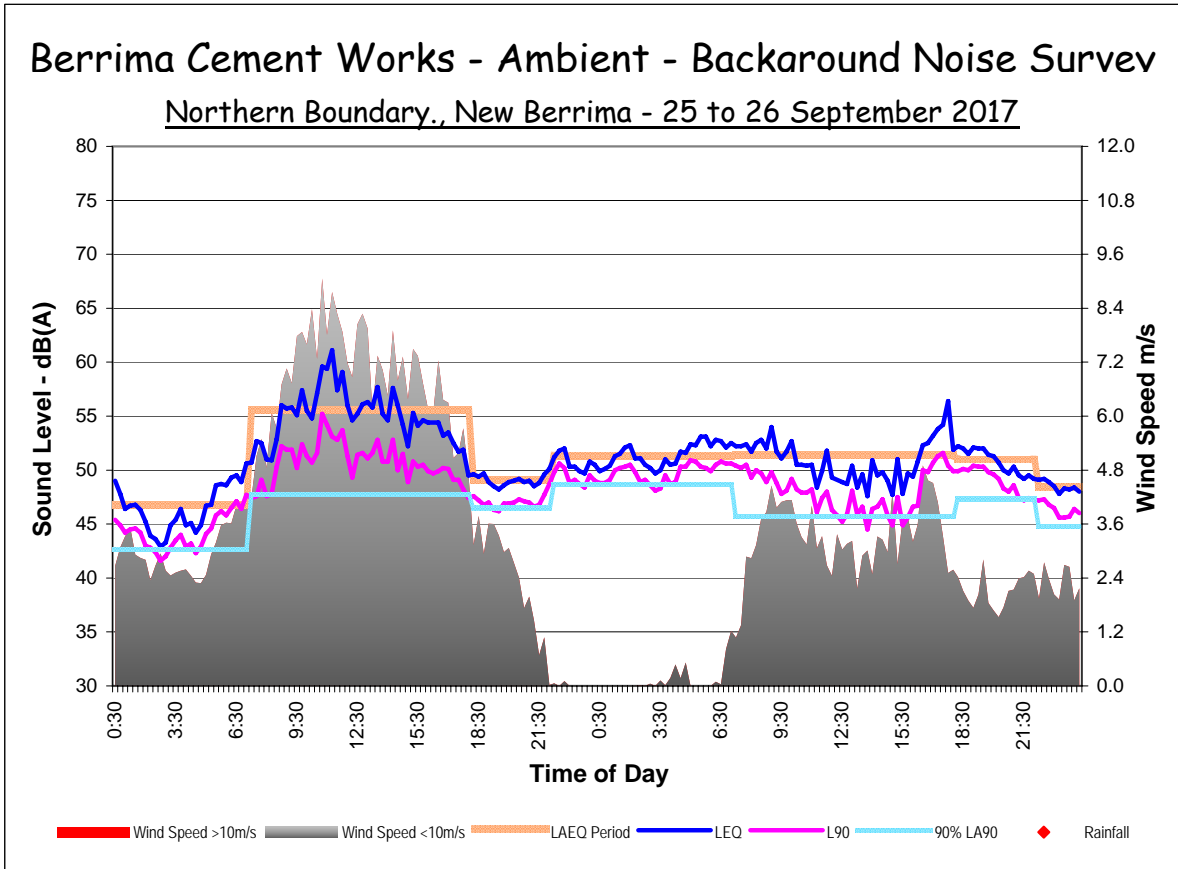
L90.15-min	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
Northern Boundary., New Berrima	51	44	47	47	49	42	47	47	50	43	47	47
Stock Yard., New Berrima	55	51	53	54	55	50	53	53	56	50	54	54
72 Taylor Ave., New Berrima	52	41	46	45	48	39	44	45	47	39	44	44

Two Day Results of Ambient Noise Monitoring



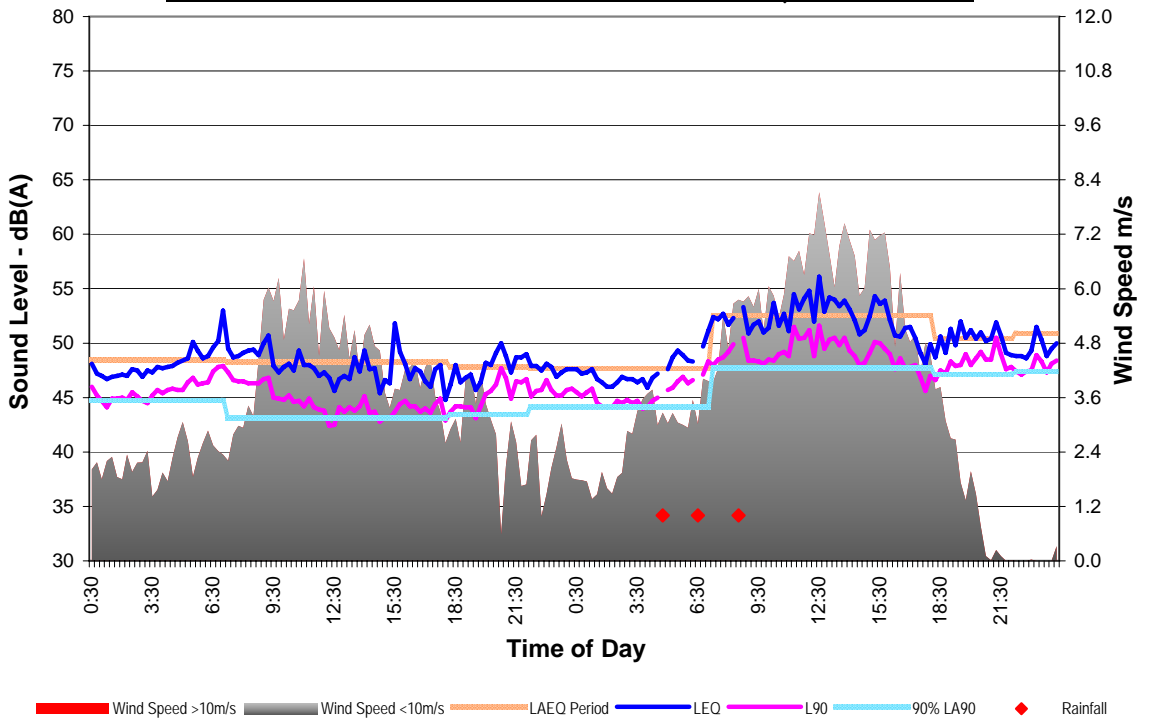






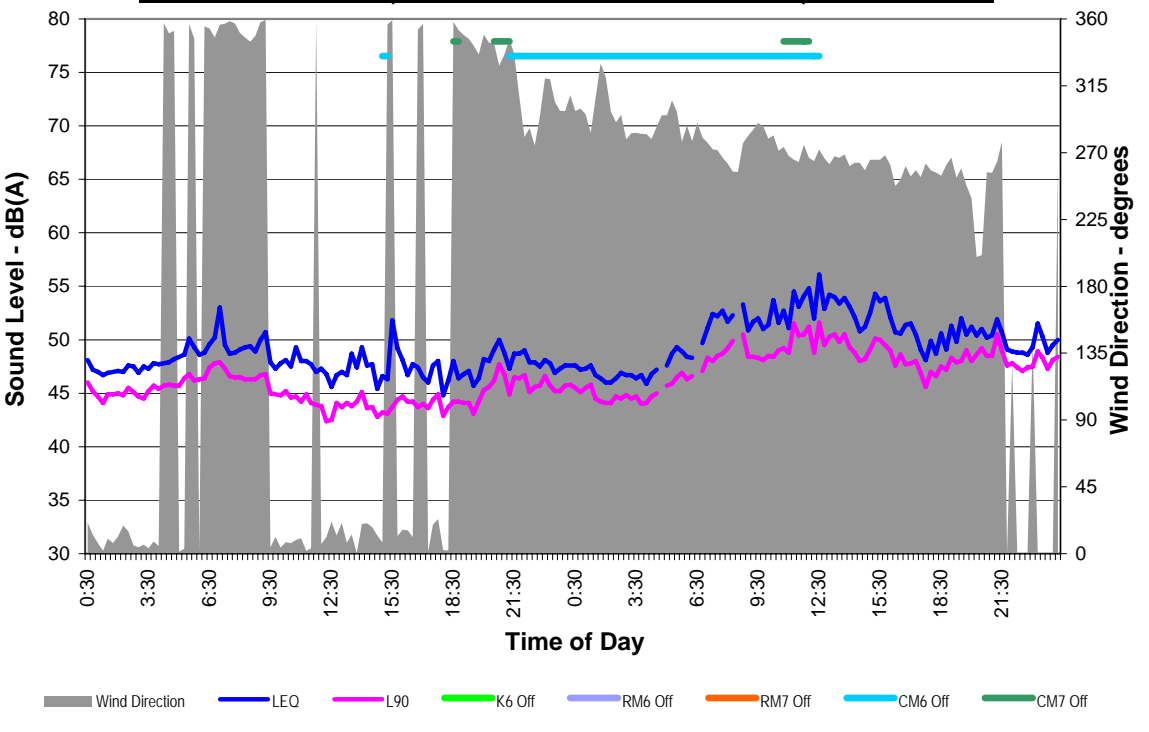
Berrima Cement Works - Ambient - Background Noise Survey

Northern Fence., New Berrima - 27 to 28 September 2017



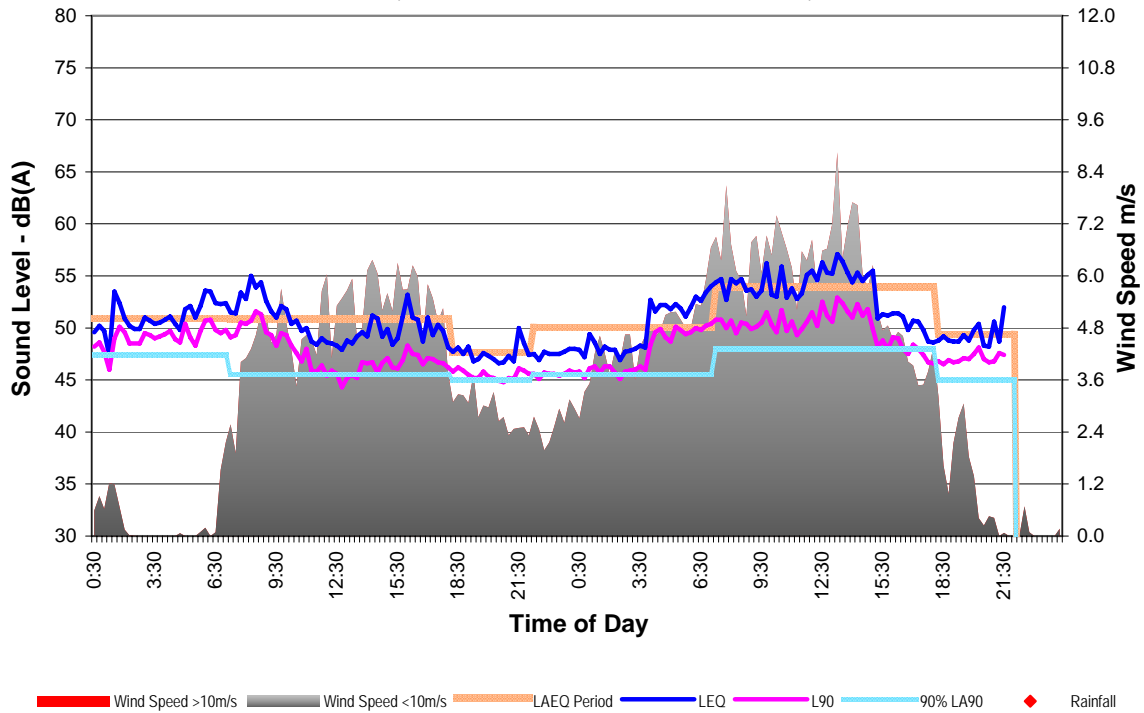
Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 27 to 28 September 2017



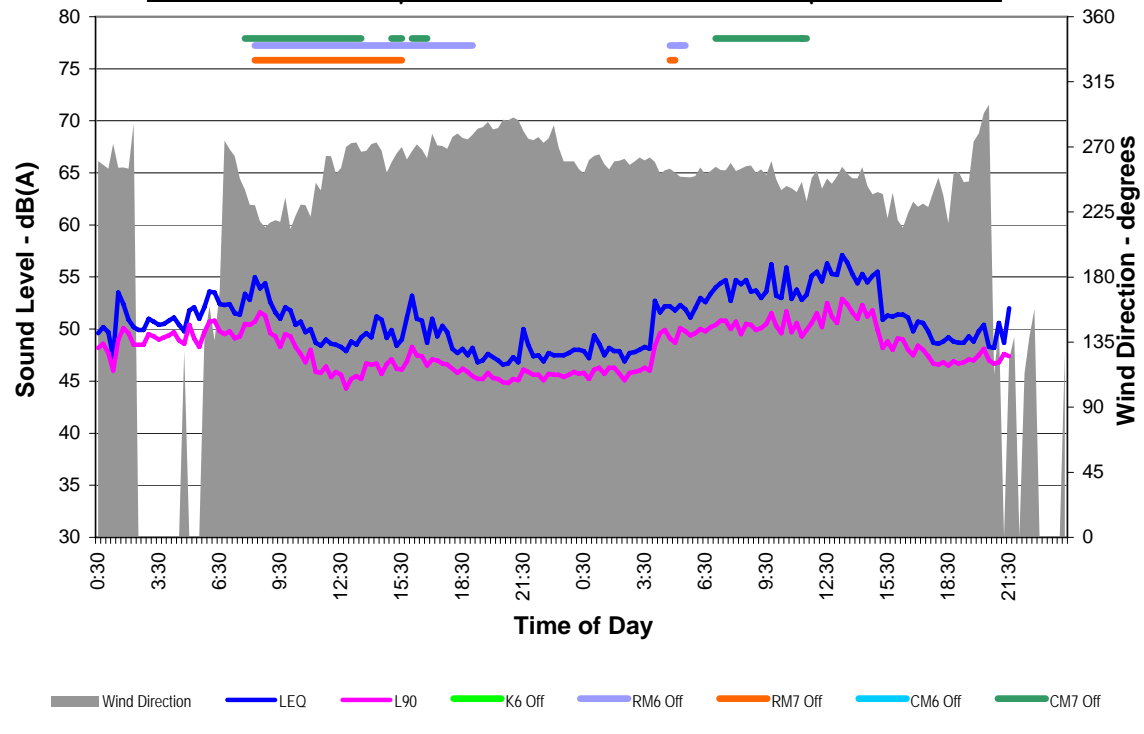
Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 29 to 30 September 2017



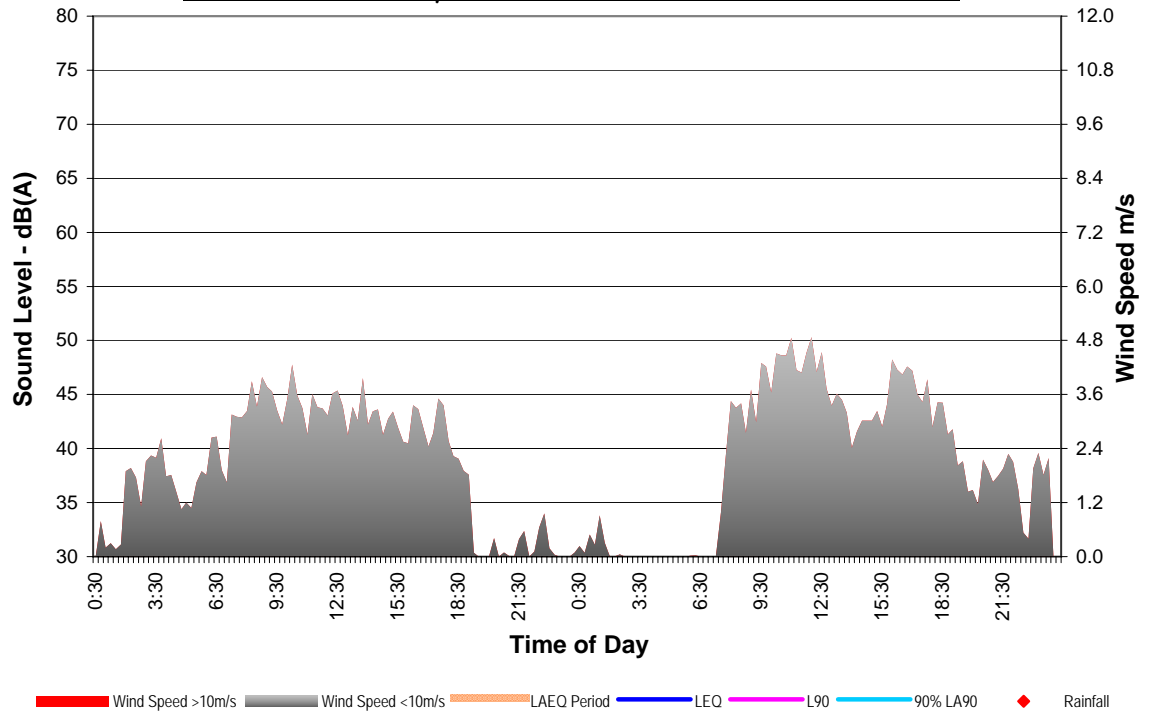
Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 29 to 30 September 2017



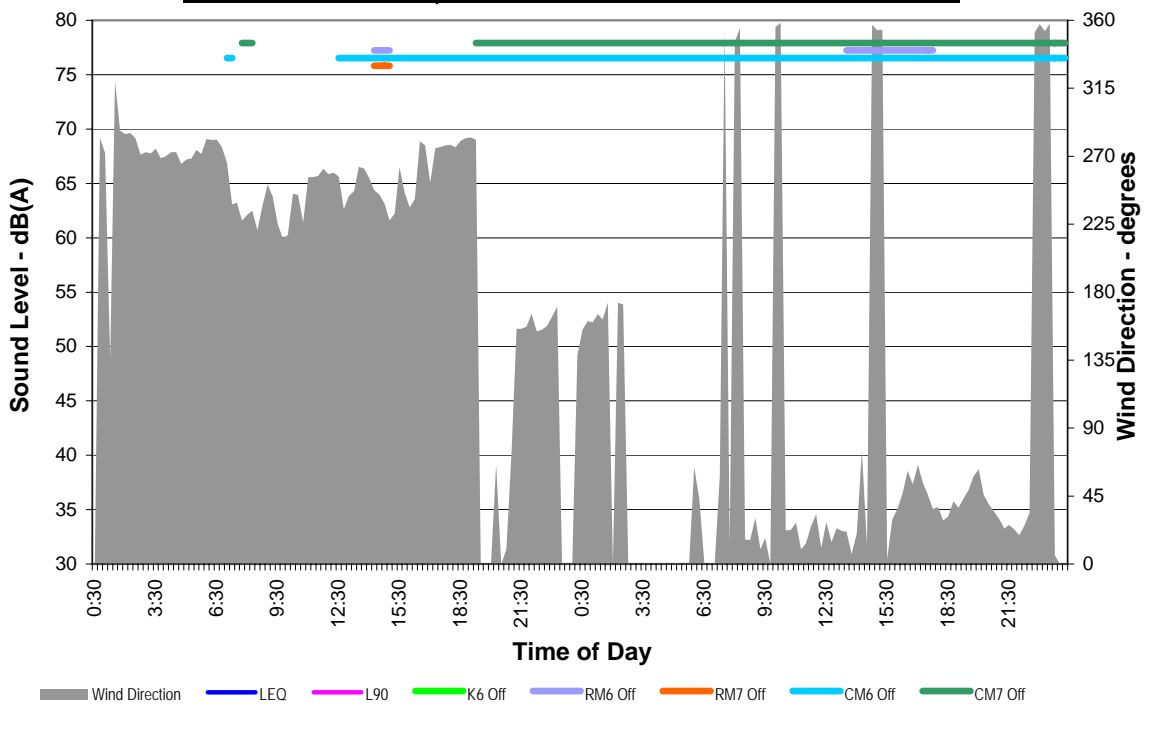
Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

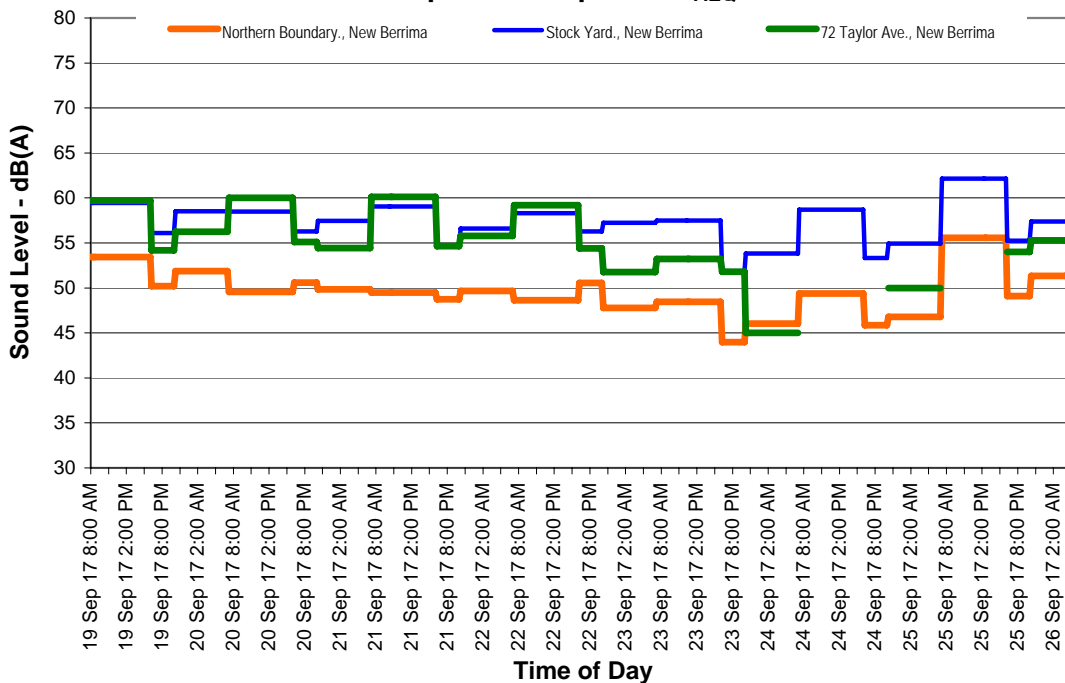
Northern Boundary., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 19 to 25 September 2017

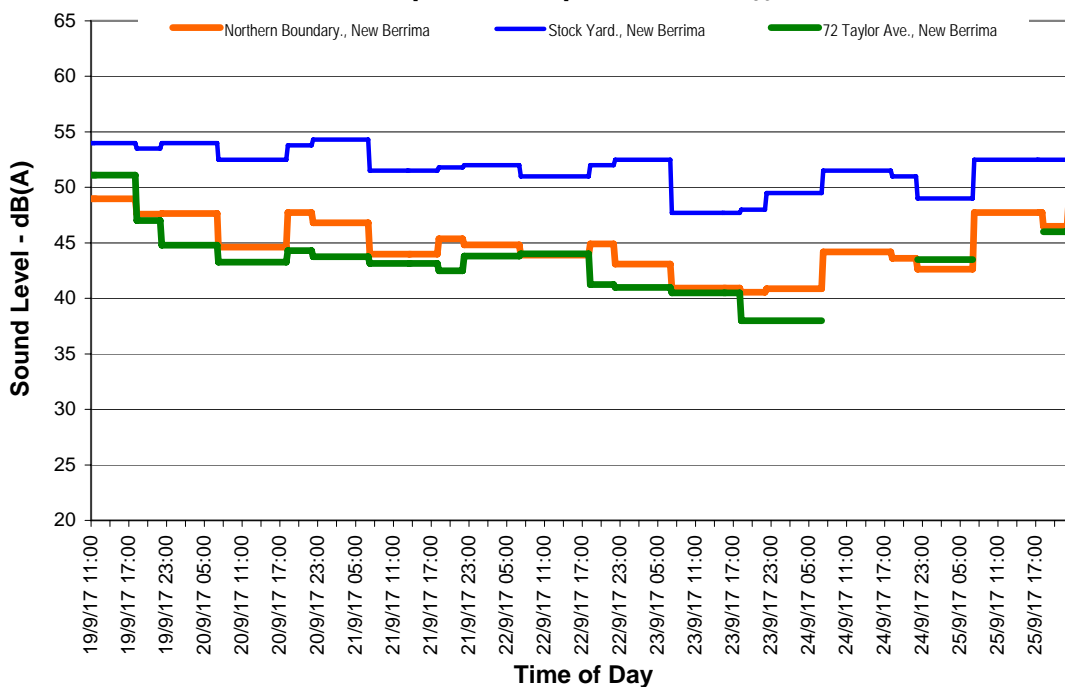
Comparison of period L_{Aeq}

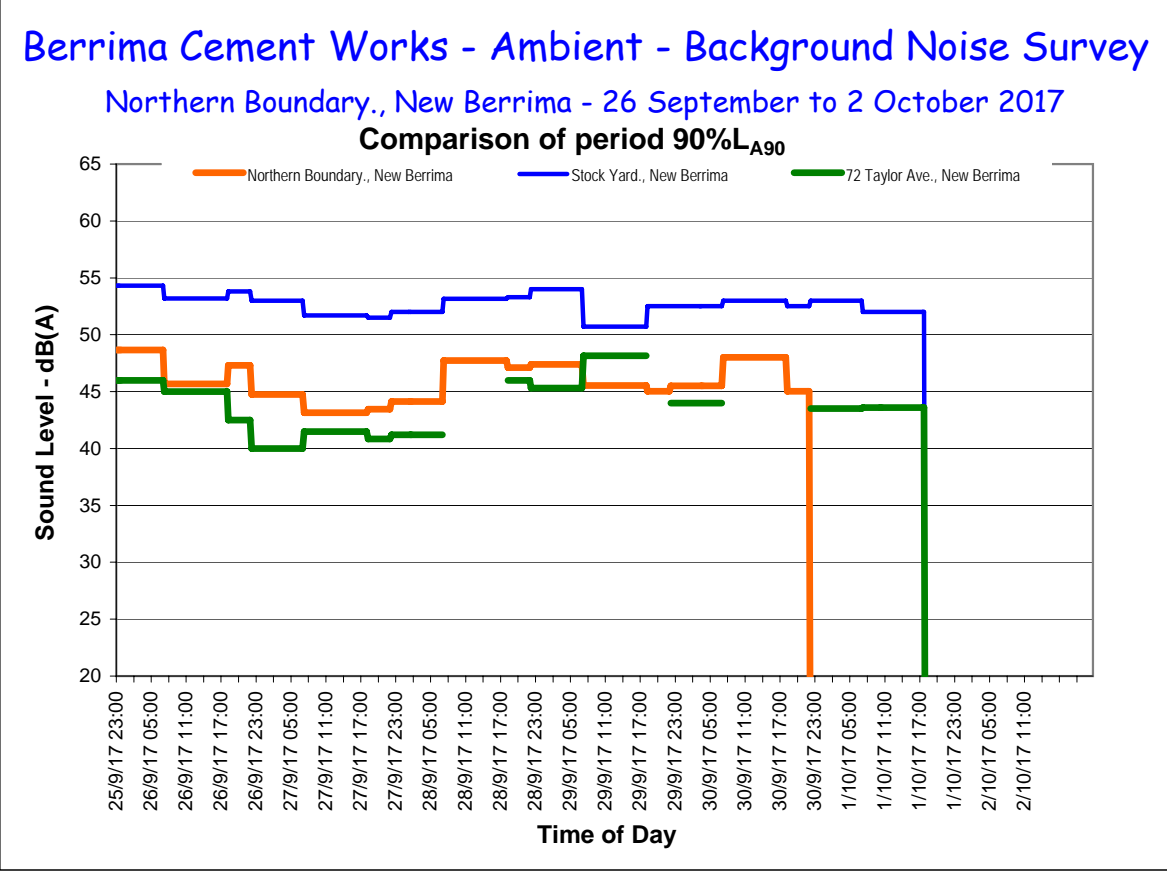
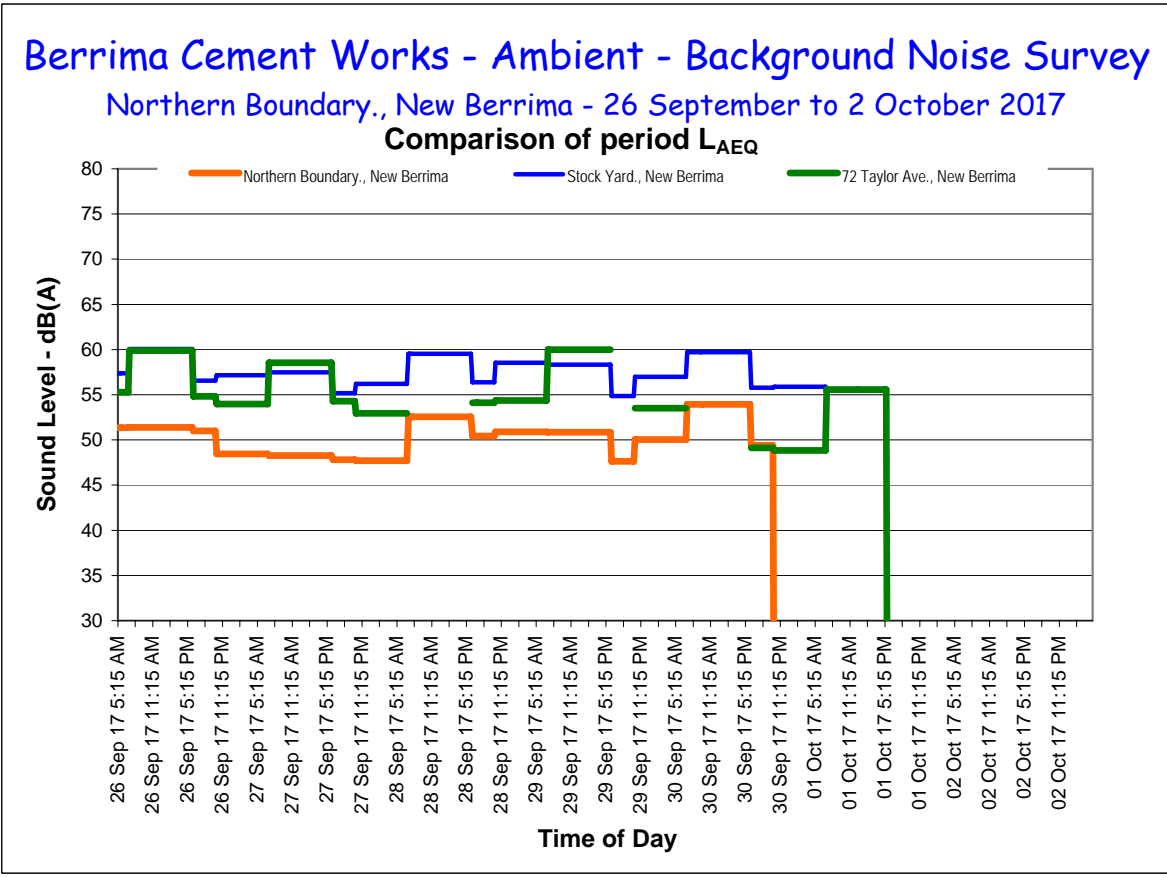


Berrima Cement Works - Ambient - Background Noise Survey

Northern Boundary., New Berrima - 19 to 25 September 2017

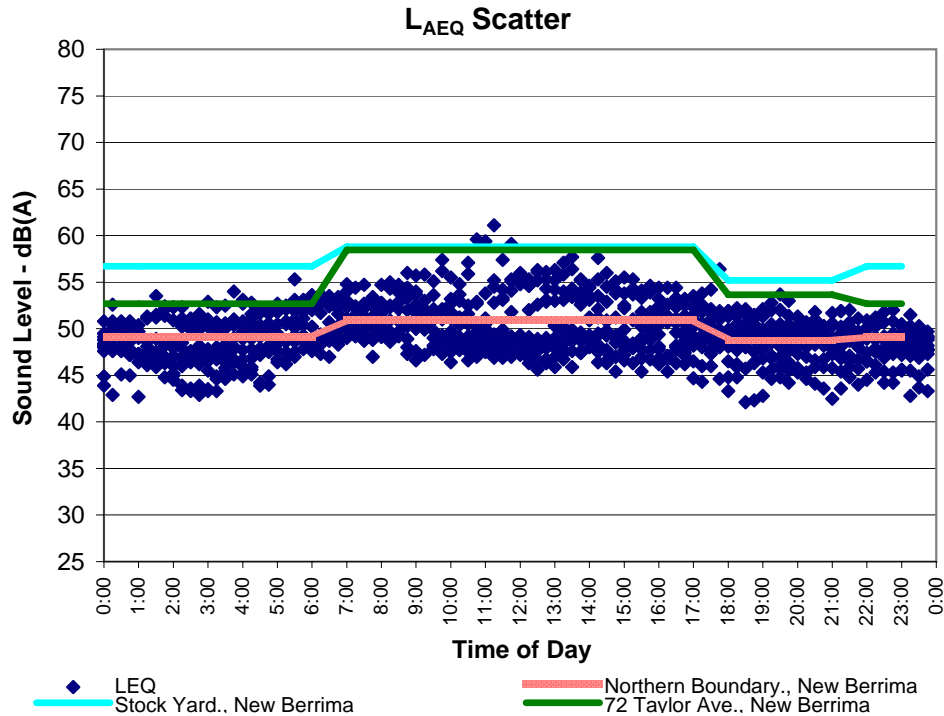
Comparison of period $90\%L_{A90}$





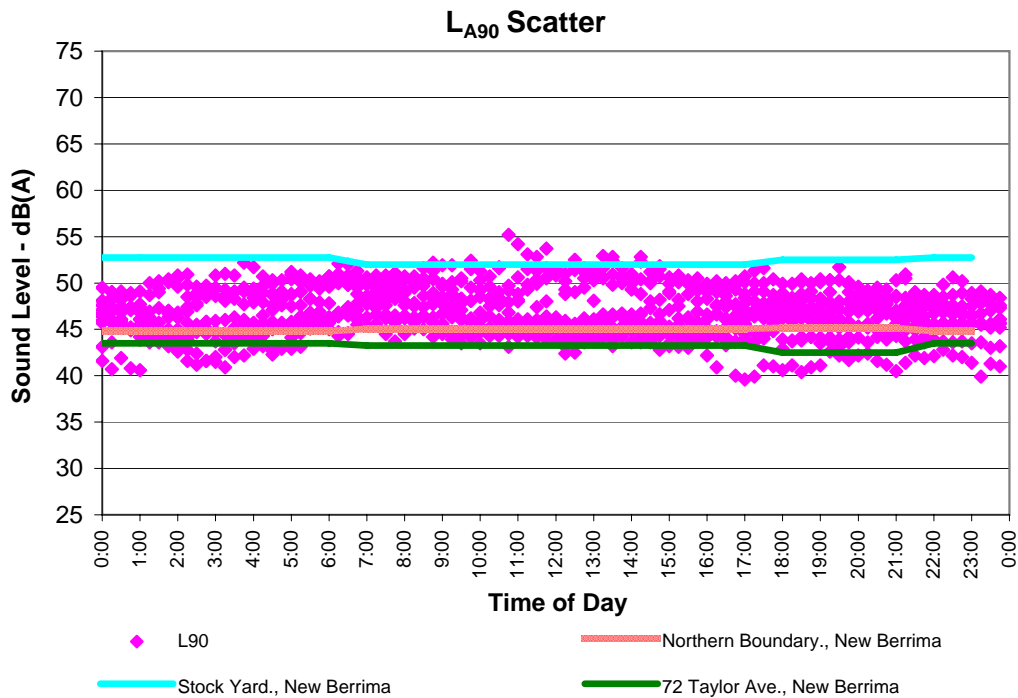
Berrima Cement Works - Ambient - Background Noise

Northern Boundary., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

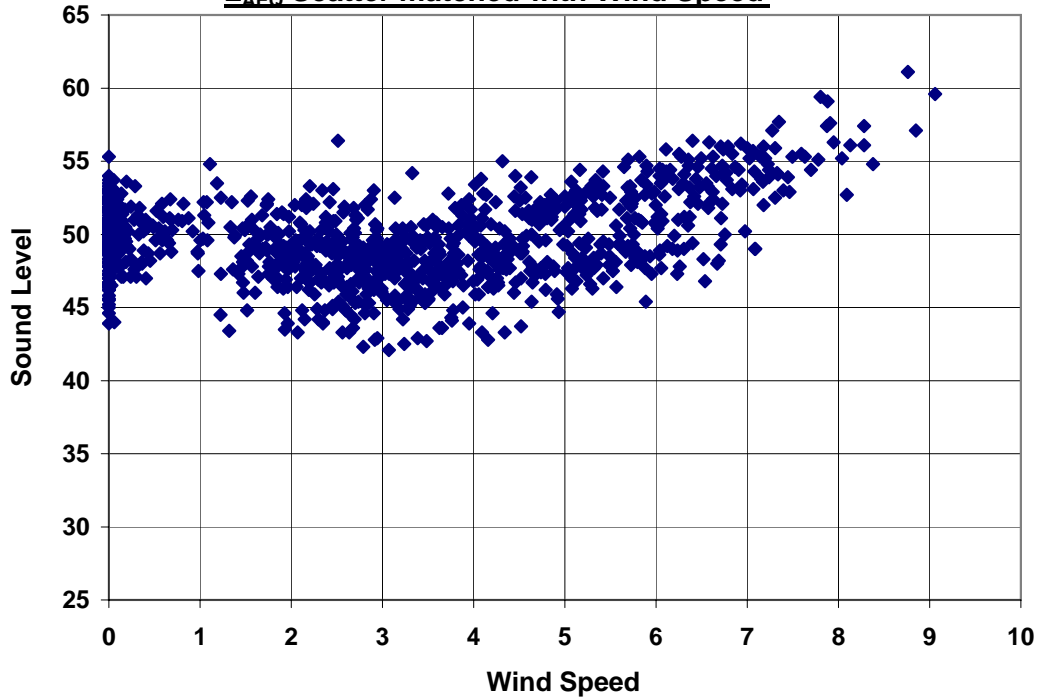
Northern Boundary., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

Northern Boundary., New Berrima - 19 September to 1 October 2017

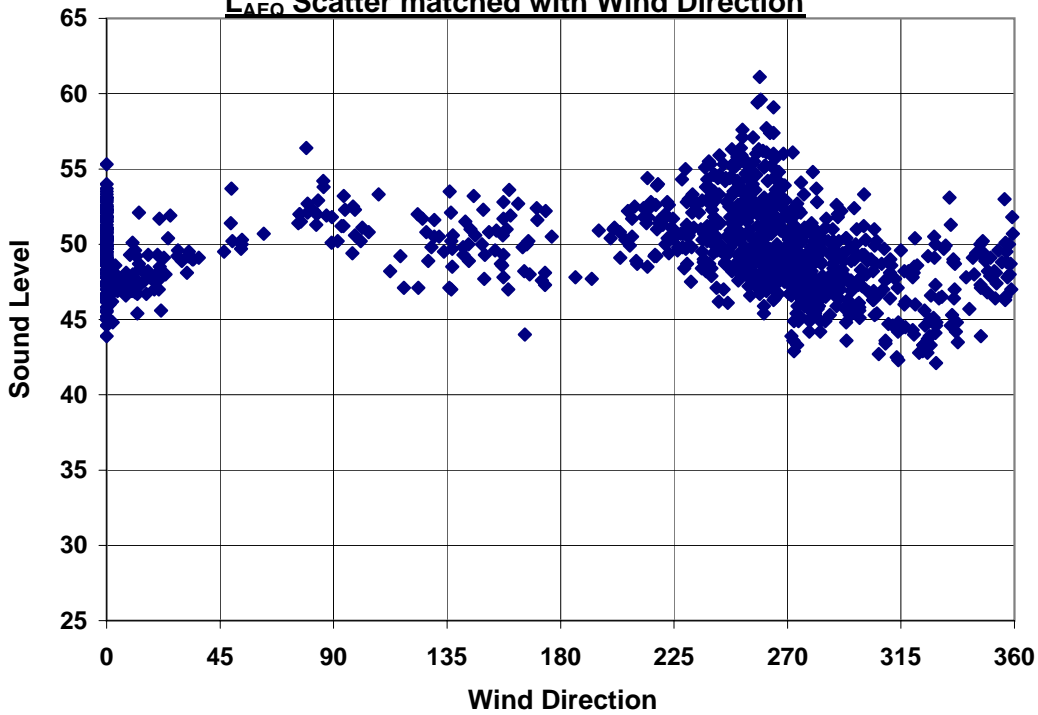
L_{AEQ} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

Northern Boundary., New Berrima - 19 September to 1 October 2017

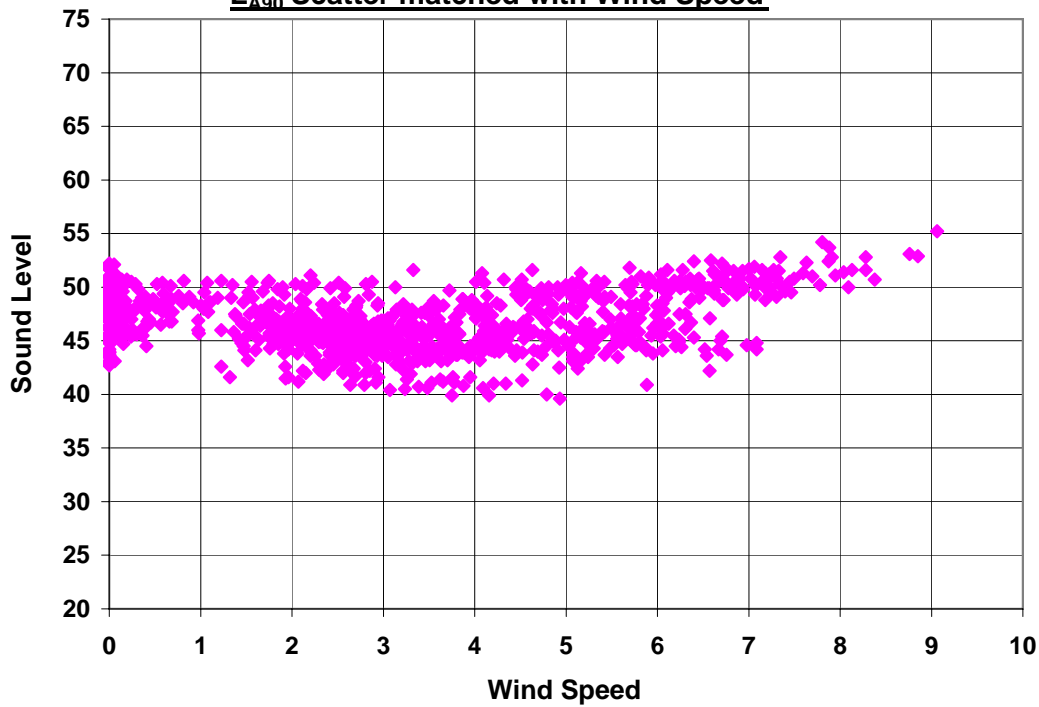
L_{AEQ} Scatter matched with Wind Direction



Berrima Cement Works - Ambient - Background Noise

Northern Boundary., New Berrima - 19 September to 1 October 2017

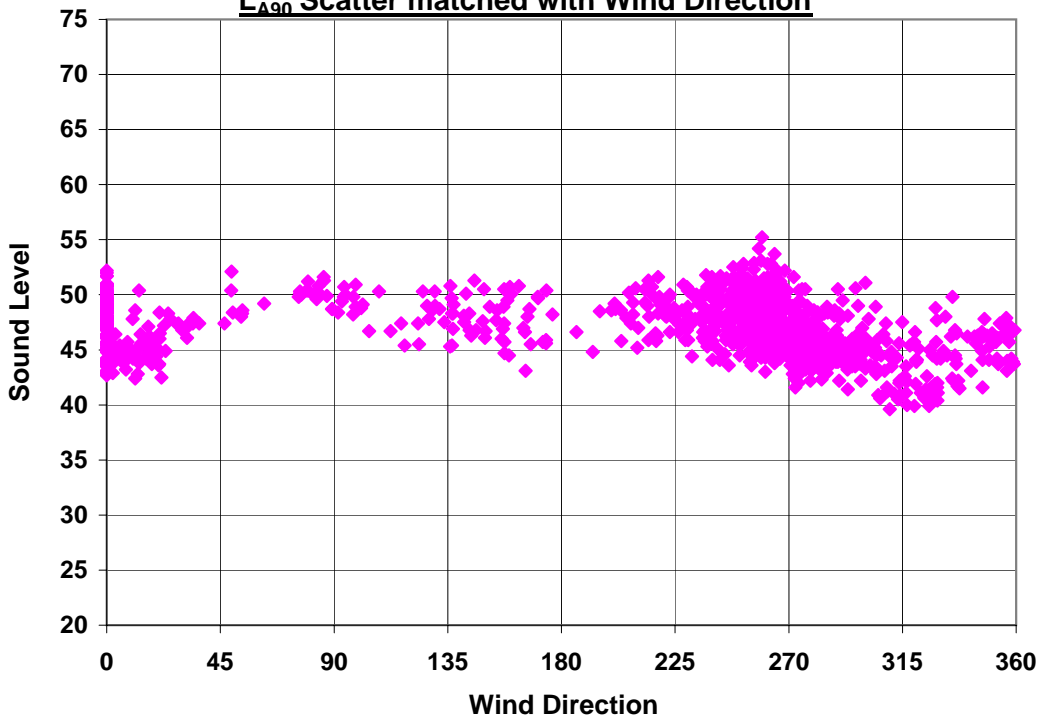
L_{A90} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

Northern Boundary., New Berrima - 19 September to 1 October 2017

L_{A90} Scatter matched with Wind Direction



Appendix F: Unattended environmental sound level results for Store Yard Close location

Stock Yard., New Berrima - 29 to 30 September 2017

Comparison of Period LAEQ, Period Average LA10 and Period 90% LA90 Results

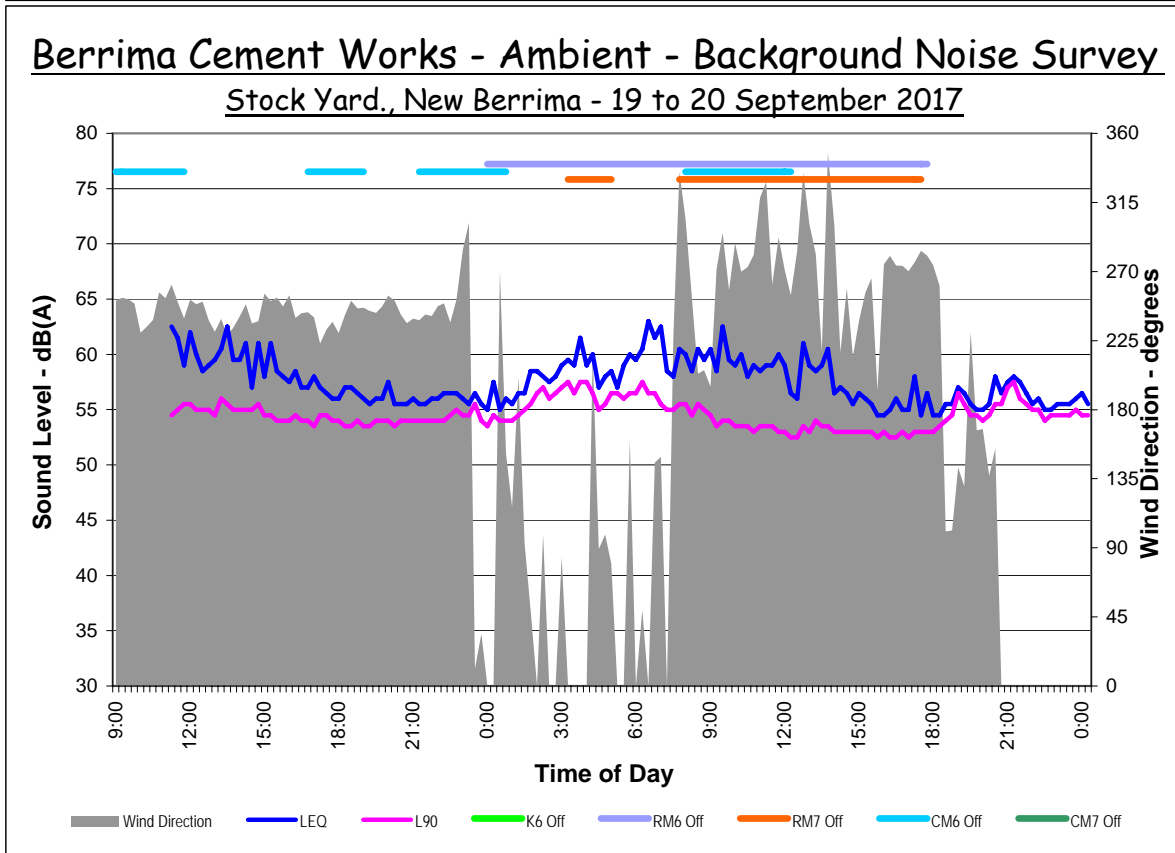
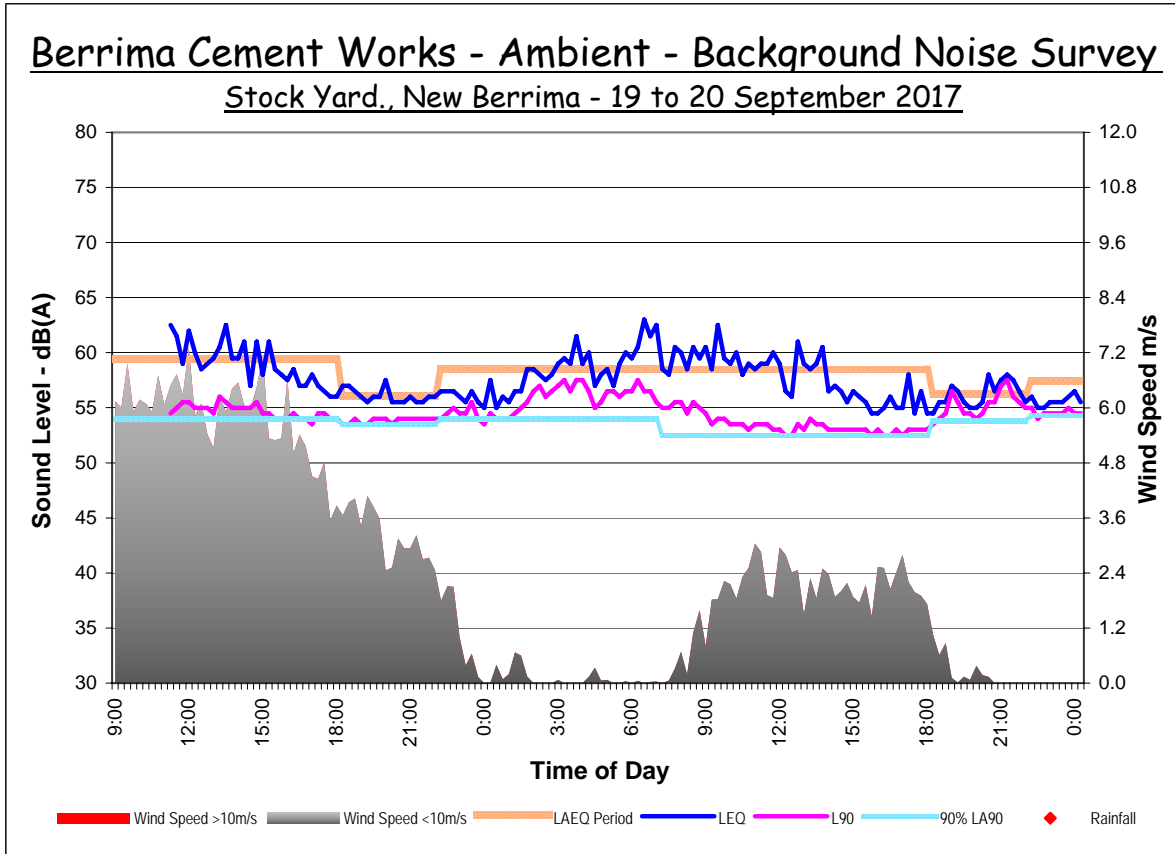
Summary of Statistical Data

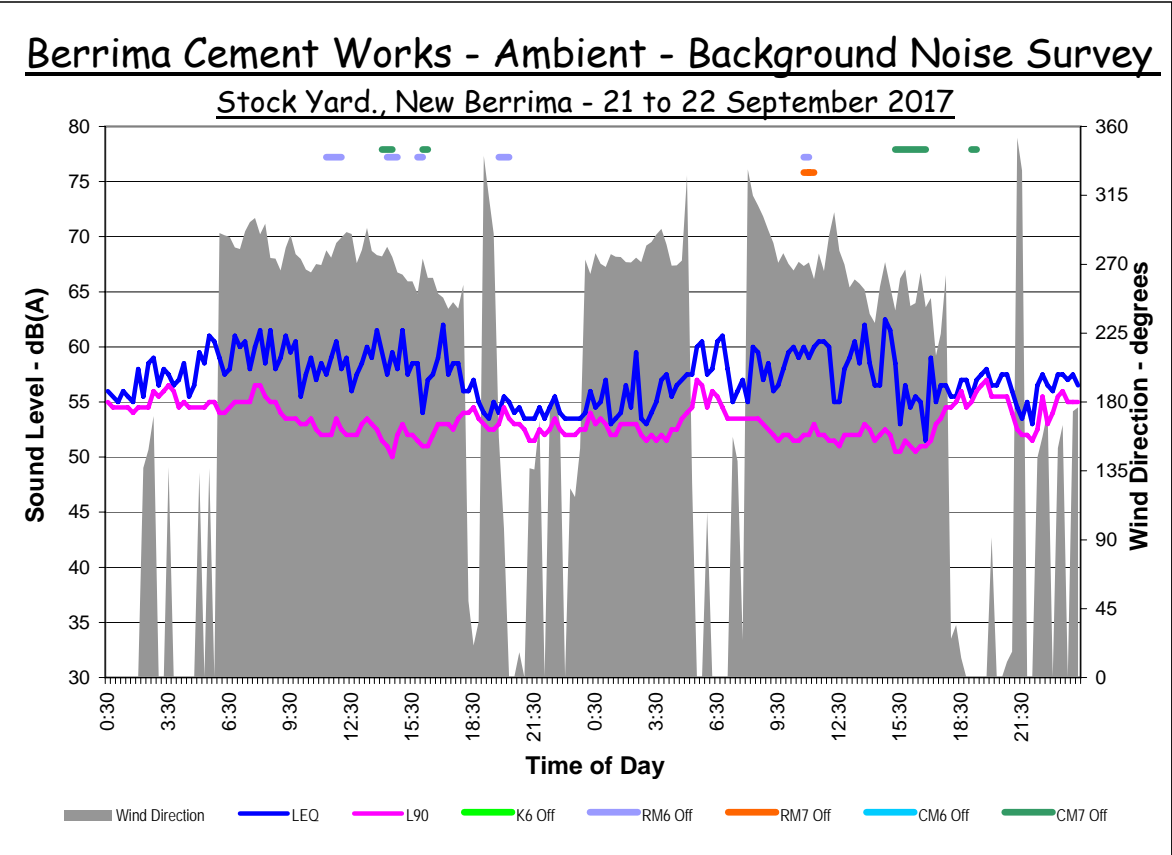
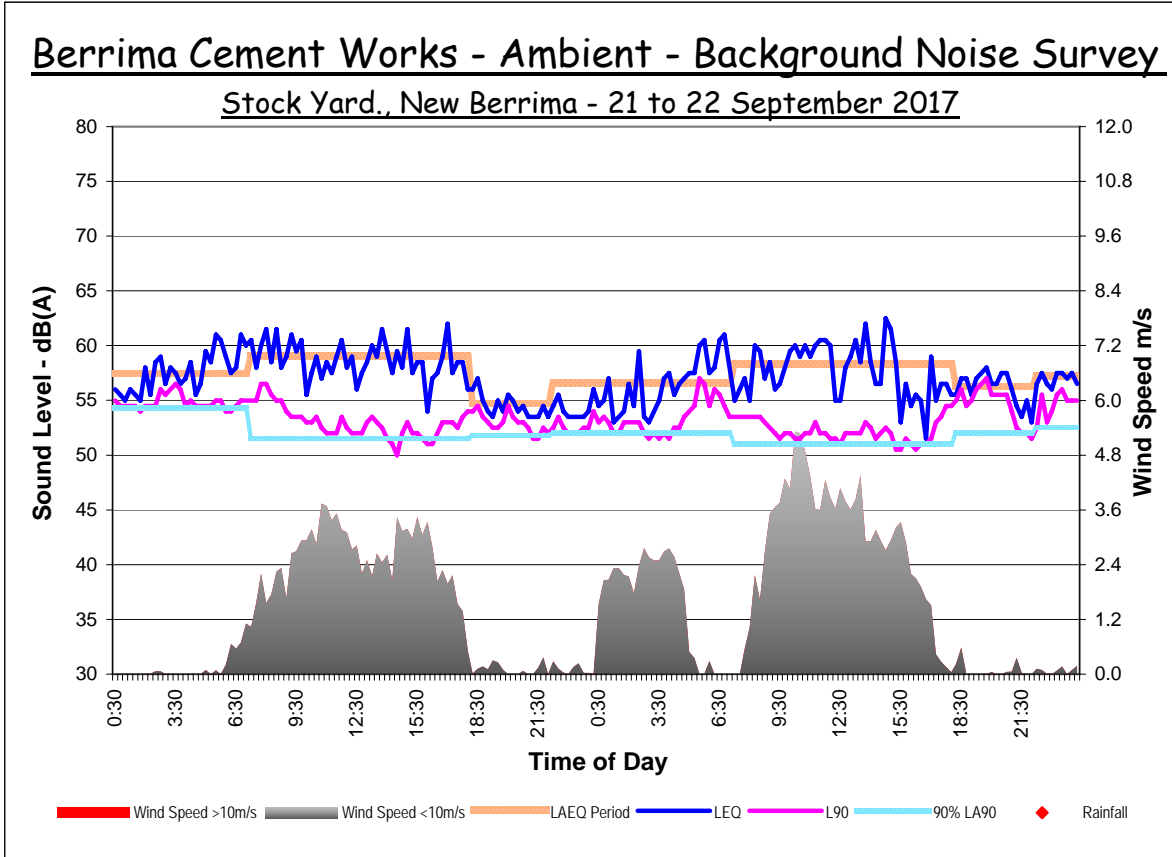
LAEQ.15min	Day			Evening			Night			24 hour		
	Max L _{AEQ.Day}	Min L _{AEQ.Day}	Ave L _{AEQ.Day}	Max L _{AEQ.Eve.}	Min L _{AEQ.Eve.}	Ave L _{AEQ.Eve.}	Max L _{AEQ.Night}	Min L _{AEQ.Night}	Ave L _{AEQ.Night}	Max L _{AEQ.24hr}	Min L _{AEQ.24hr}	Ave. L _{AEQ.24hr}
Stock Yard., New Berrima	62	56	59	57	52	55	59	54	57	63	53	58
Northern Fence	56	48	51	51	44	49	52	46	49	55	46	50
72 Taylor Ave., New Berrima	60	53	58	55	49	54	56	45	53	53	48	50

L90.15-min 10%	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
Stock Yard., New Berrima	54	48	52	52	54	48	52	53	54	49	53	53
Northern Fence	49	41	45	45	48	41	45	45	49	41	45	45
72 Taylor Ave., New Berrima	51	33	43	43	47	38	43	43	46	38	43	44

L90.15-min	Day				Evening				Night			
	Max L _{A90.Day}	Min L _{A90.Day}	Ave L _{A90.Day}	Median L _{A90.Day}	Max L _{A90.Eve.}	Min L _{A90.Eve.}	Ave L _{A90.Eve.}	Median L _{A90.Eve.}	Max L _{A90.Night}	Min L _{A90.Night}	Ave L _{A90.Night}	Median L _{A90.Night}
Stock Yard., New Berrima	55	51	53	54	55	50	53	53	56	50	54	54
Northern Fence	51	44	47	47	49	42	47	47	50	43	47	47
72 Taylor Ave., New Berrima	52	41	46	45	48	39	44	45	47	39	44	44

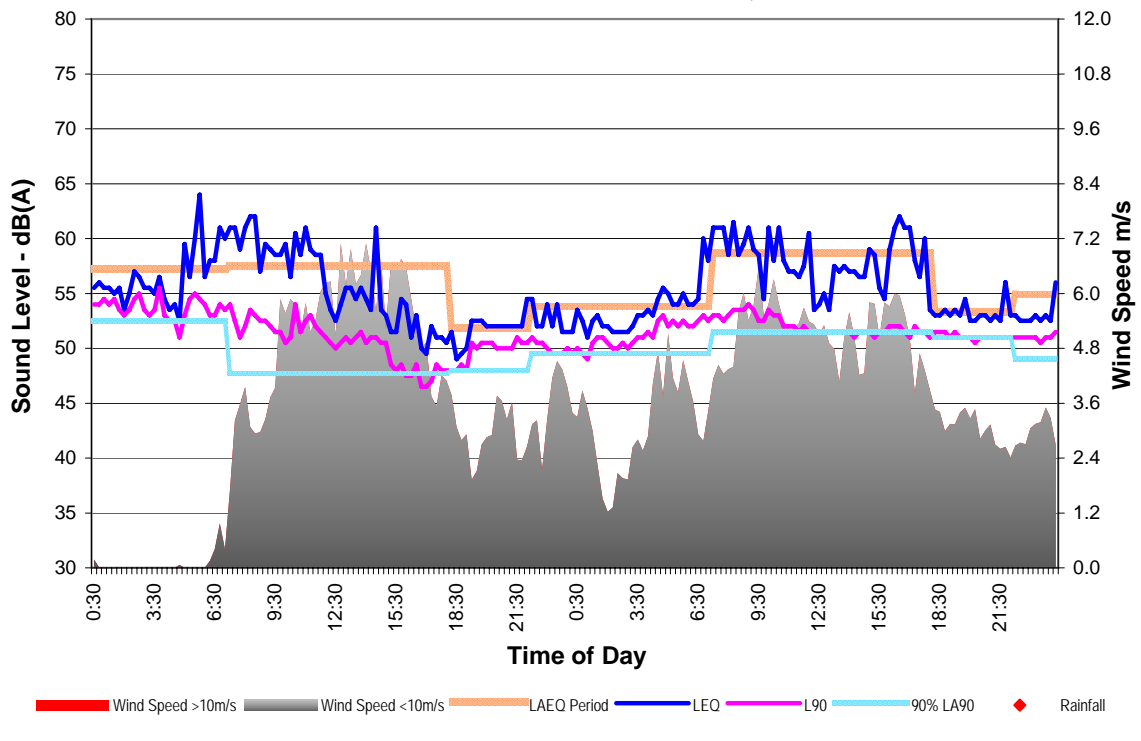
Two Day Results of Ambient Noise Monitoring





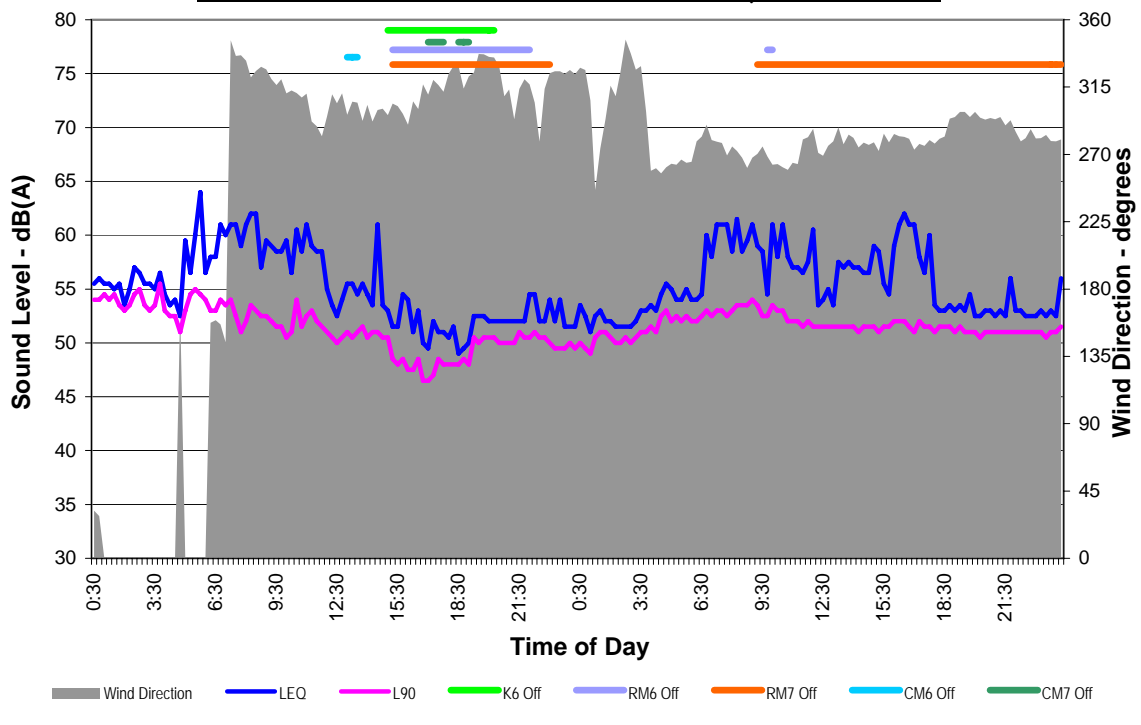
Berrima Cement Works - Ambient - Background Noise Survey

Stock Yard., New Berrima - 23 to 24 September 2017

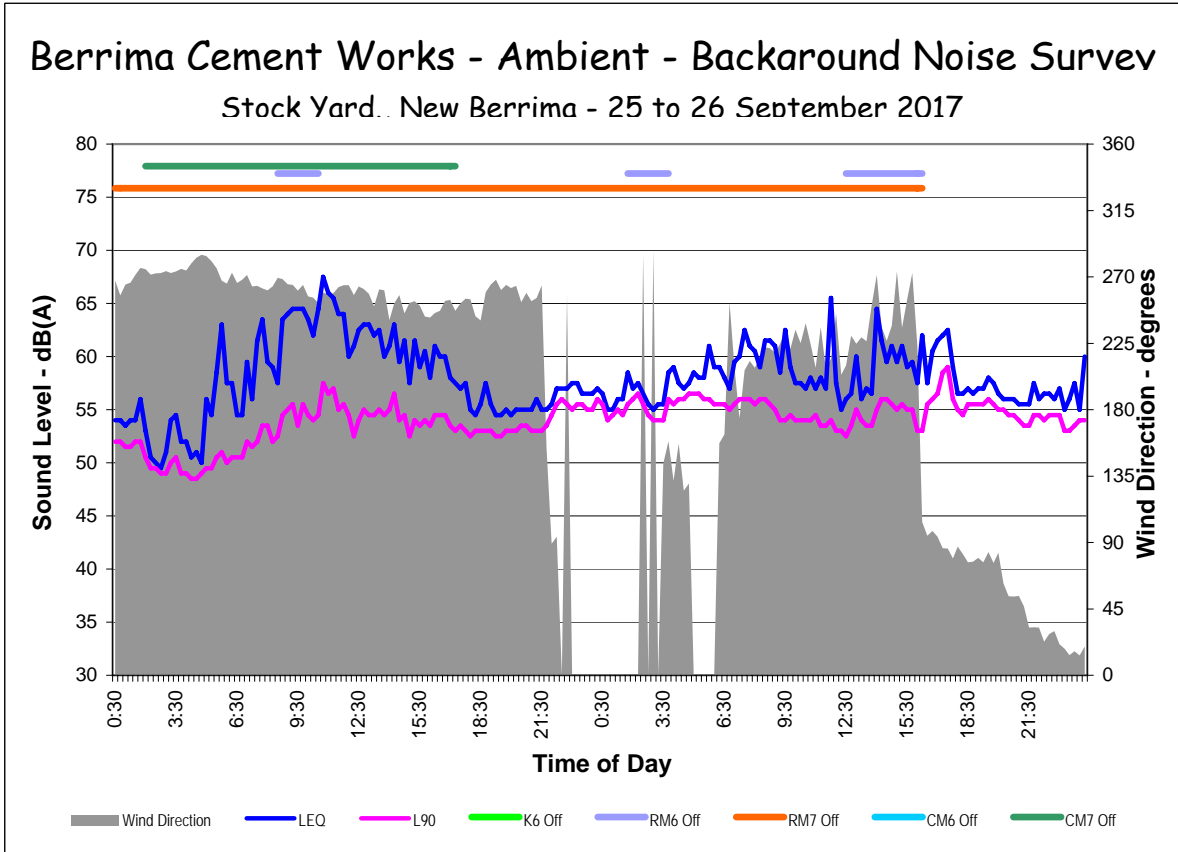
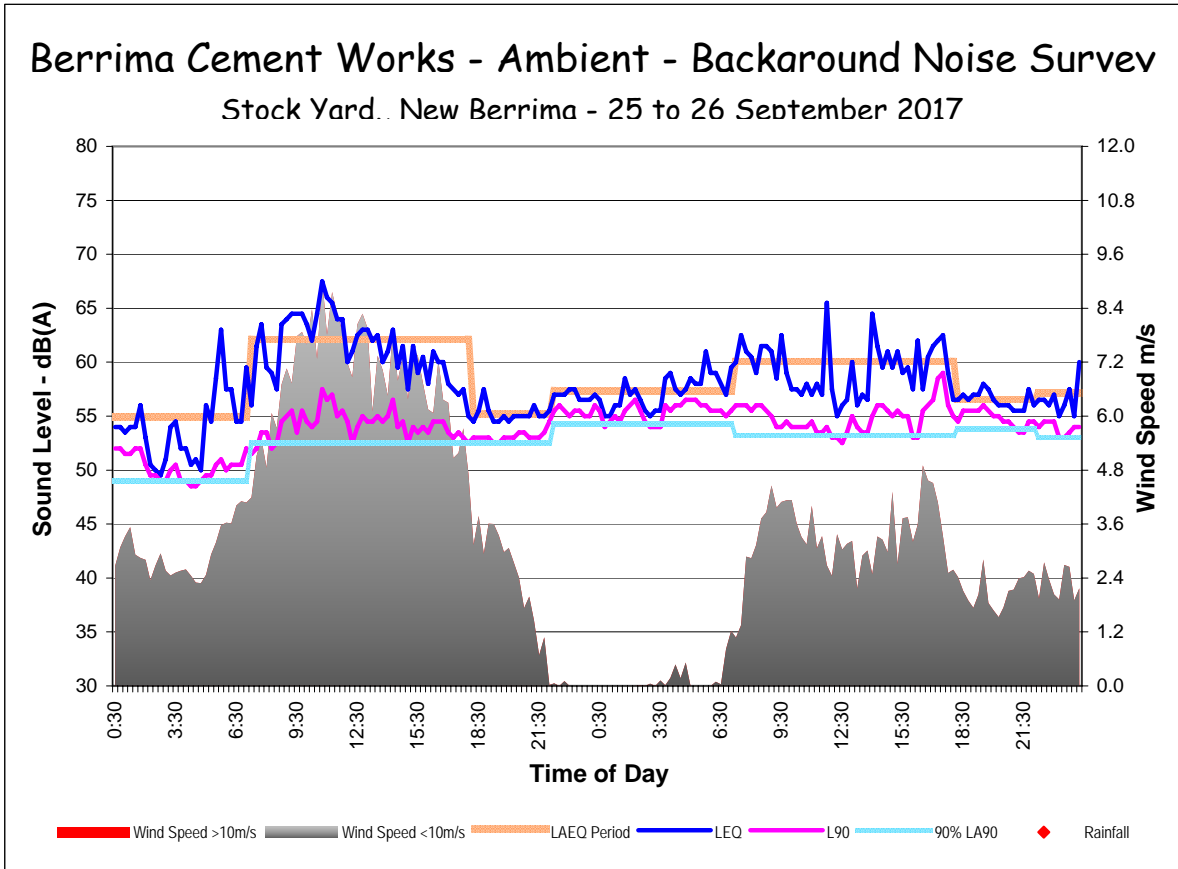


Berrima Cement Works - Ambient - Background Noise Survey

Stock Yard., New Berrima - 23 to 24 September 2017

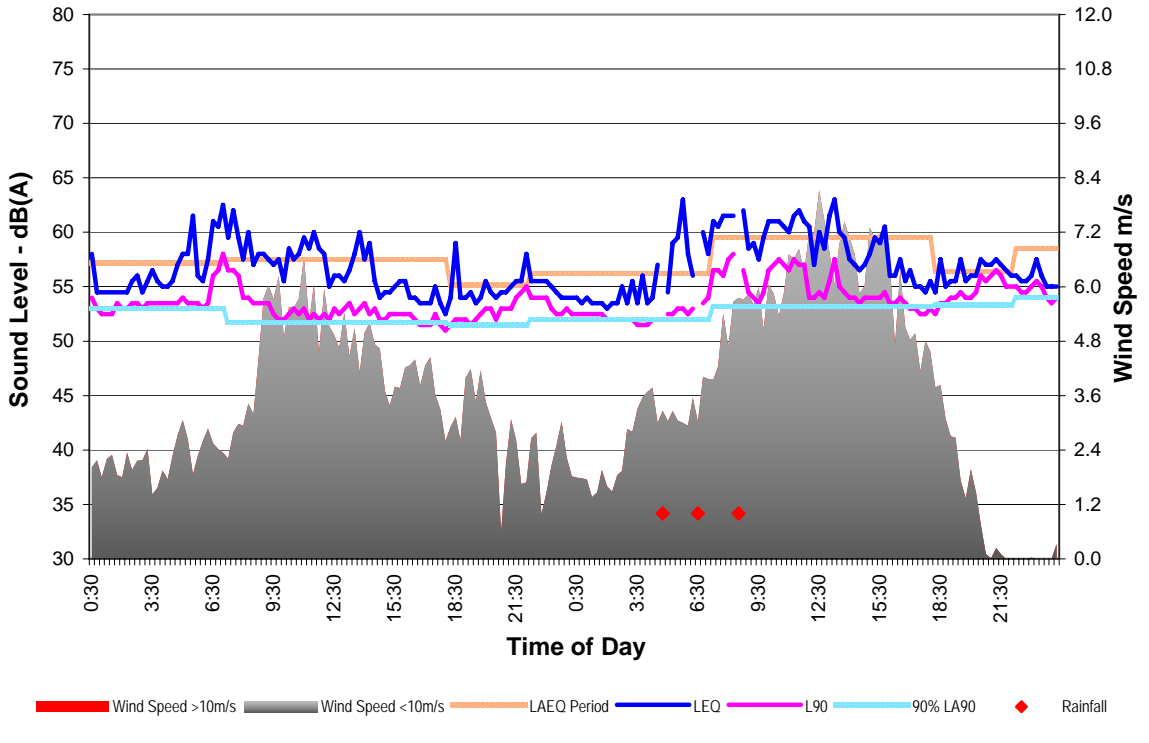


Two Day Results of Ambient Noise Monitoring



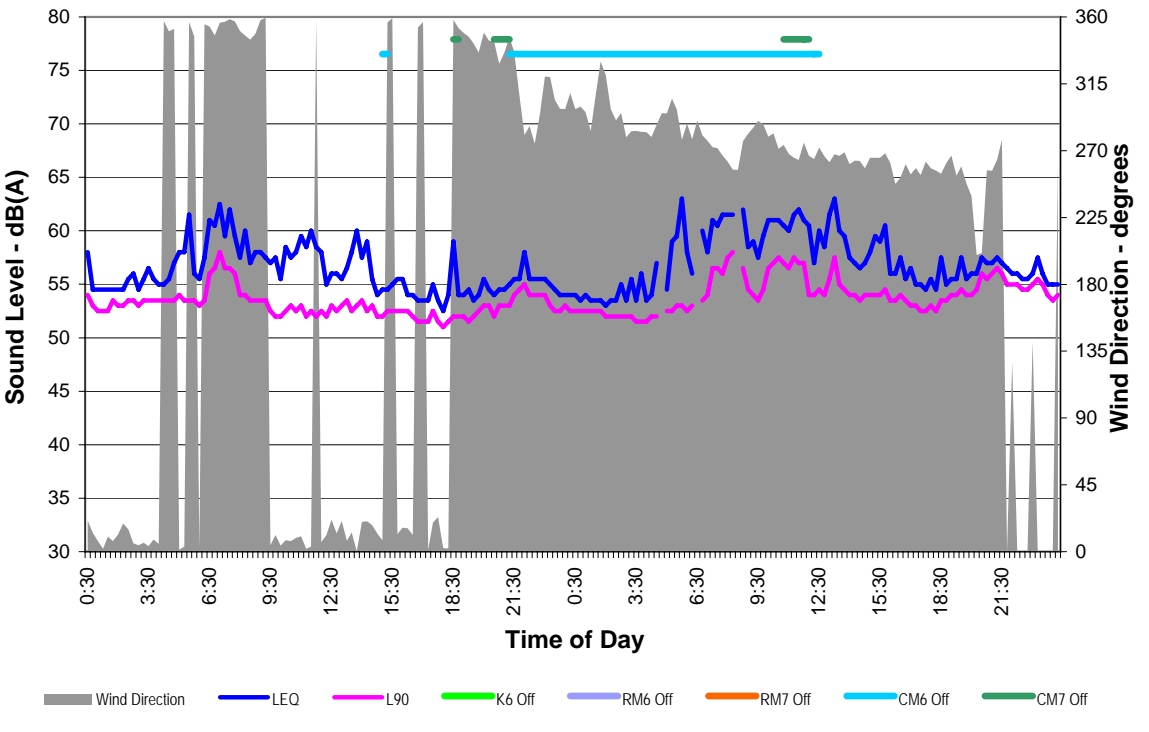
Berrima Cement Works - Ambient - Background Noise Survey

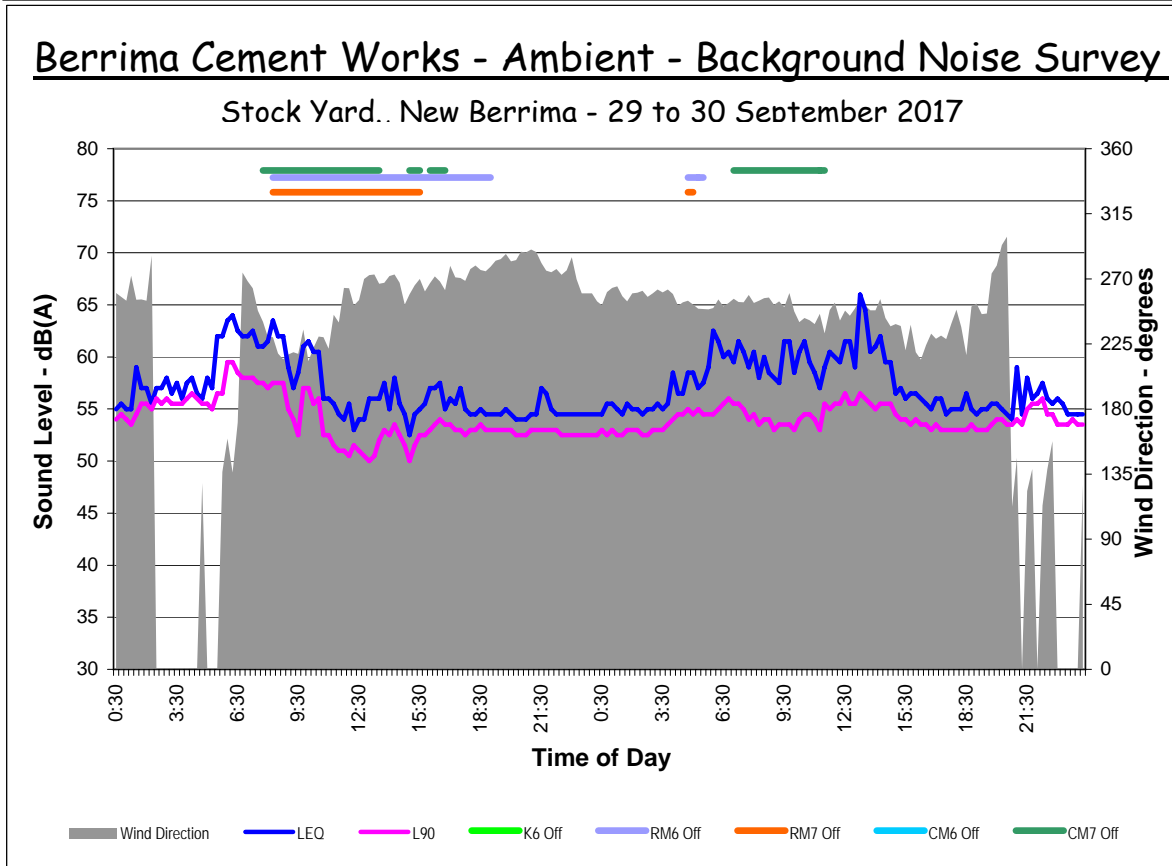
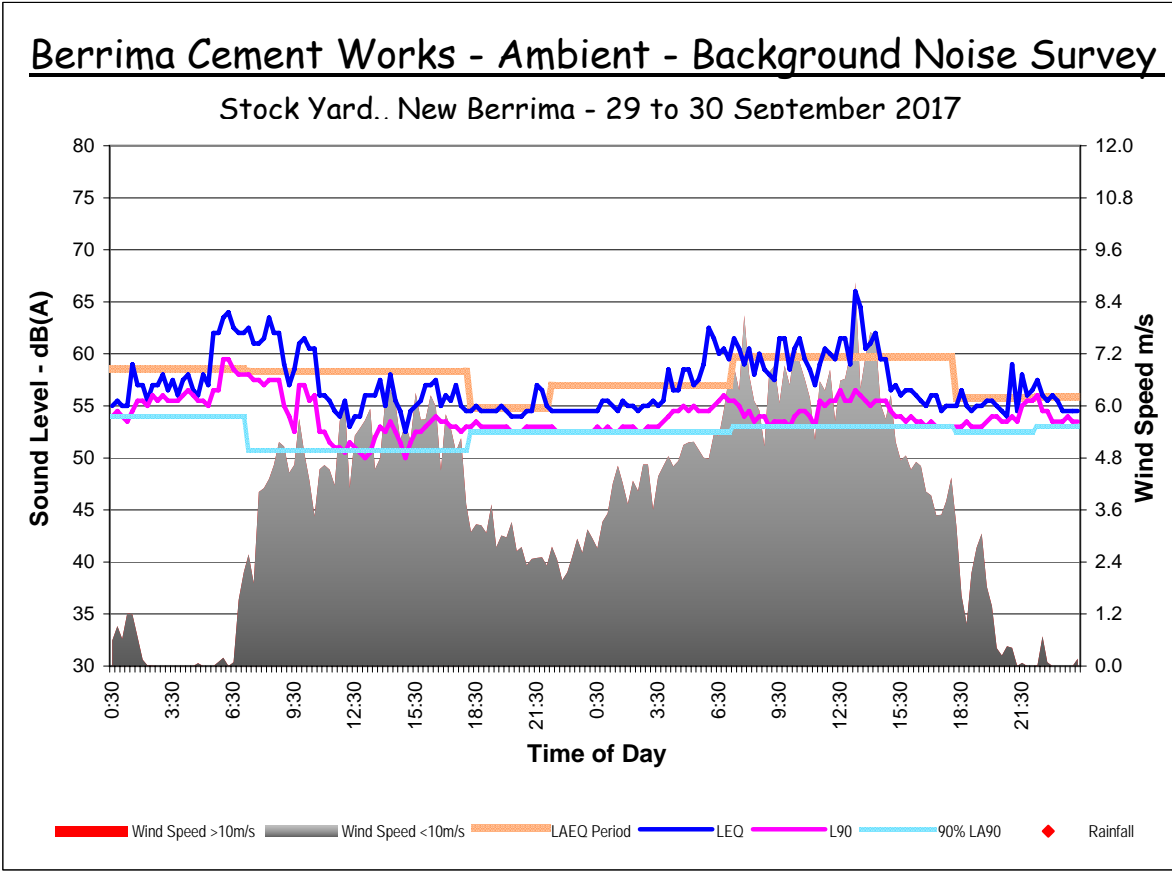
Stock Yard.. New Berrima - 27 to 28 September 2017



Berrima Cement Works - Ambient - Background Noise Survey

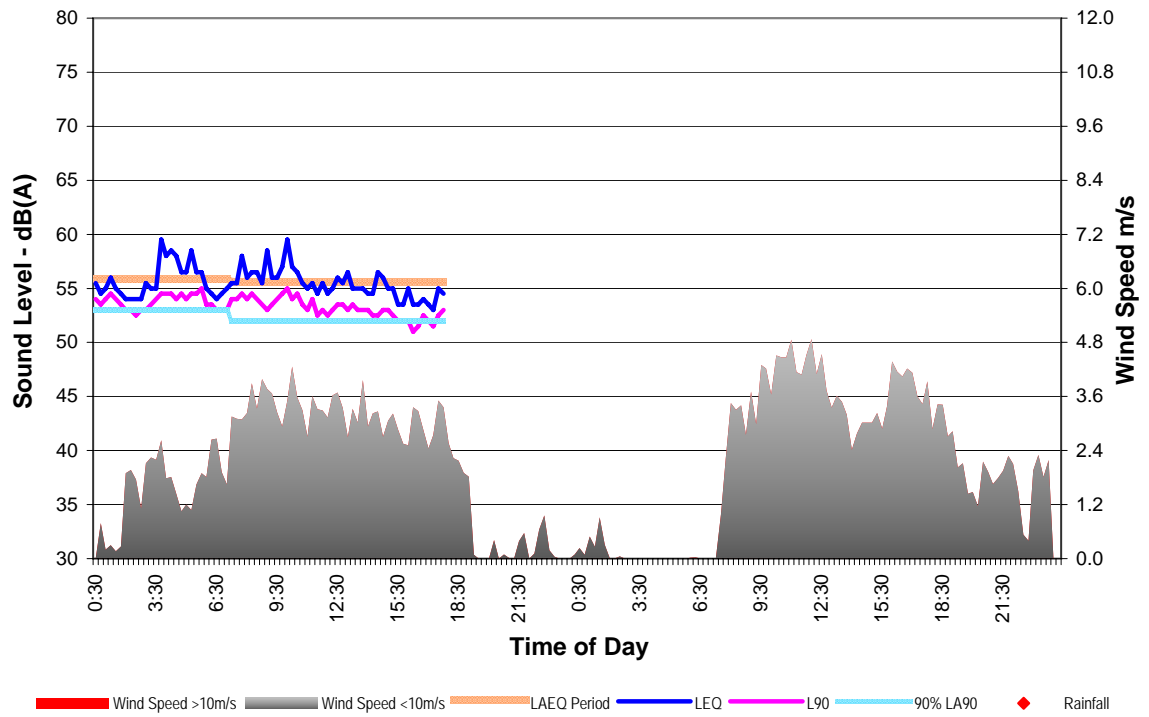
Stock Yard.. New Berrima - 27 to 28 September 2017





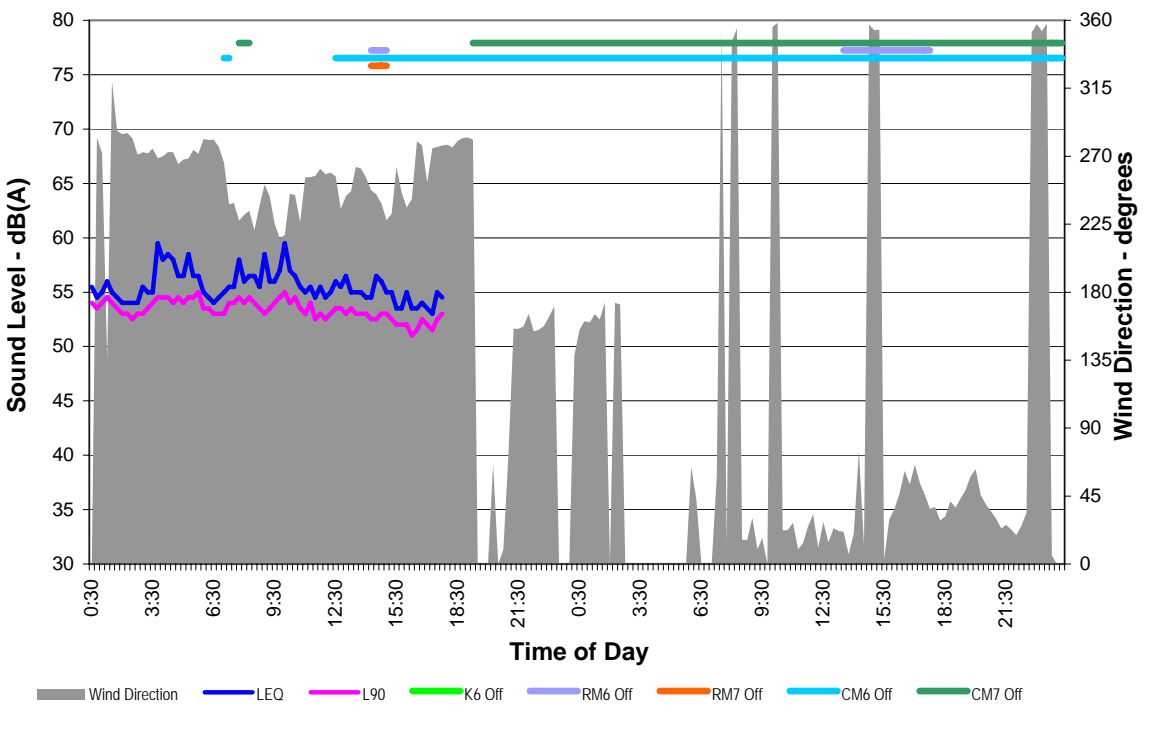
Berrima Cement Works - Ambient - Background Noise Survey

Stock Yard., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

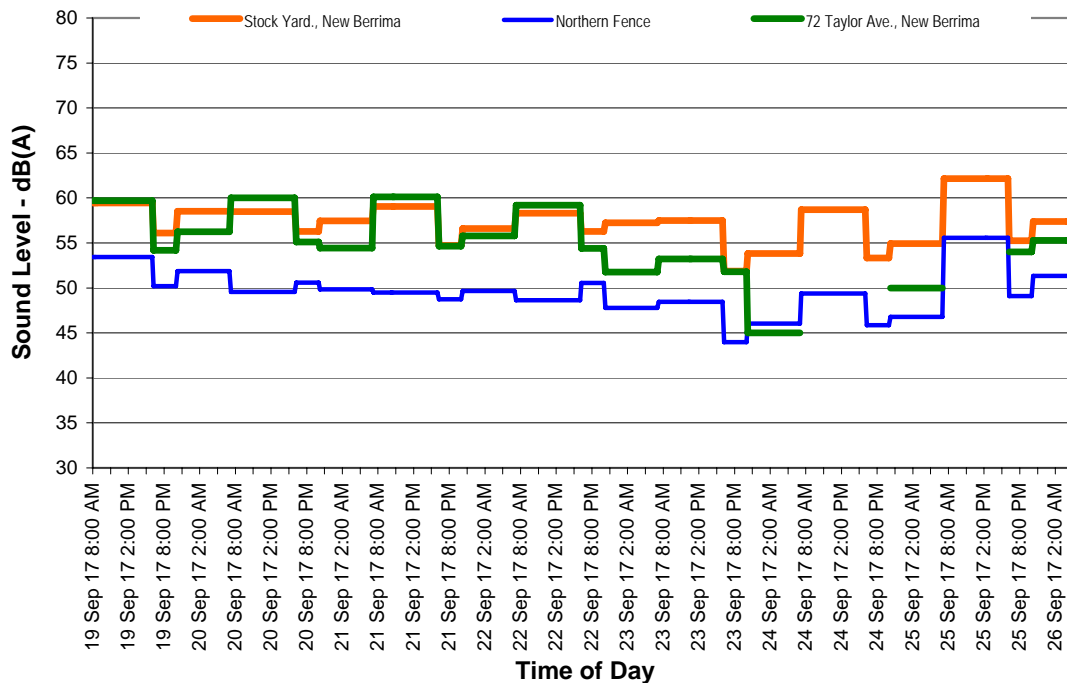
Stock Yard., New Berrima - 1 to 2 October 2017



Berrima Cement Works - Ambient - Background Noise Survey

Stock Yard., New Berrima - 19 to 25 September 2017

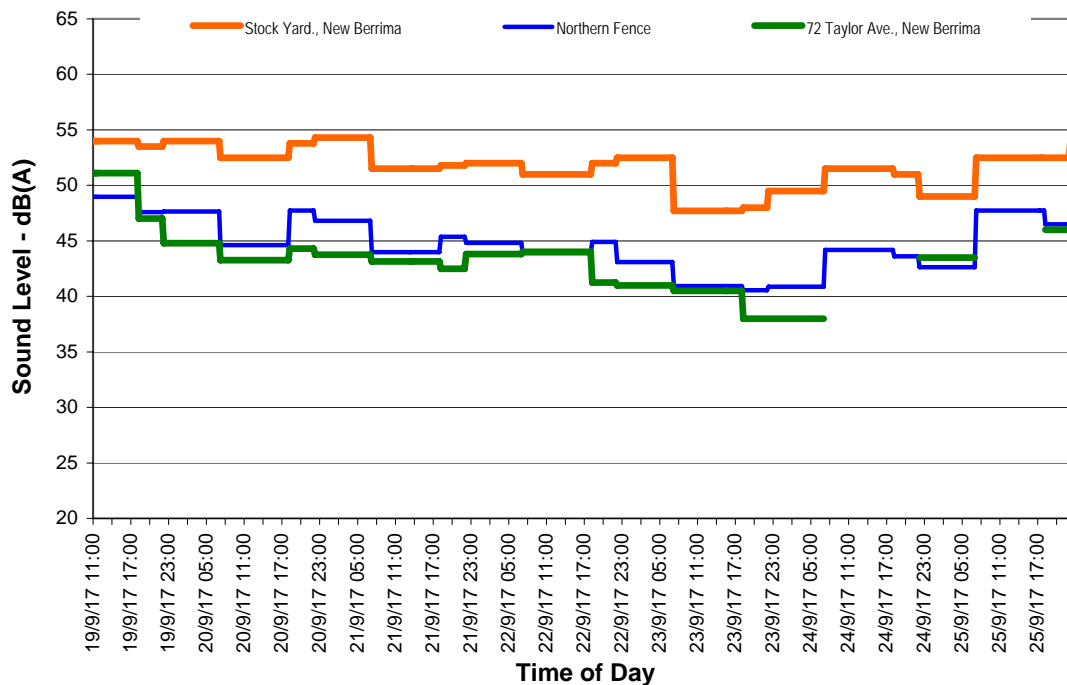
Comparison of period L_{Aeq}

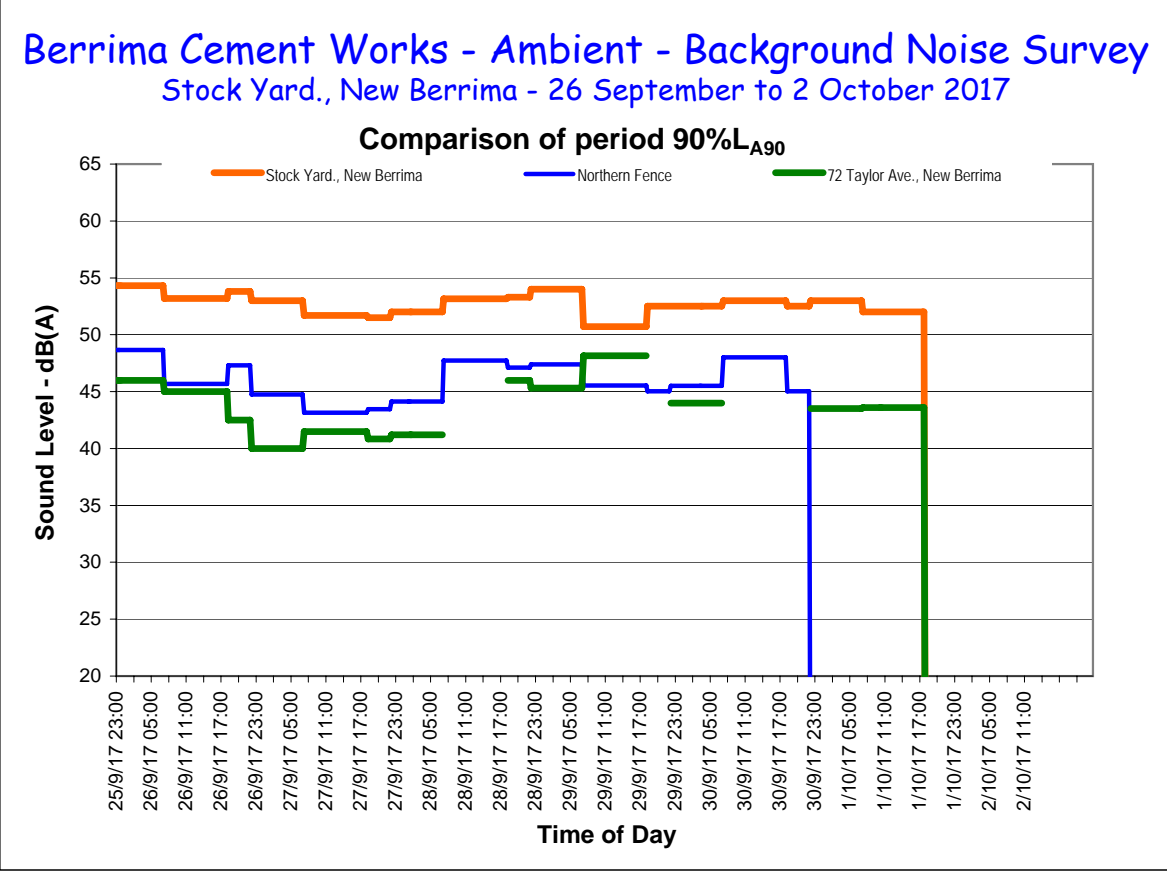
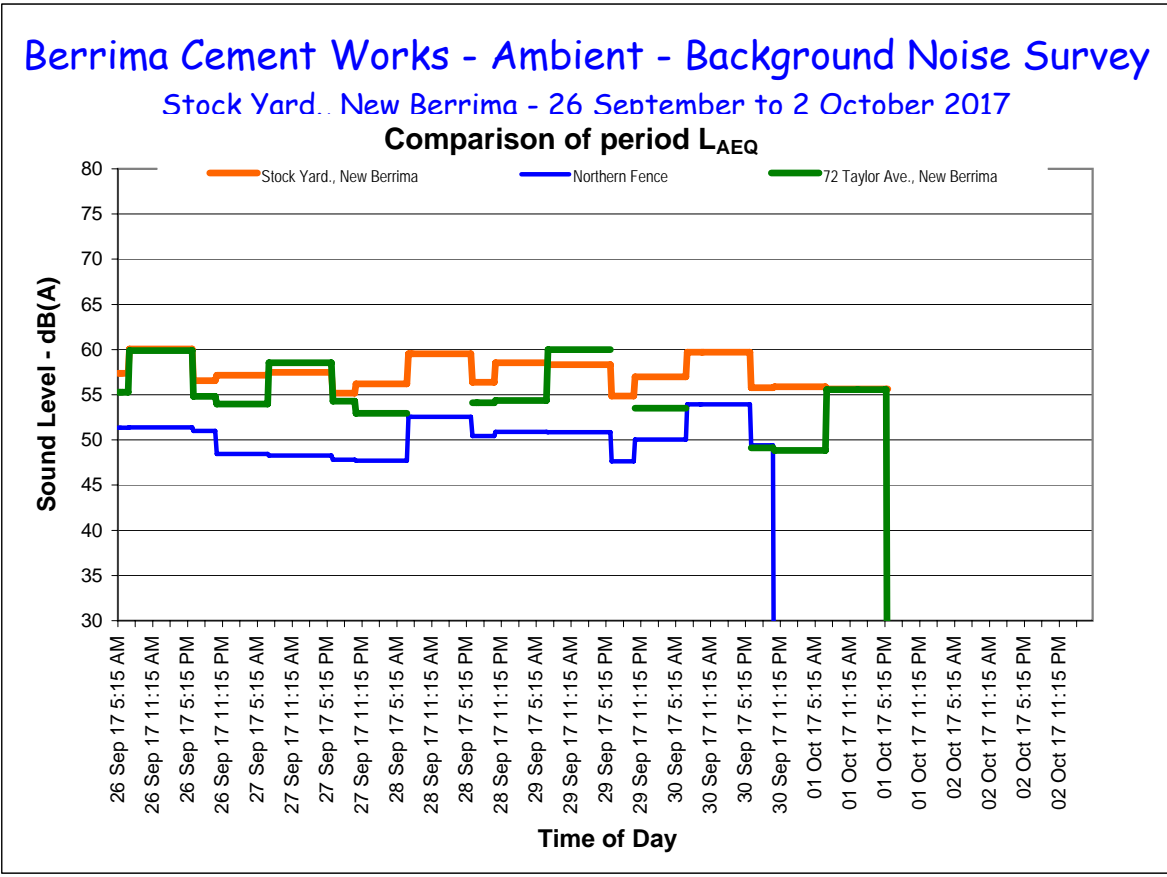


Berrima Cement Works - Ambient - Background Noise Survey

Stock Yard., New Berrima - 19 to 25 September 2017

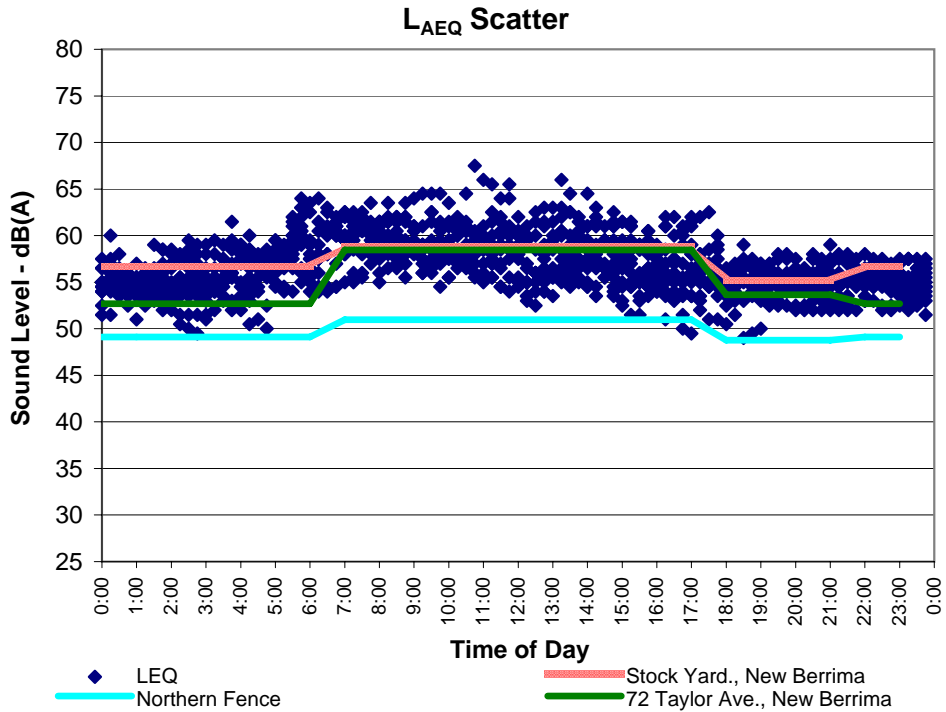
Comparison of period $90\%L_{A90}$





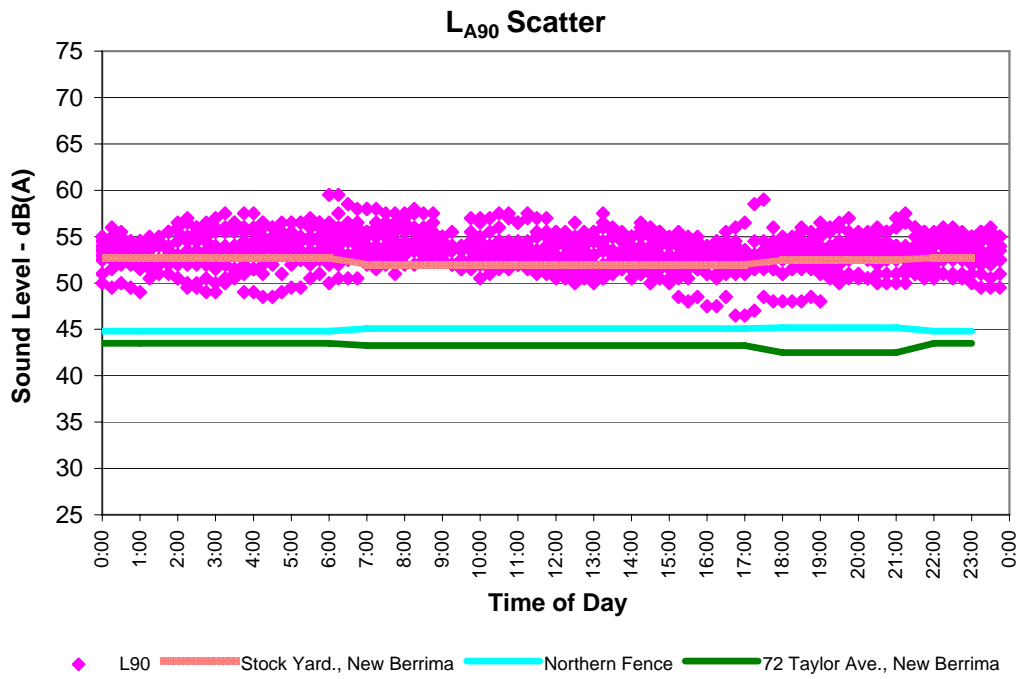
Berrima Cement Works - Ambient - Background Noise

Stock Yard., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

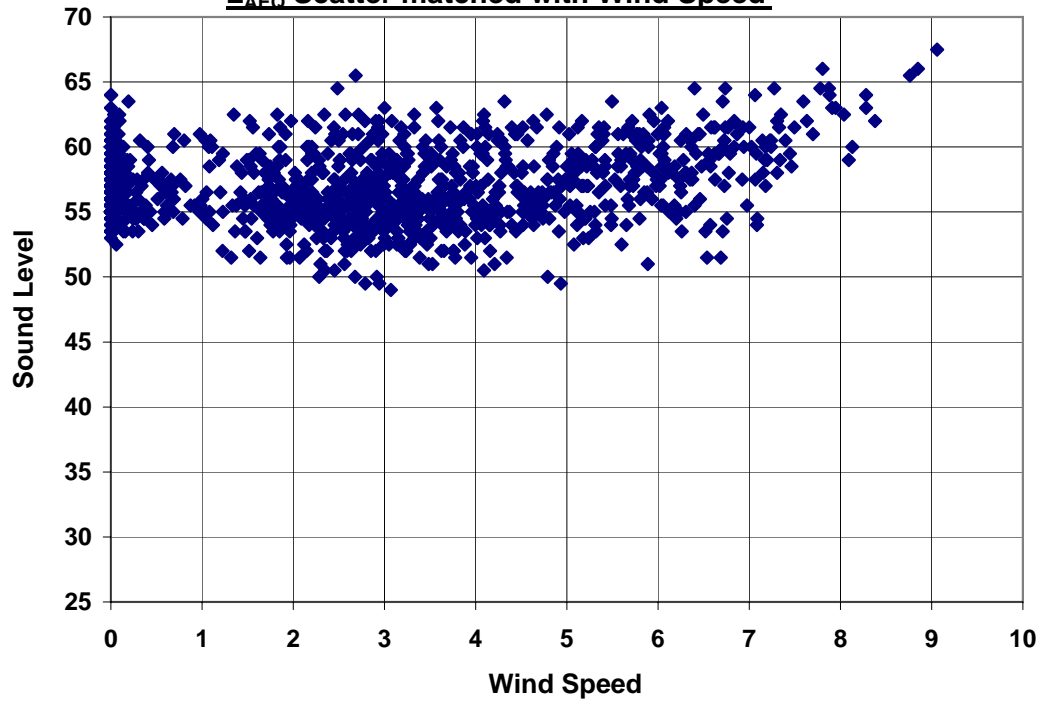
Stock Yard., New Berrima - 19 September to 1 October 2017



Berrima Cement Works - Ambient - Background Noise

Stock Yard., New Berrima - 19 September to 1 October 2017

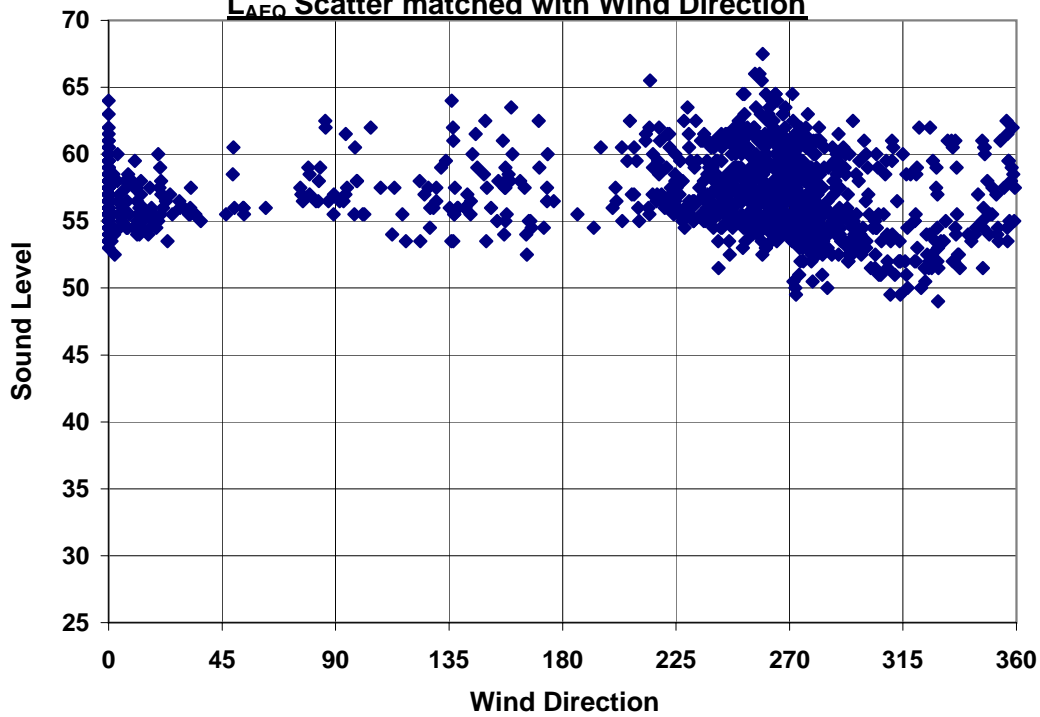
L_{AEQ} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

Stock Yard., New Berrima - 19 September to 1 October 2017

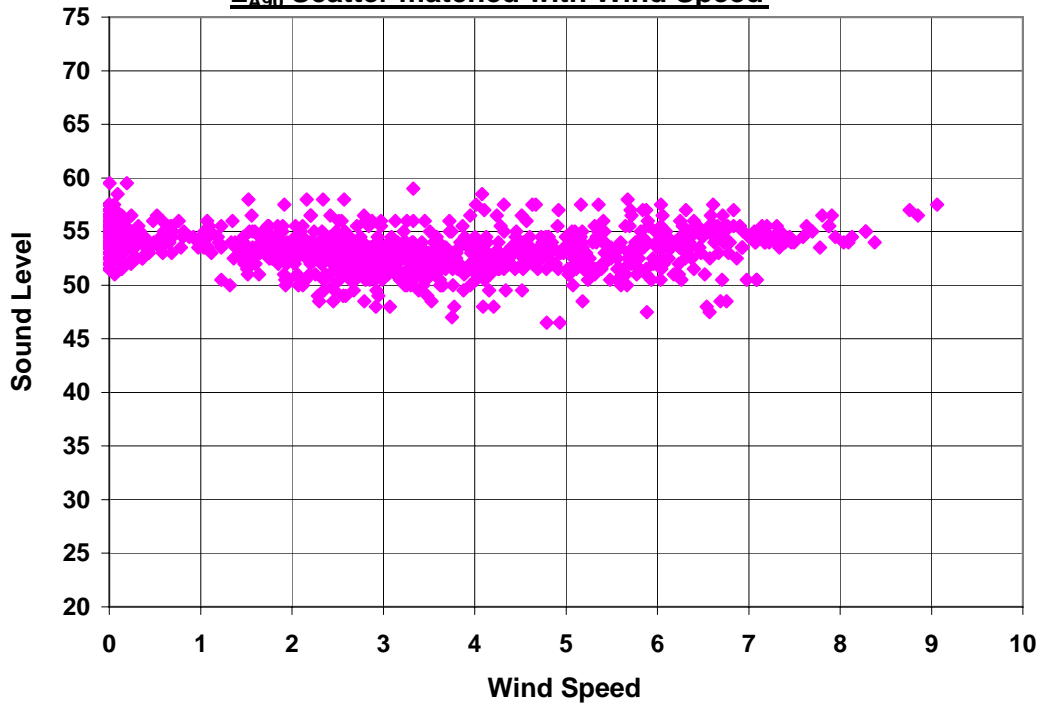
L_{AEQ} Scatter matched with Wind Direction



Berrima Cement Works - Ambient - Background Noise

Stock Yard., New Berrima - 19 September to 1 October 2017

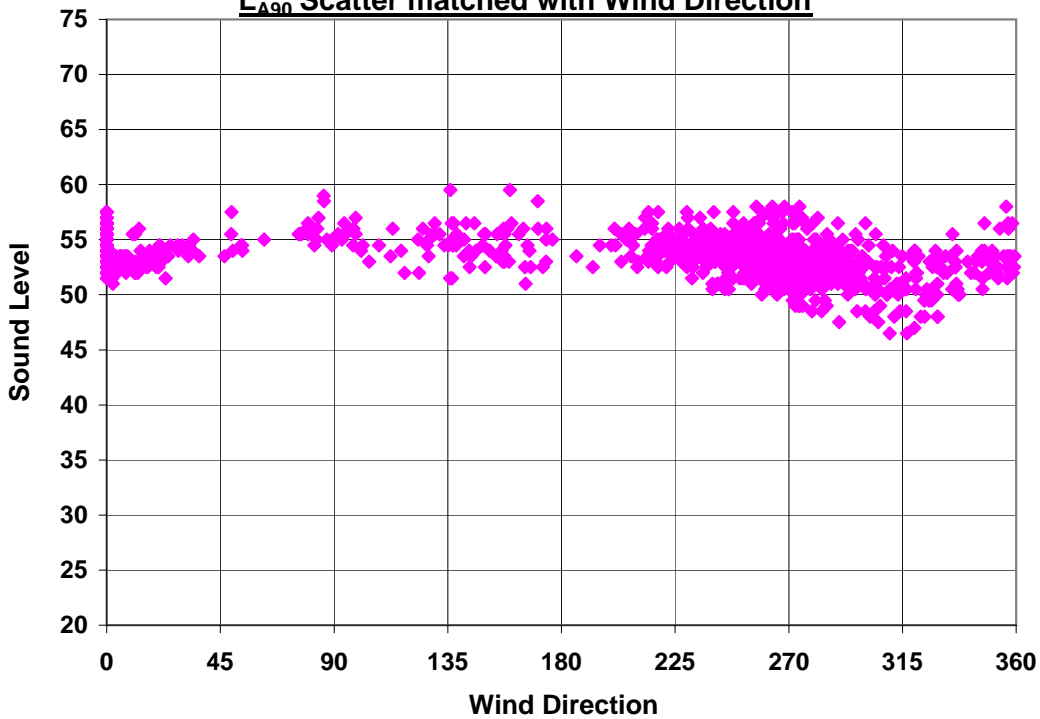
L_{A90} Scatter matched with Wind Speed



Berrima Cement Works - Ambient - Background Noise

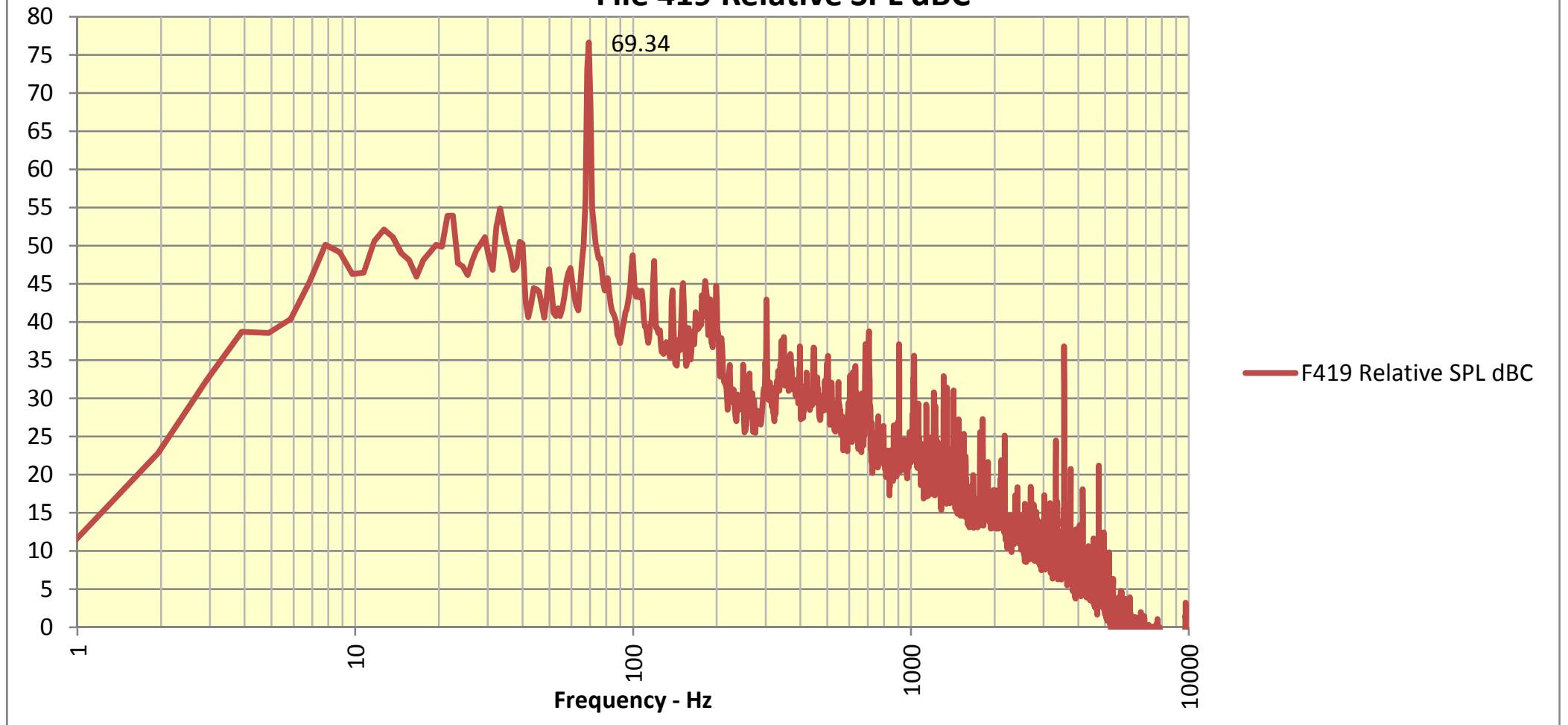
Stock Yard., New Berrima - 19 September to 1 October 2017

L_{A90} Scatter matched with Wind Direction

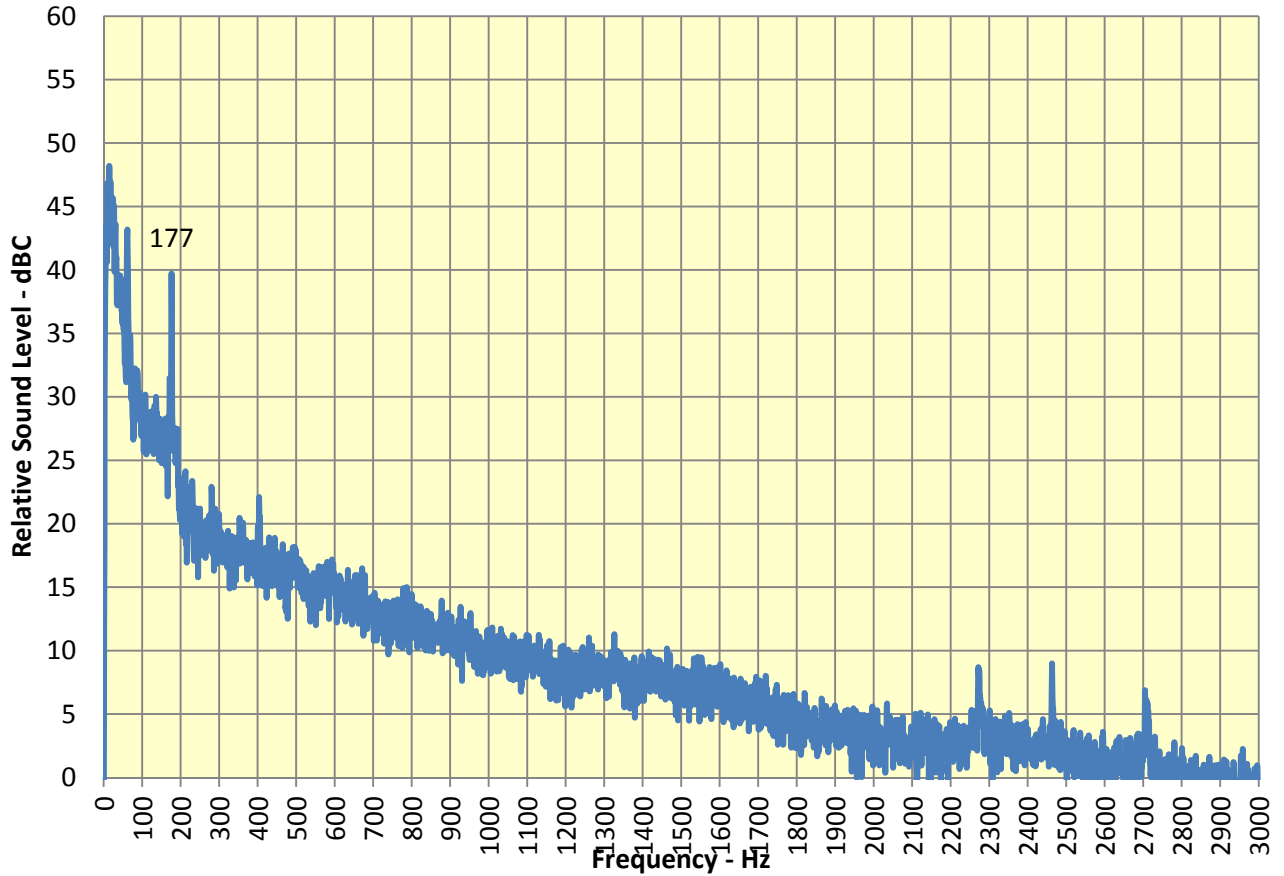


Appendix G: Narrow-band spectra from attended measurement recordings

Figure 3.5: Boral Cement Berrima PHT Sound level - Spectra for FA063
File 419 Relative SPL dBC



**Figure 4.62: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 19/9/17 11:13am F677**



**Figure 4.62A: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 19/9/17 11:13am F677**

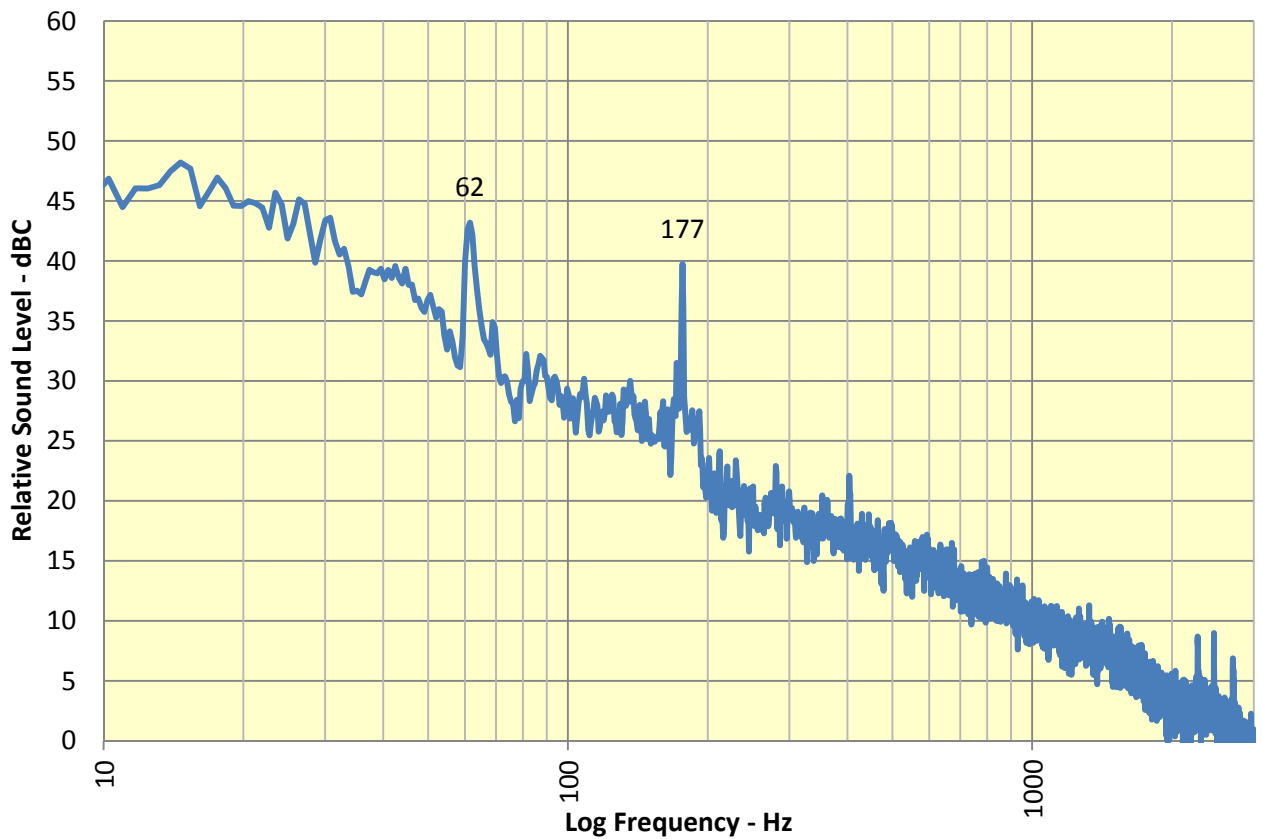


Figure 4.63: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 19/9/17 18:43pm F679

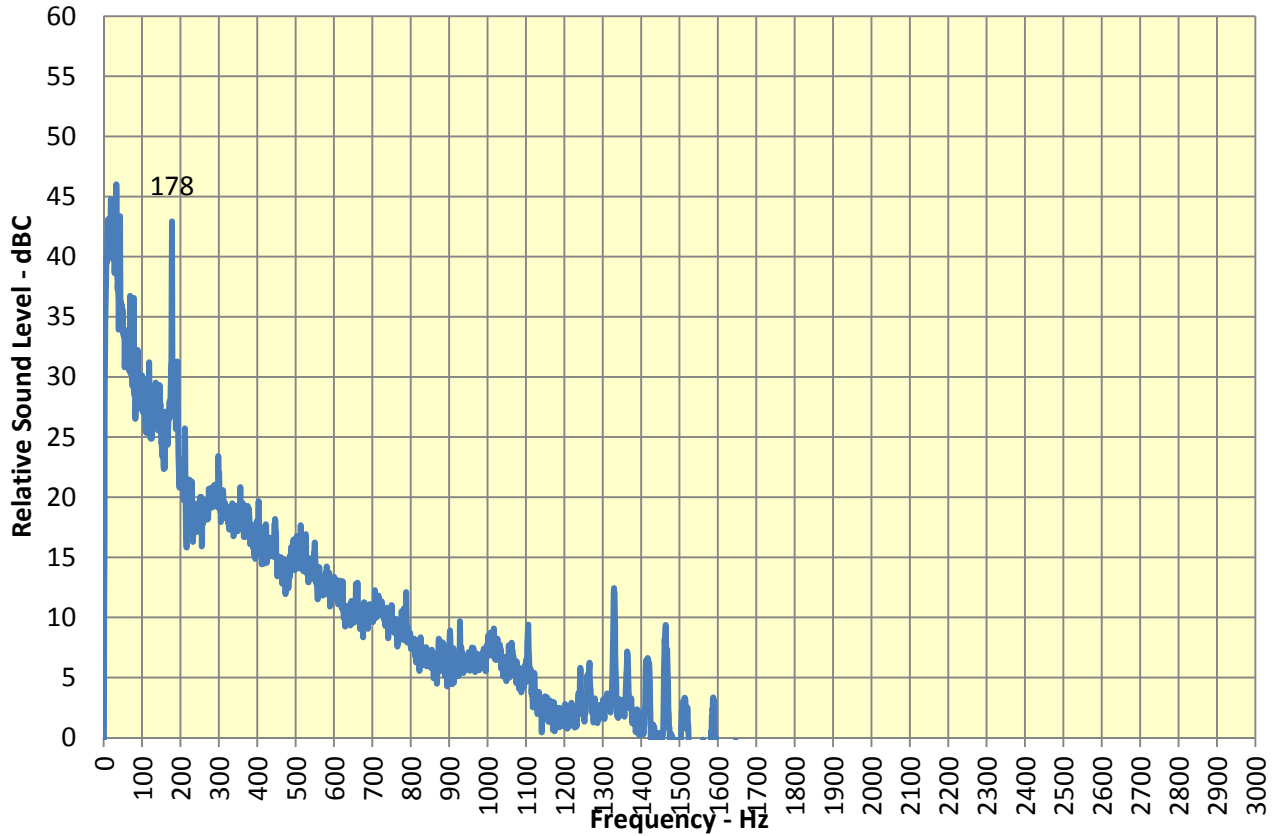
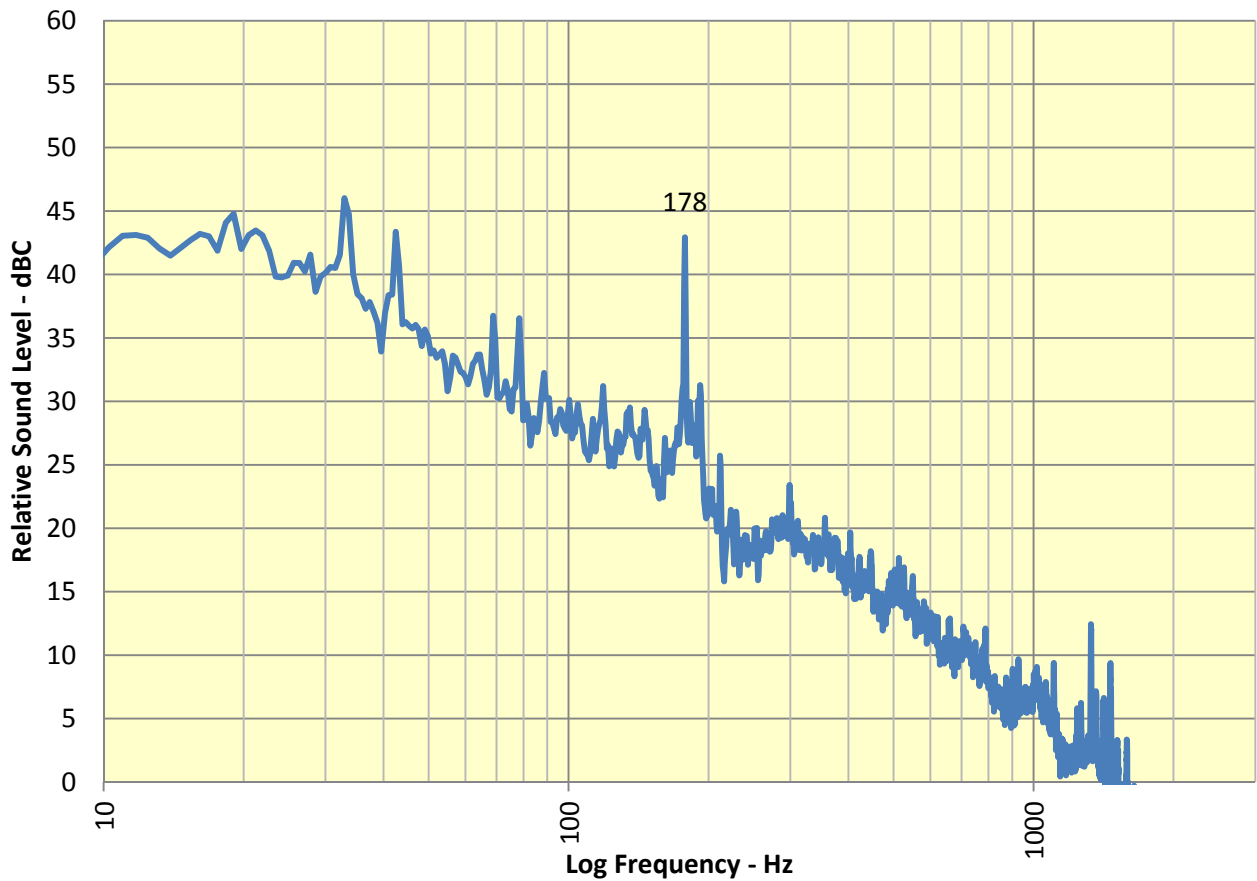
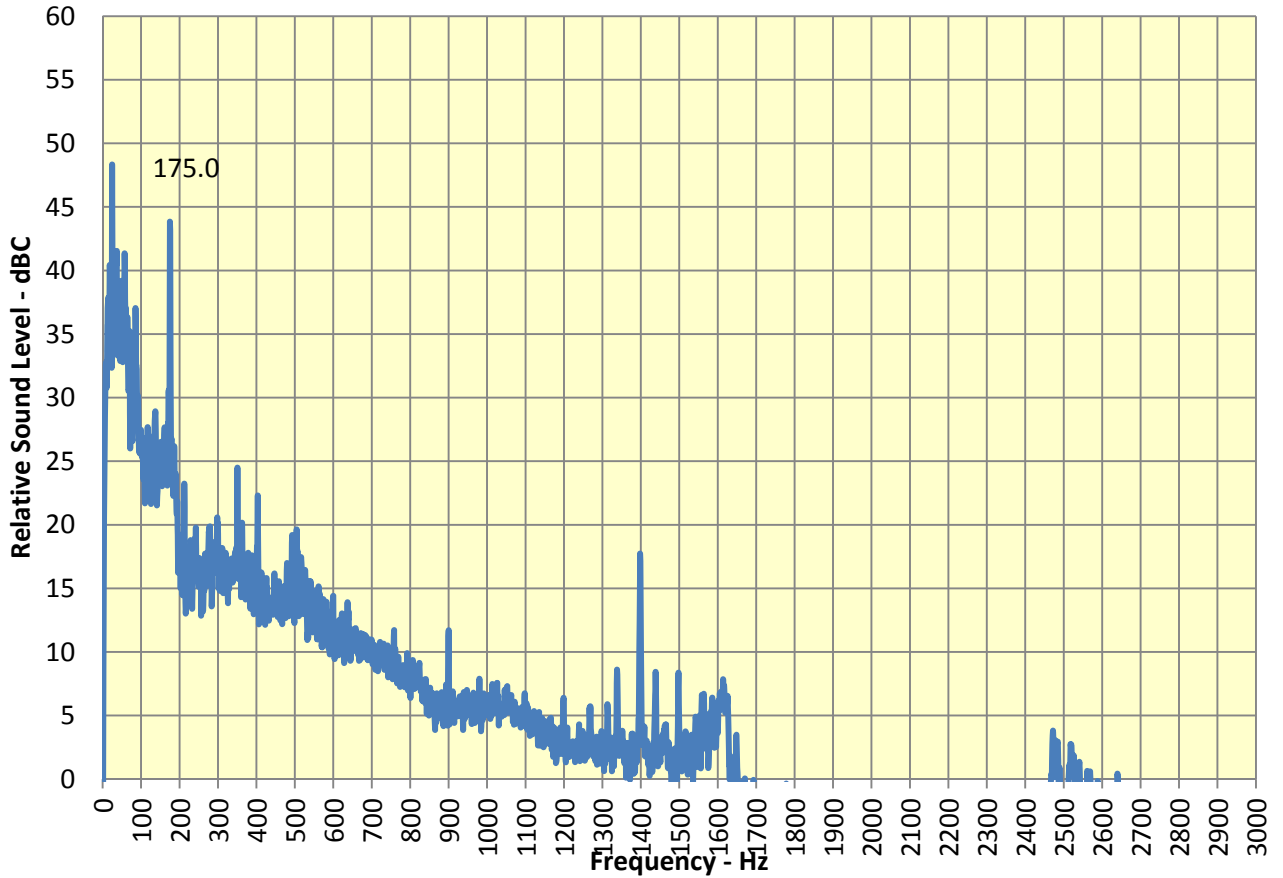


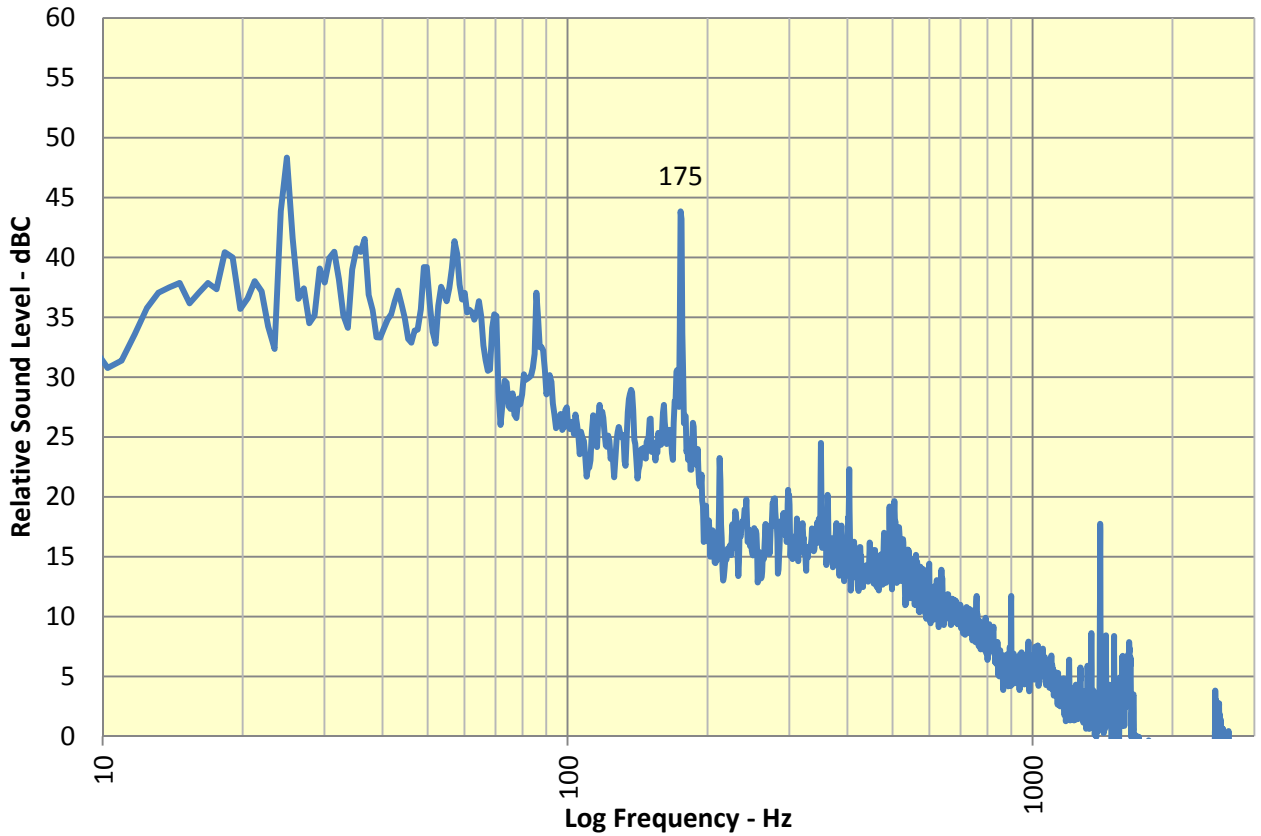
Figure 4.63A: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 19/9/17 18:43pm F679



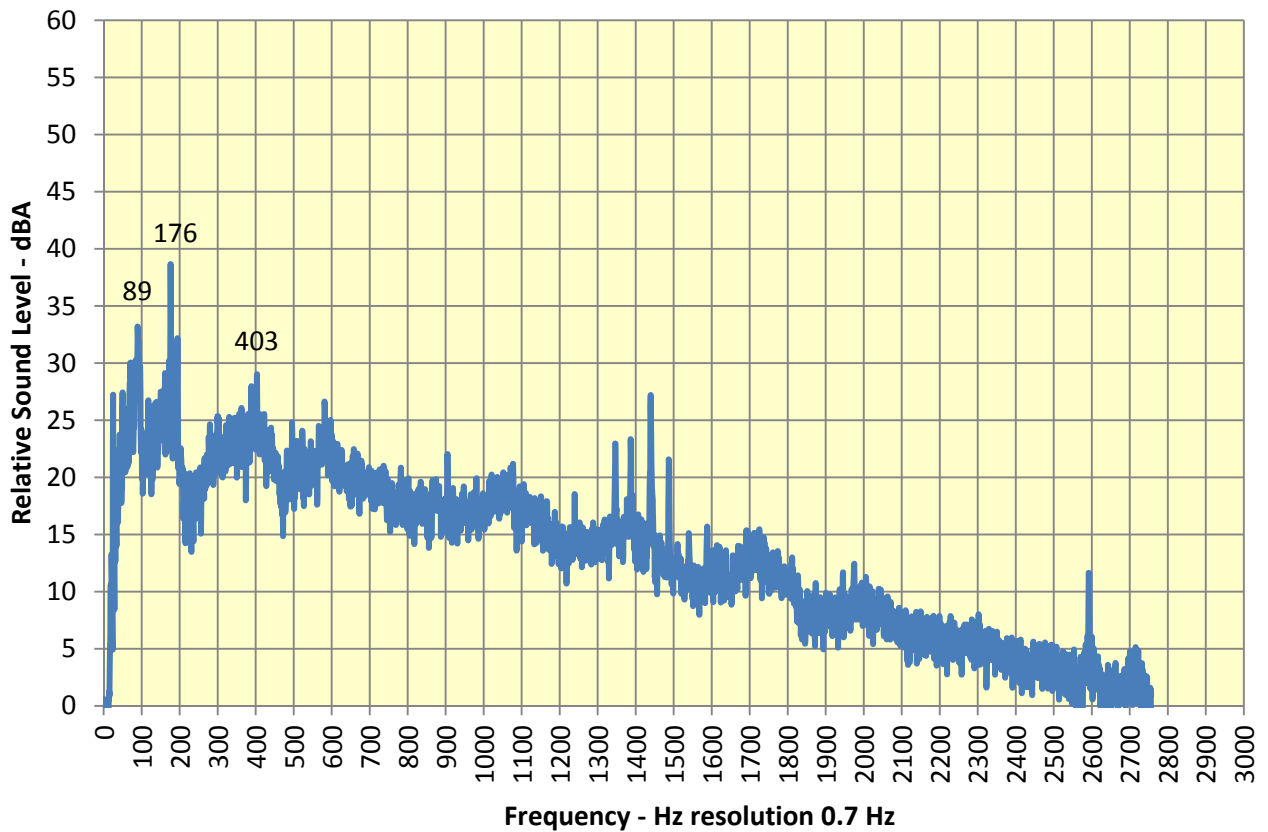
**Figure 4.64: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 6/10/17 8:46am F683**



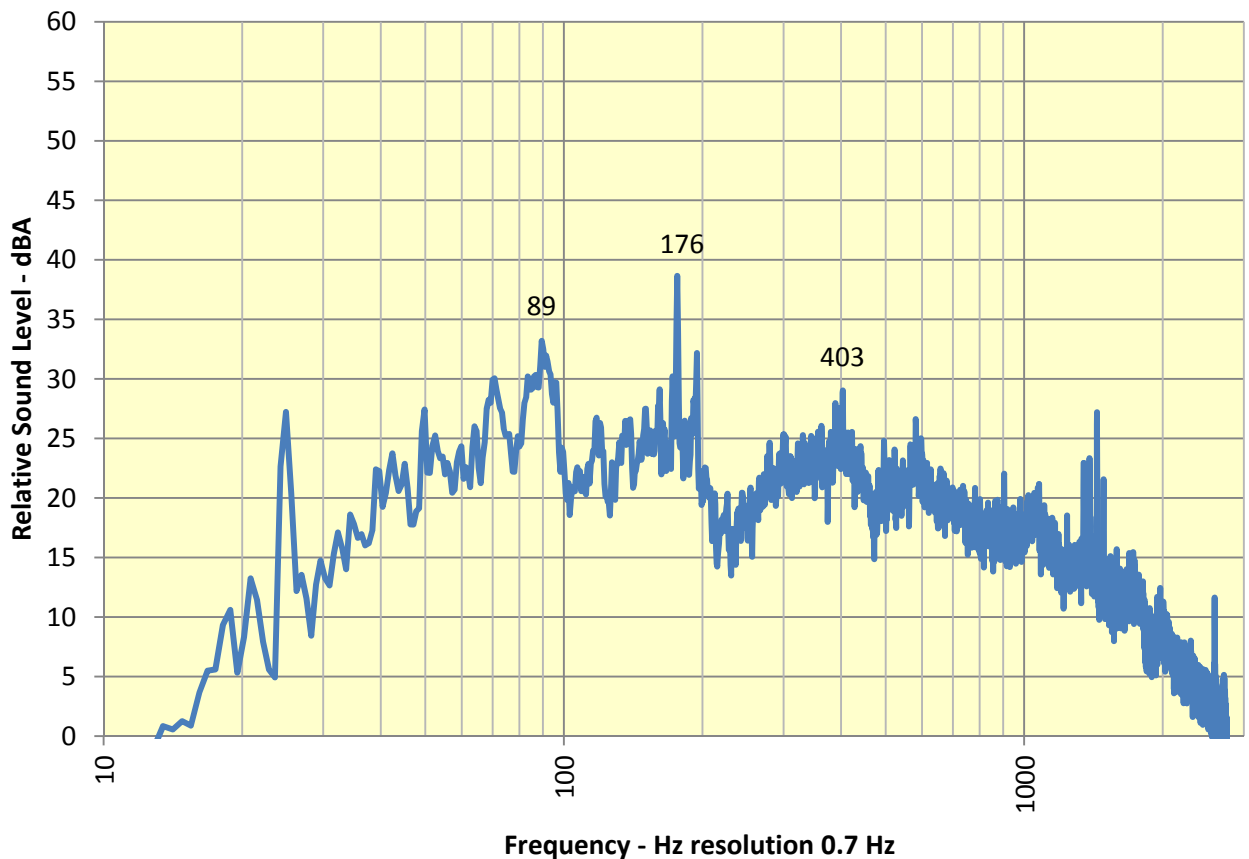
**Figure 4.64A: Boral Cement Berrima Narrow band frequency analysis
4 Melbourne St 6/10/17 8:46am F683**



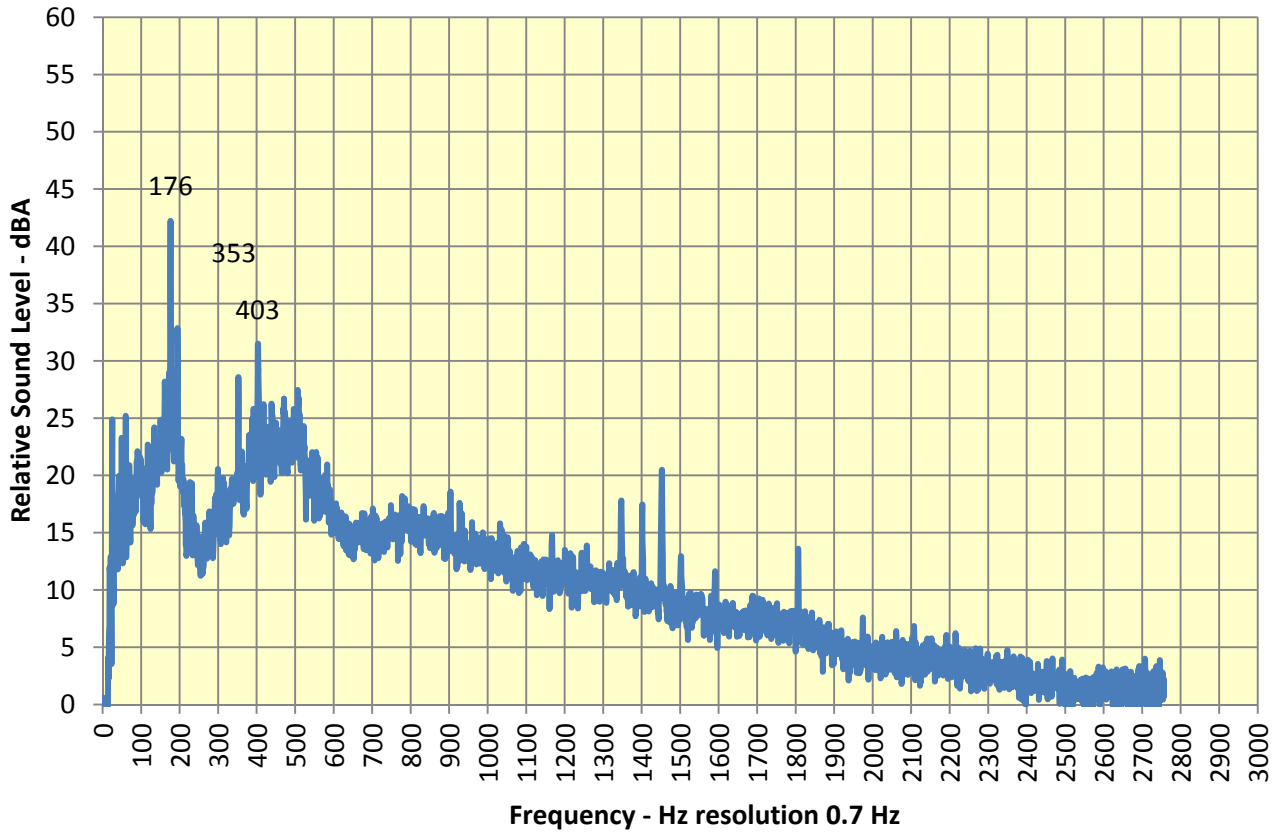
**Figure 4.65: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 4 Melbourne St 16/10/17 9:25pm**



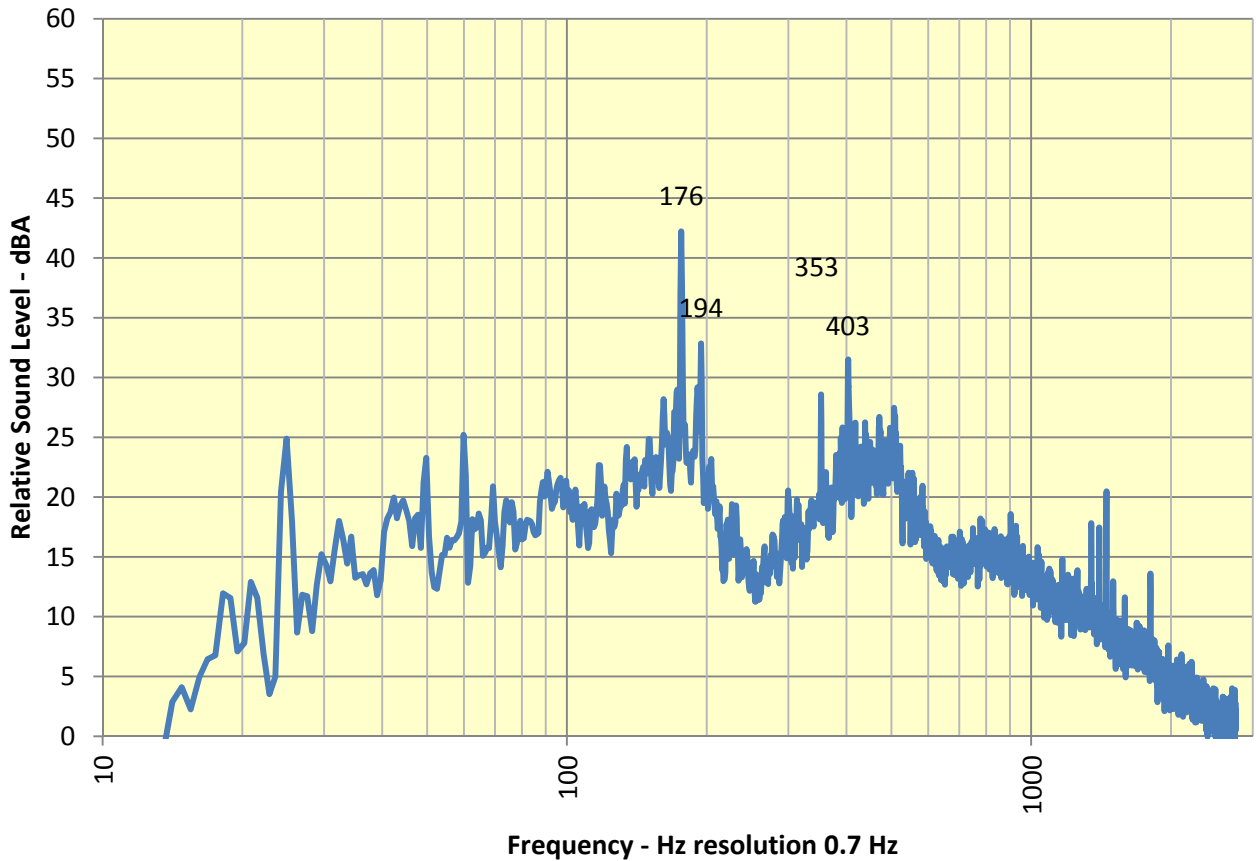
**Figure 4.65A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 4 Melbourne St 16/10/17 9:25pm**



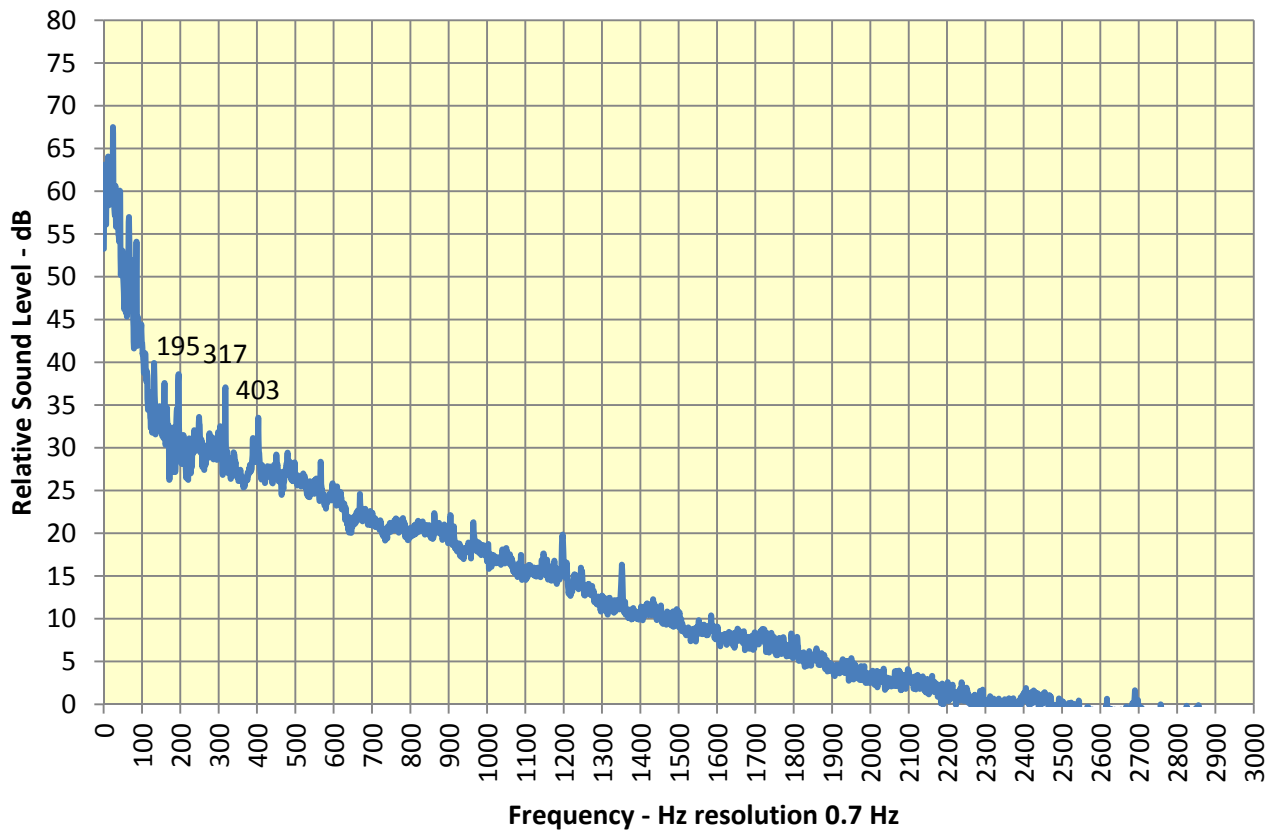
**Figure 4.66: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 4 Melbourne St 16/10/17 10:45pm**



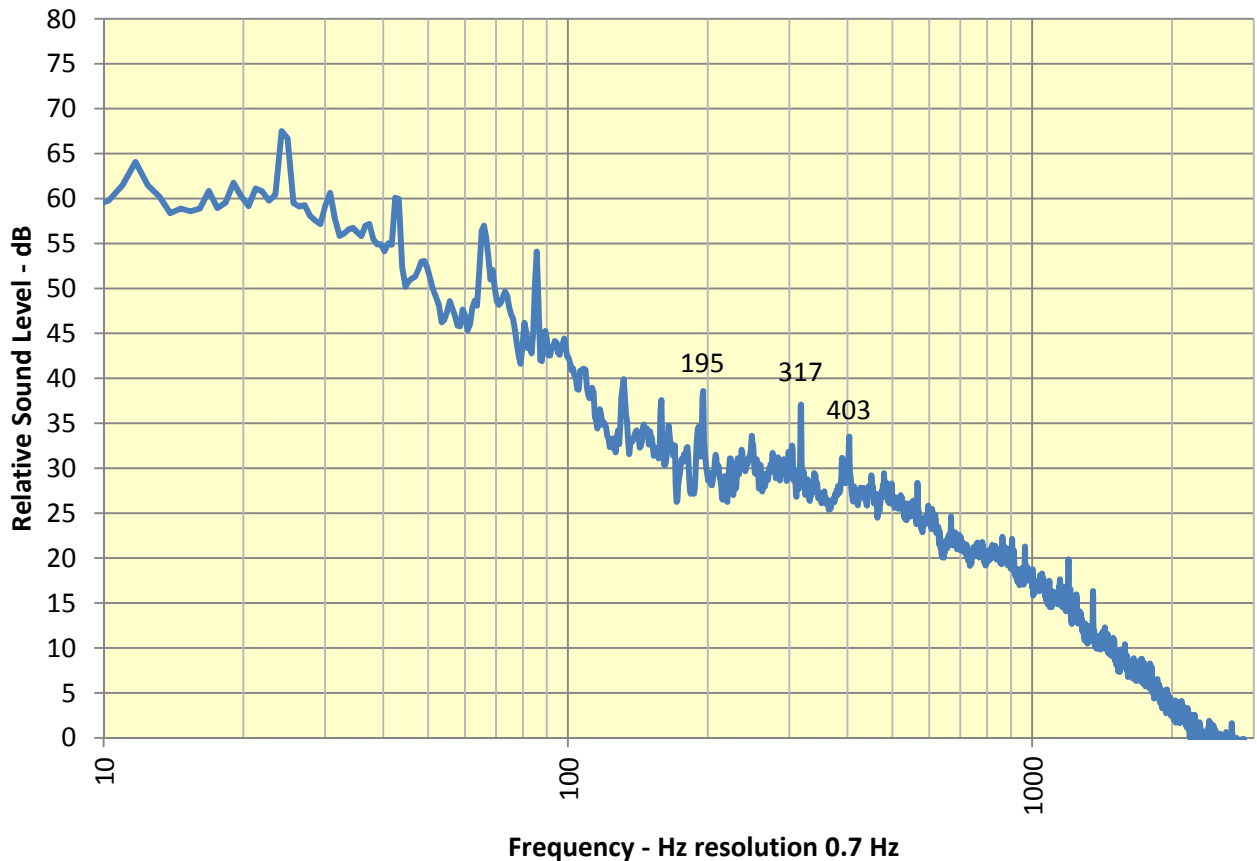
**Figure 4.66A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 4 Melbourne St 16/10/17 10:45pm**



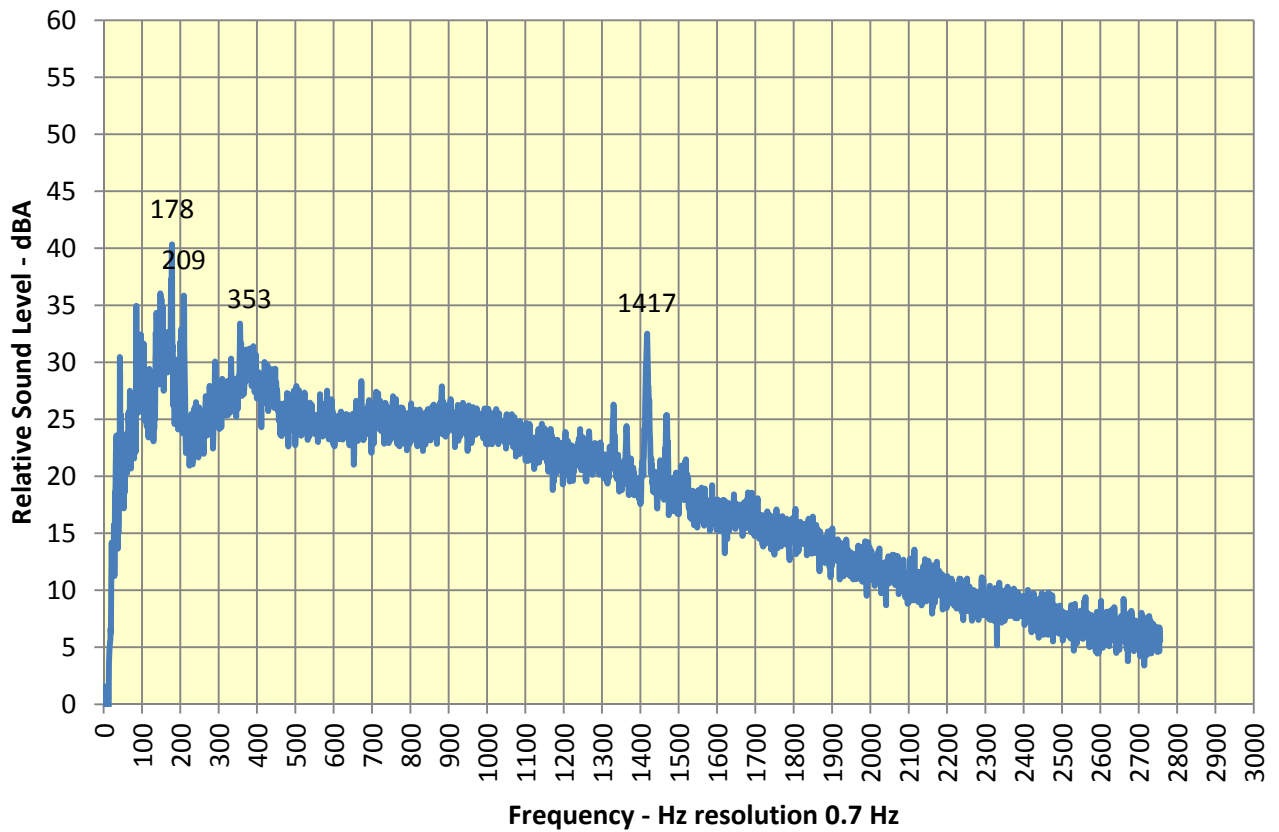
**Figure 4.67: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 72 Taylor Ave 19/9/17 12:15 pm**



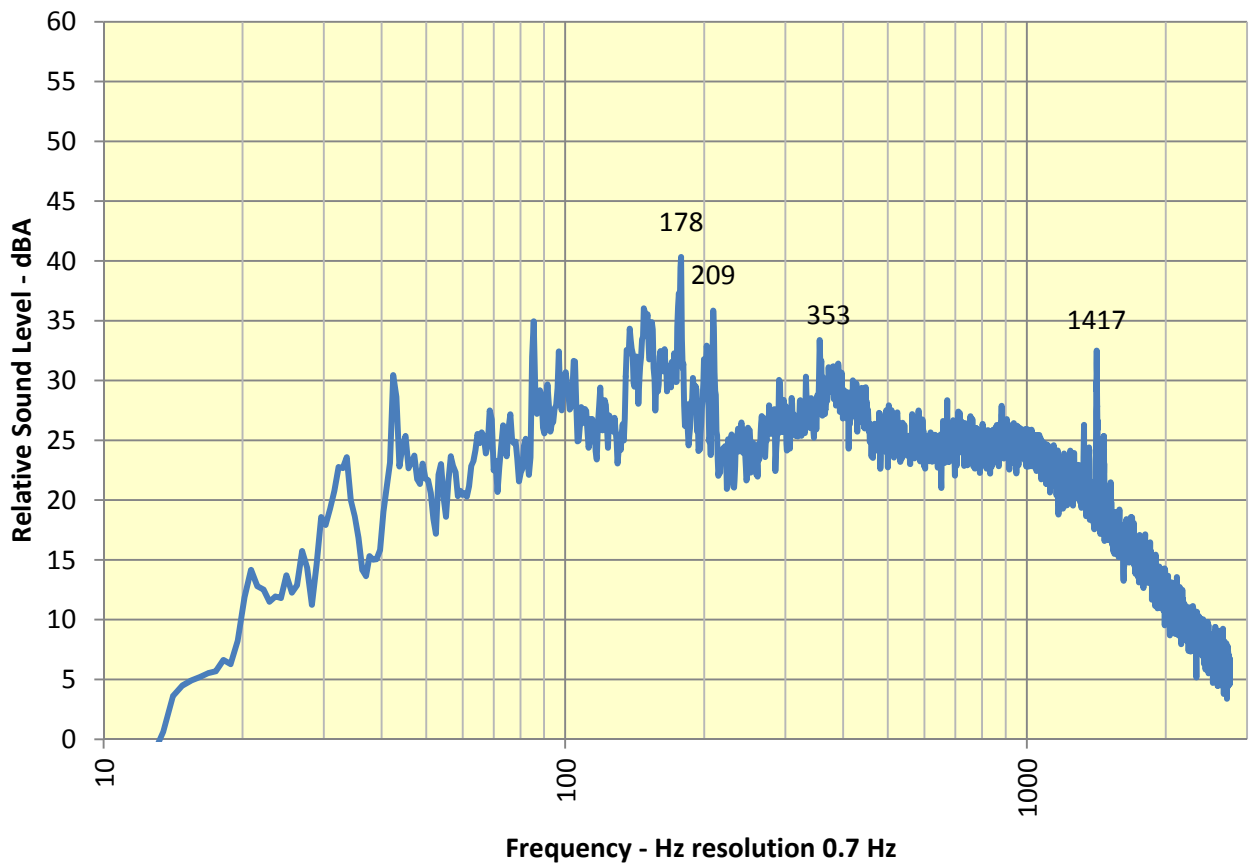
**Figure 4.67A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 72 Taylor Ave 19/9/17 12:15 pm**



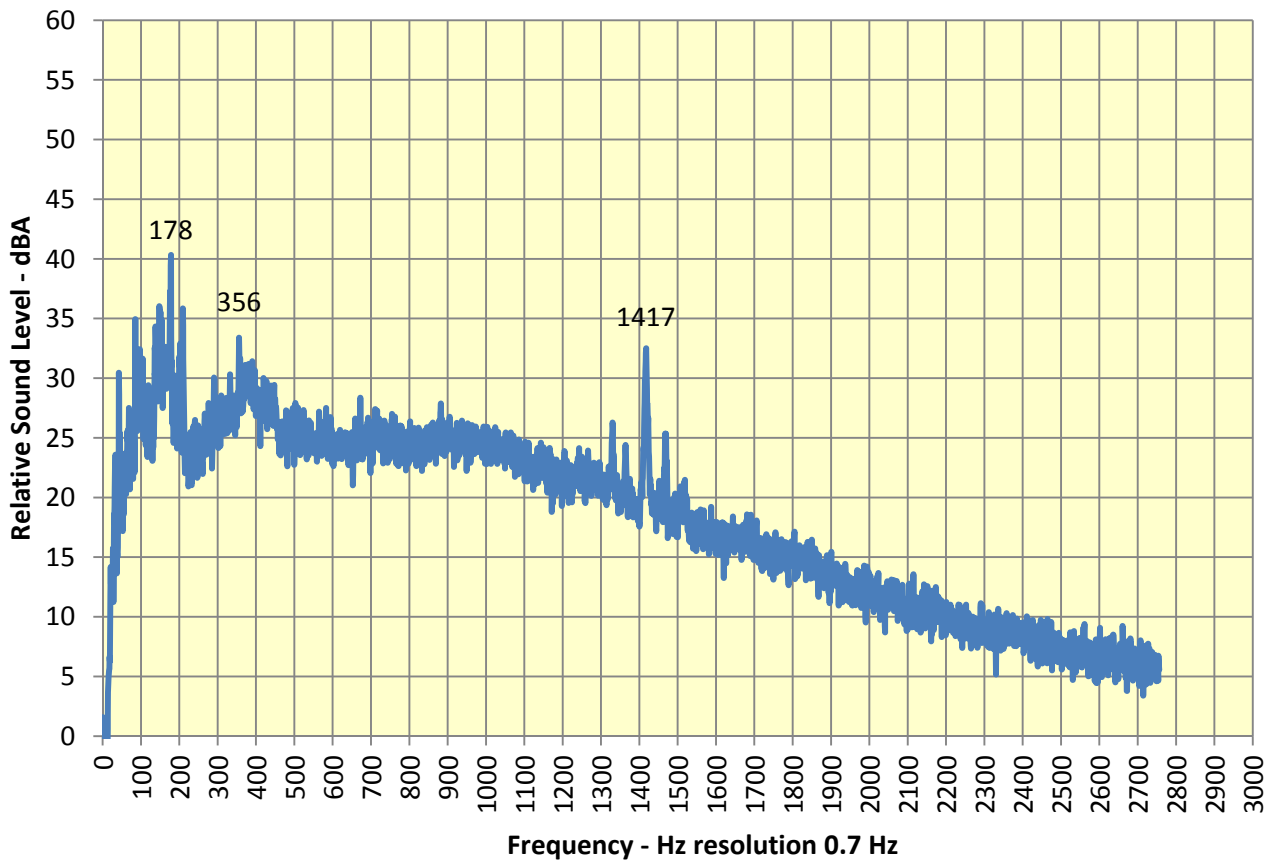
**Figure 4.68: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 19/9/17 6:20 pm**



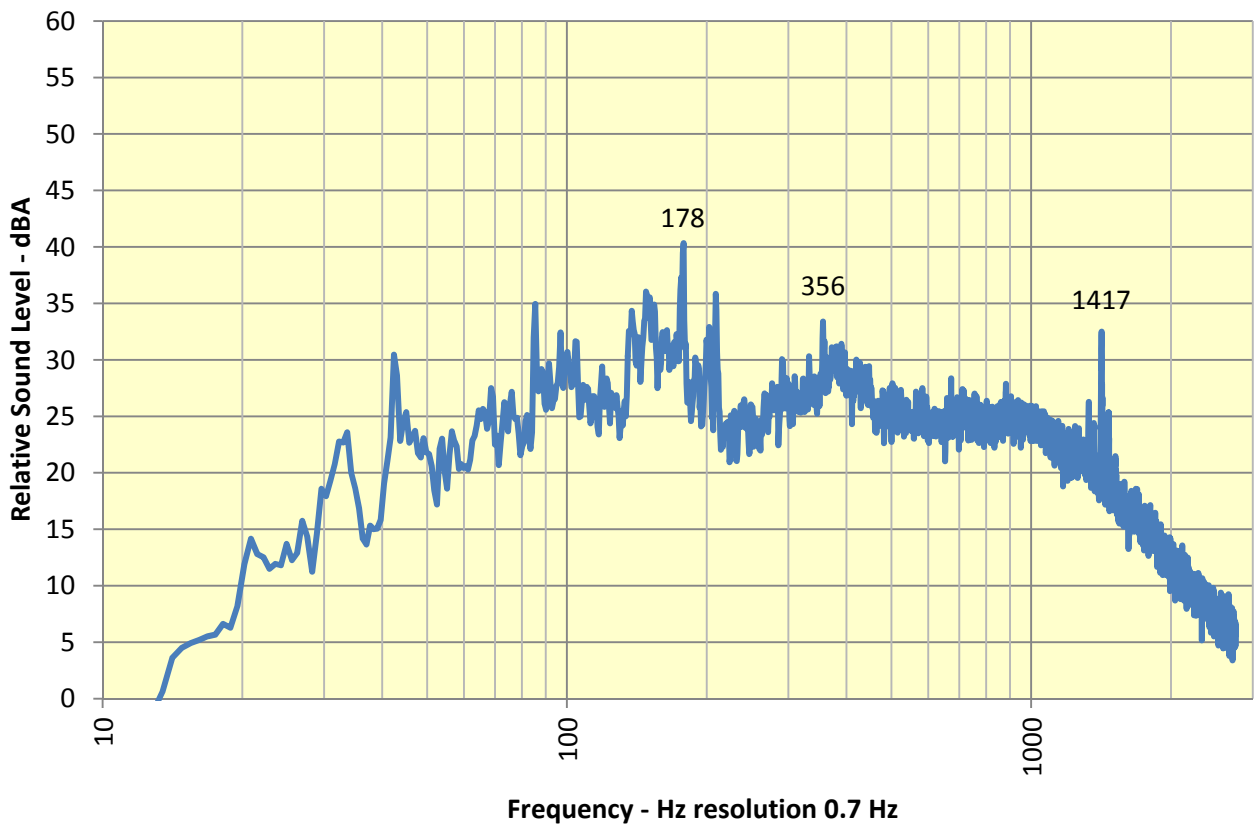
**Figure 4.68A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 19/9/17 6:20 pm**



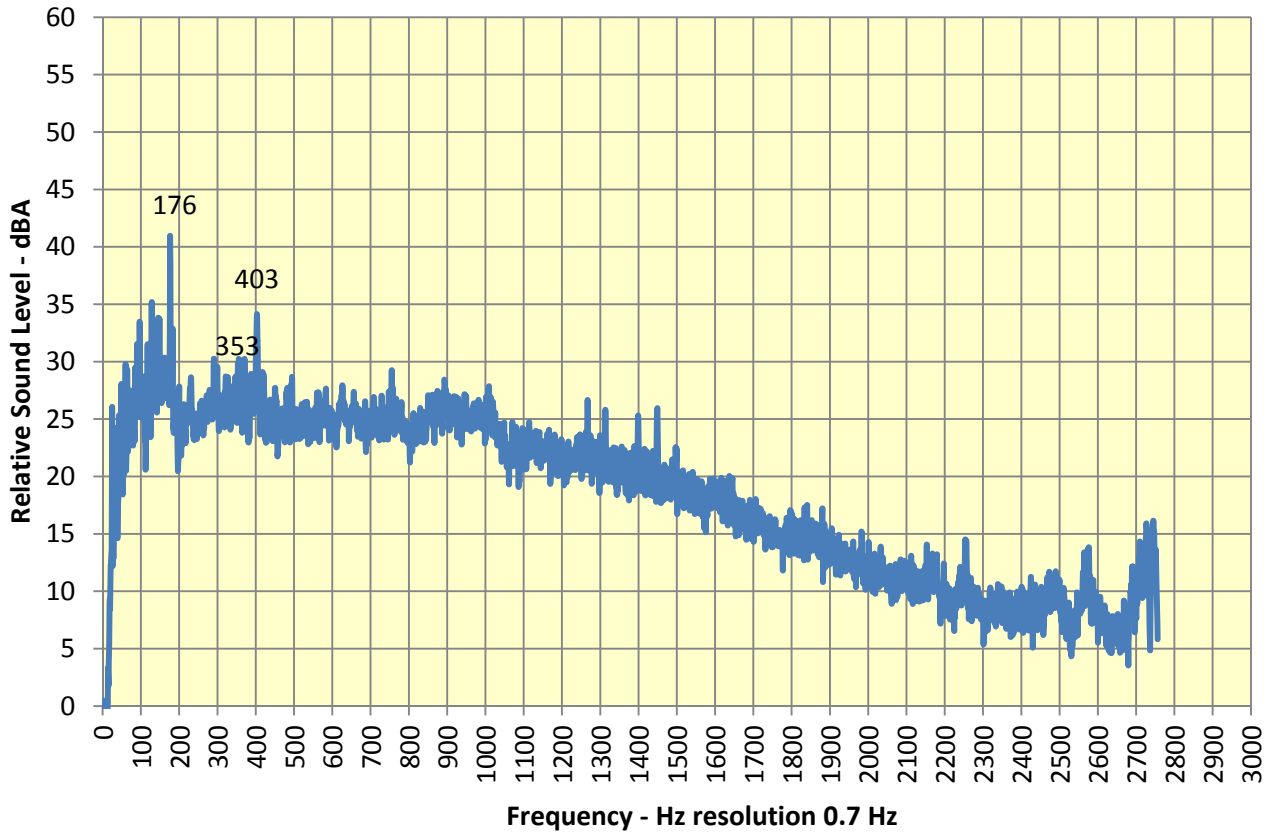
**Figure 4.69: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 19/9/17 6:25pm**



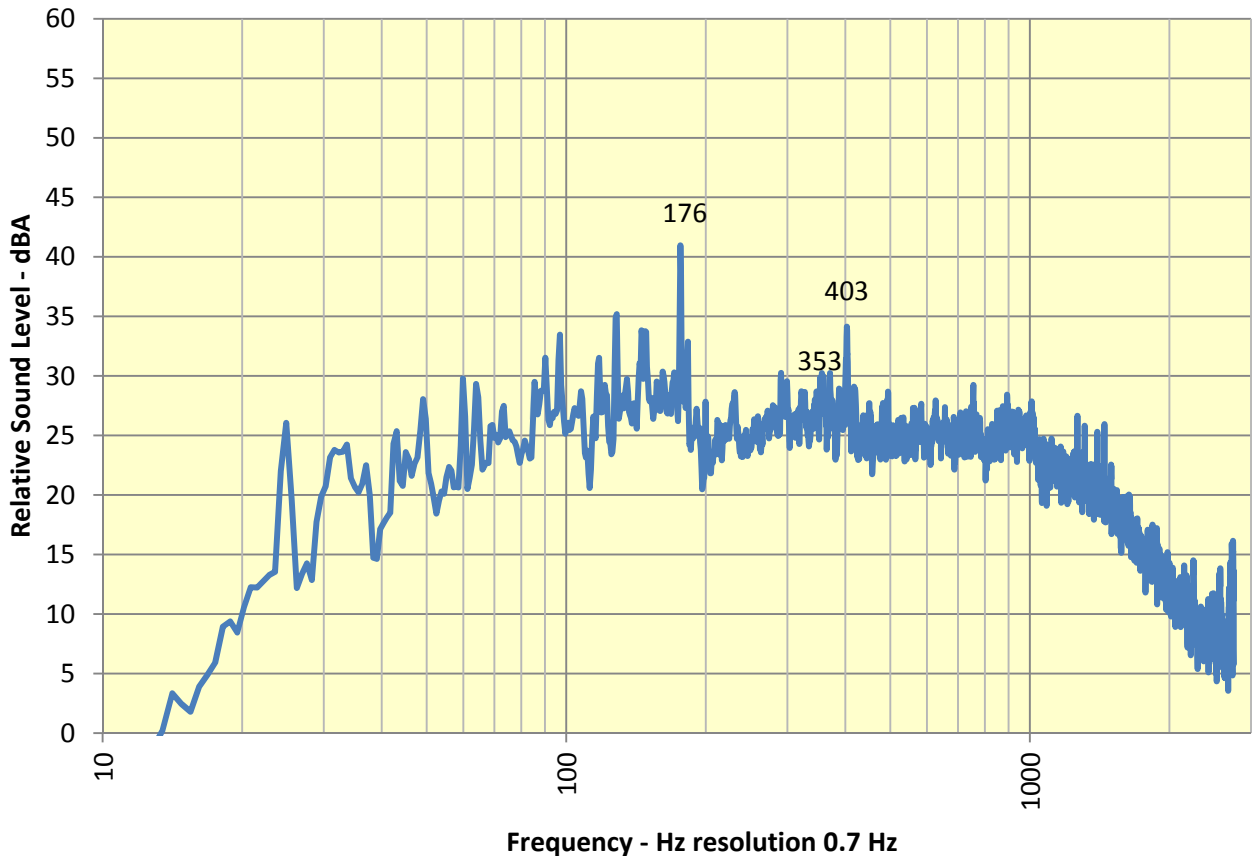
**Figure 4.69: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 19/9/17 6:25pm**



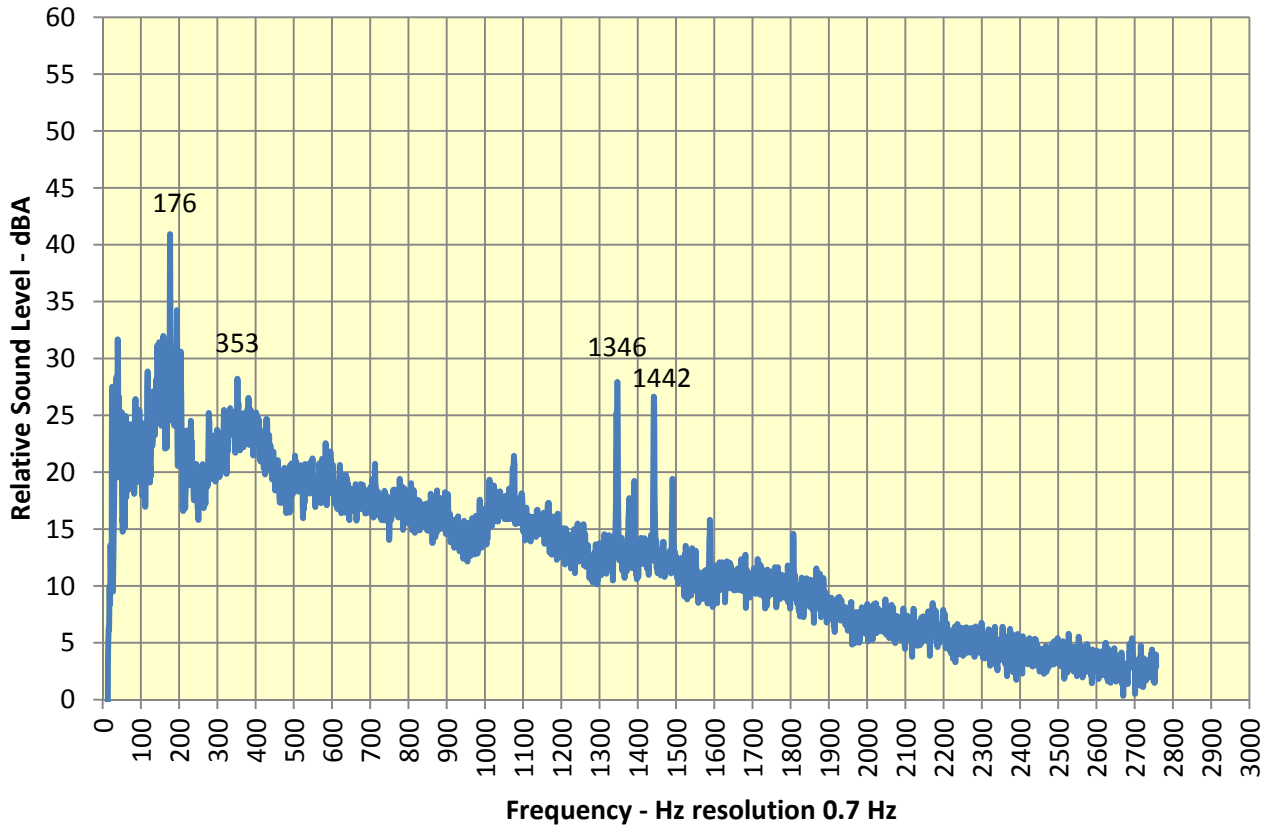
**Figure 4.70: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 72 Taylor Ave 6/10/17 9:10 am**



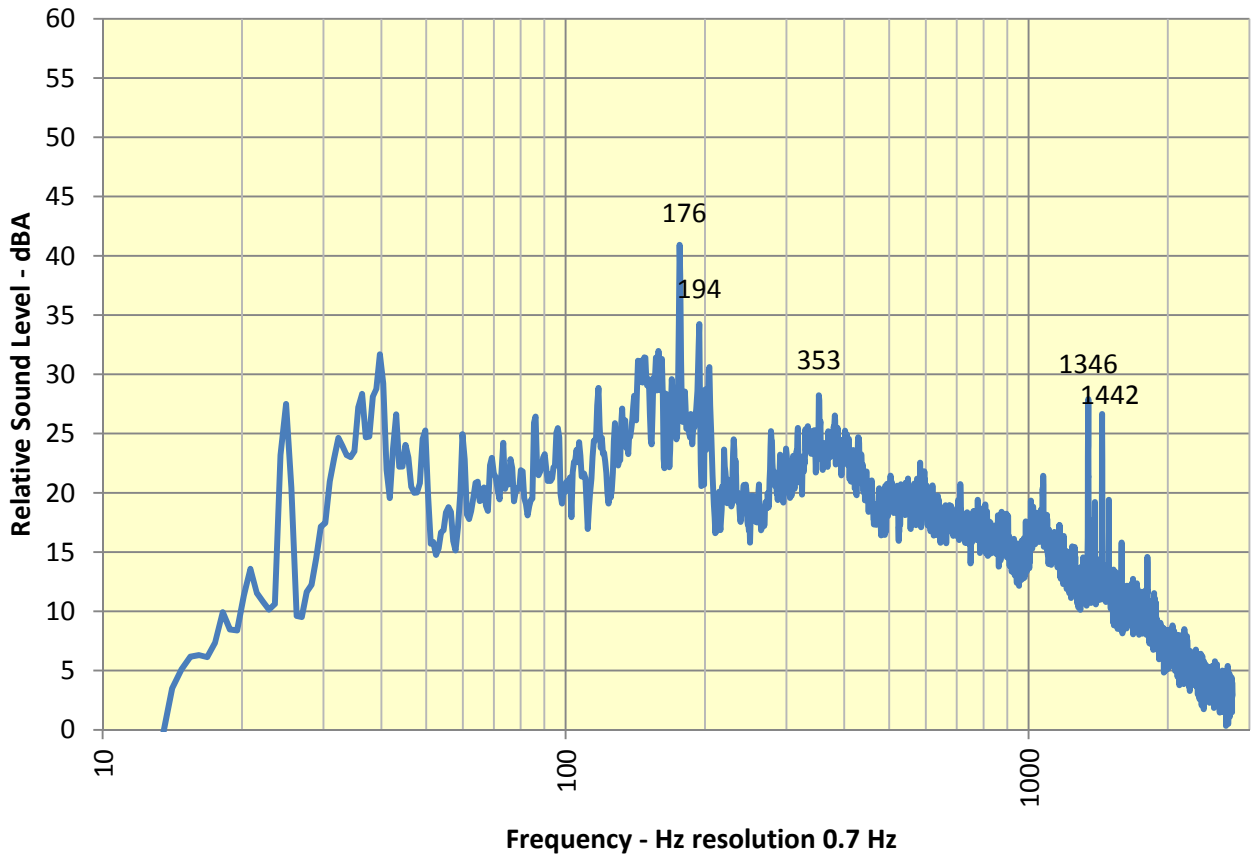
**Figure 4.70A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 72 Taylor Ave 6/10/17 9:10 am**



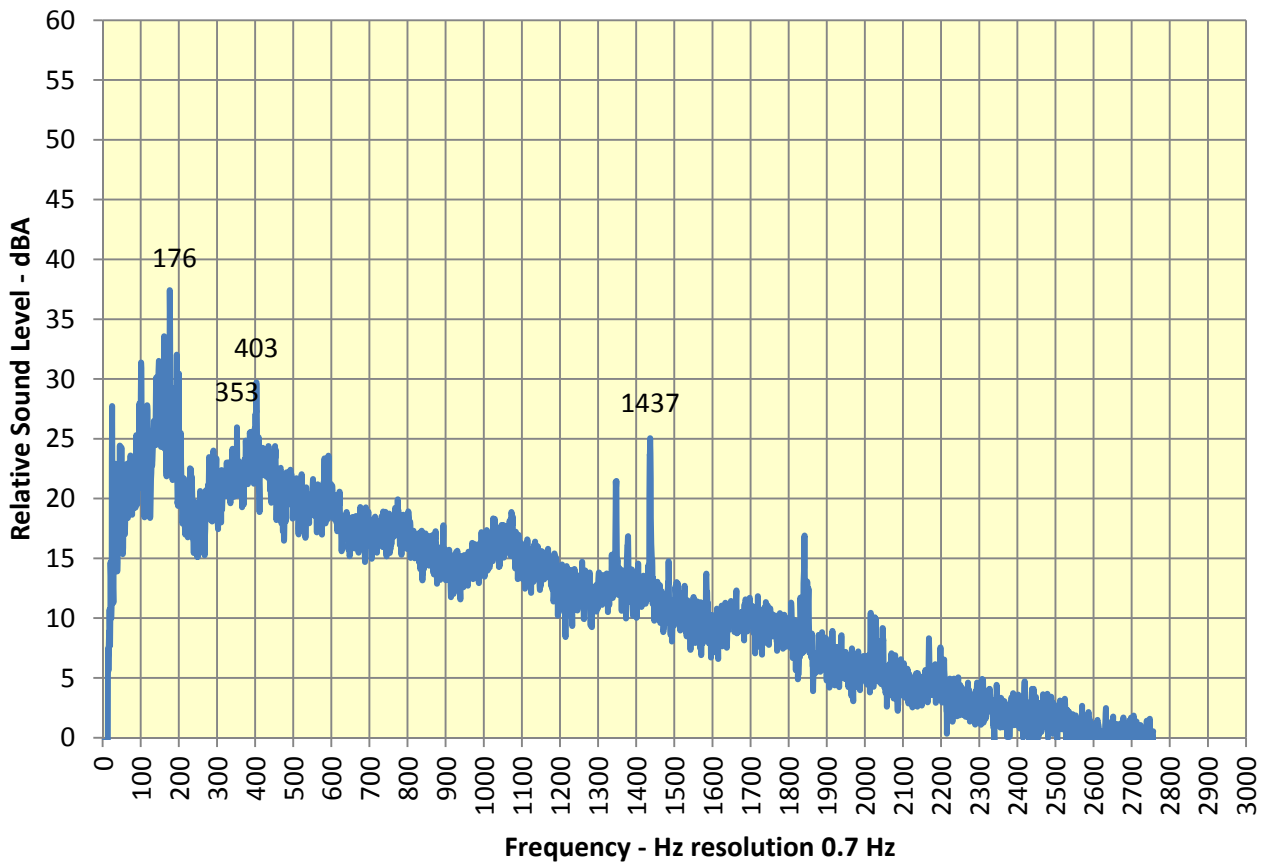
**Figure 4.71: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 16 /10/17 9:41pm**



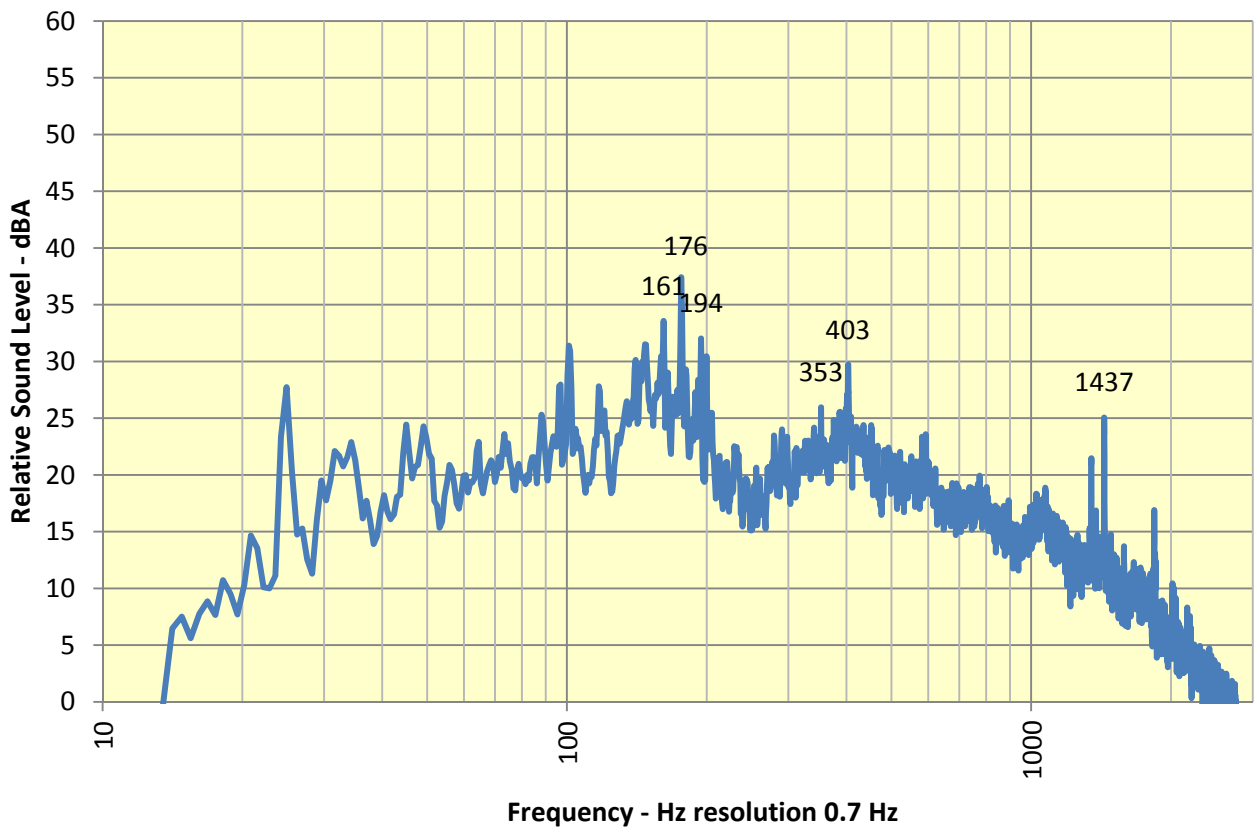
**Figure 4.71A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 72 Taylor Ave 16 /10/17 9:41pm**



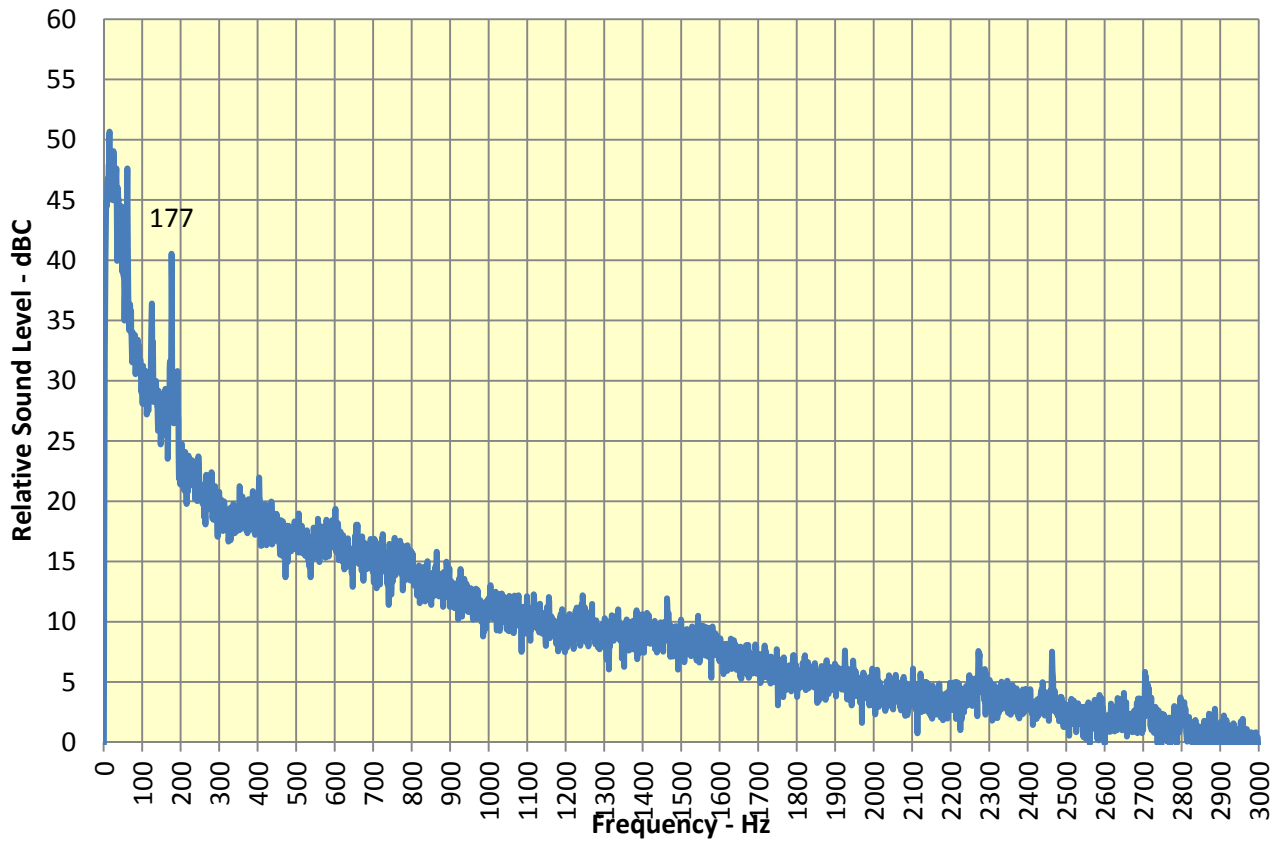
**Figure 4.72: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night Time
 72 Taylor Ave 16/10/17 10:05pm**



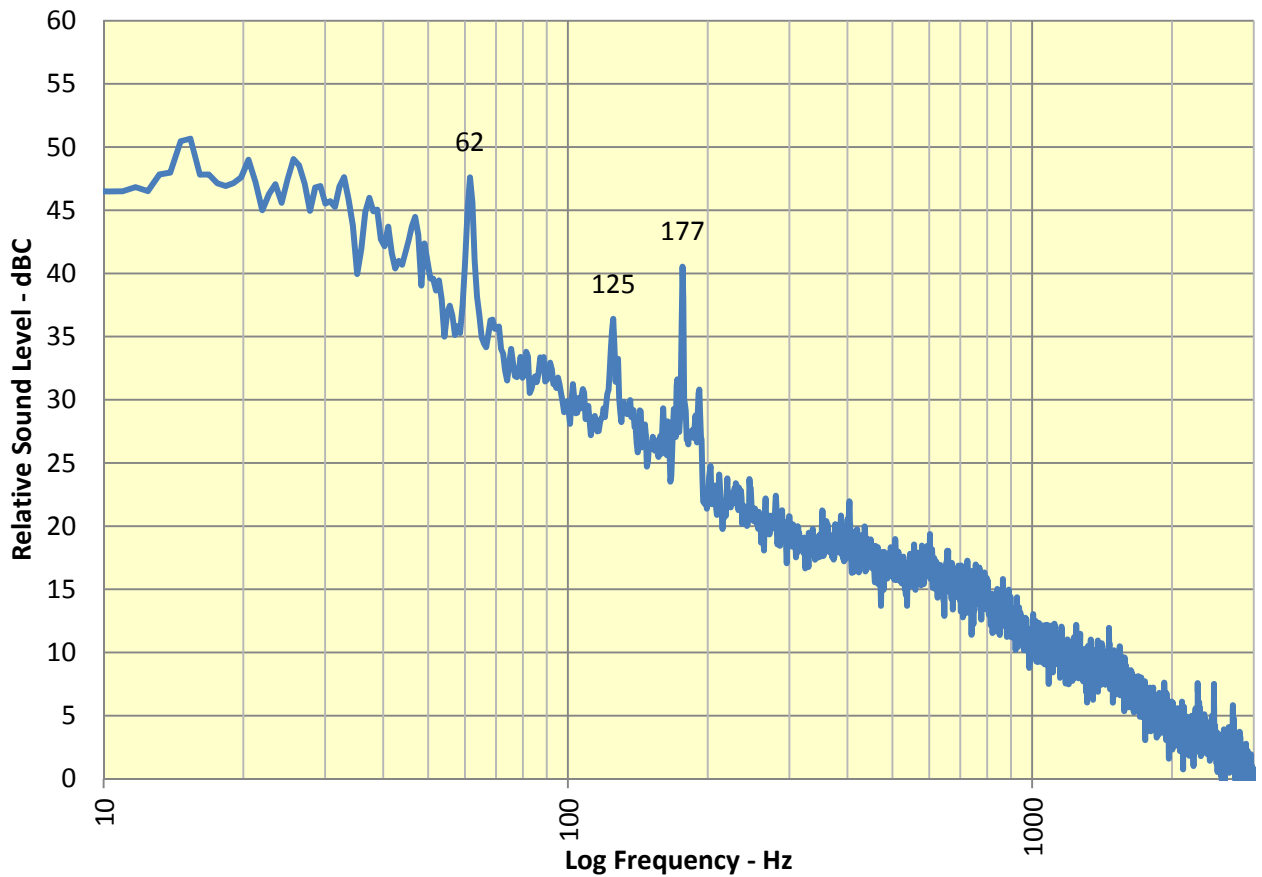
**Figure 4.72A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night Time
 72 Taylor Ave 16/10/17 10:05pm**



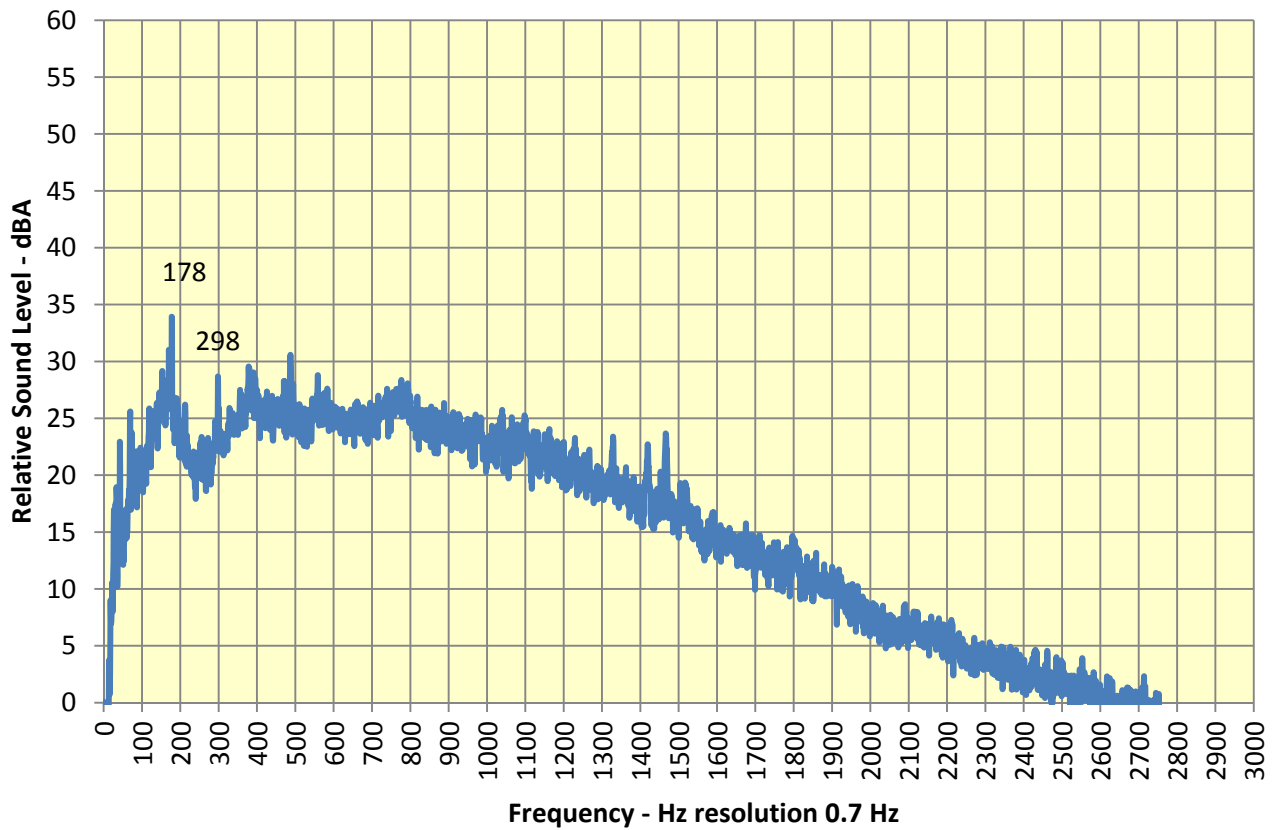
**Figure 4.73: Boral Cement Berrima Narrow band frequency analysis
12 Brisbane St 19/9/17 12:00pm F678**



**Figure 4.73A: Boral Cement Berrima Narrow band frequency analysis
12 Brisbane St 19/9/17 12:00pm F678**



**Figure 4.74: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 12 Brisbane St. 19/9/17 6:45pm**



**Figure 4.74A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Evening time
 12 Brisbane St. 19/9/17 6:45pm**

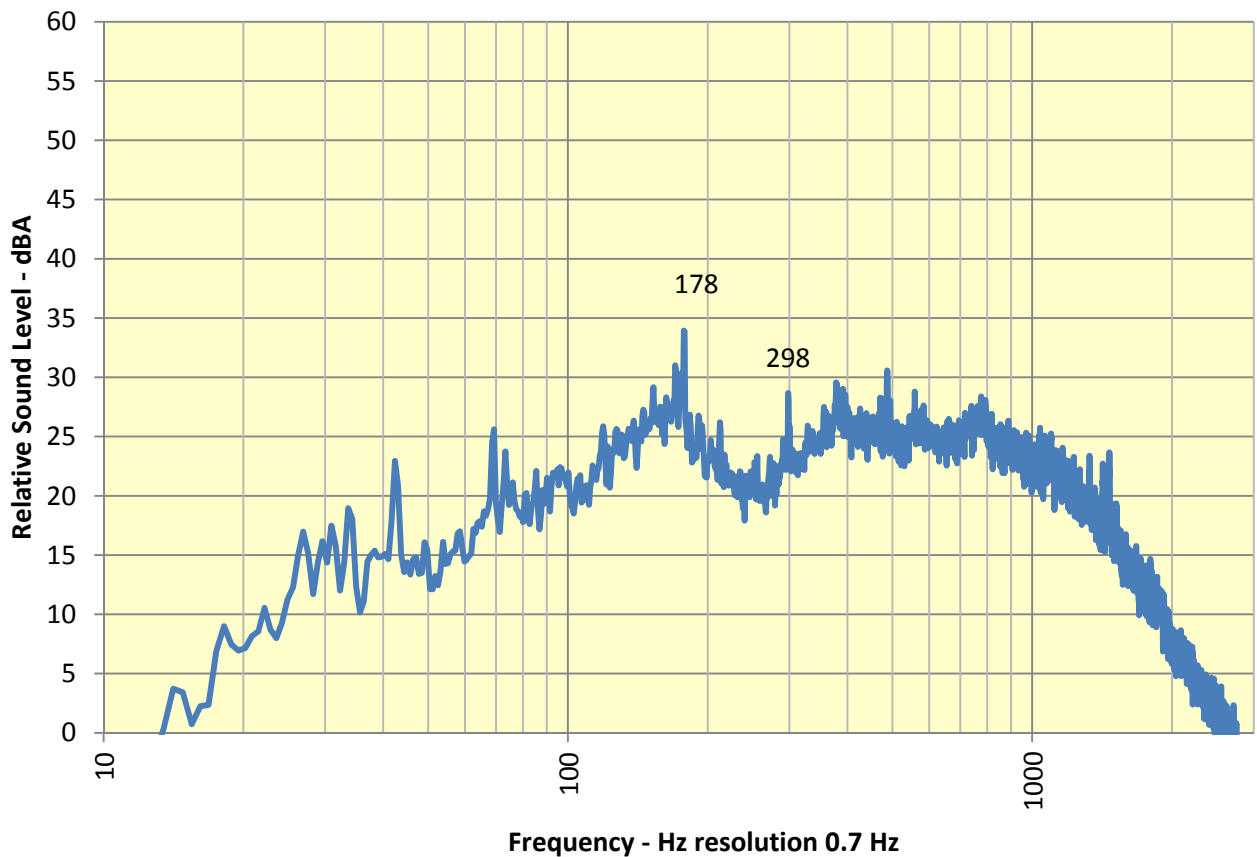


Figure 4.75: Boral Cement Berrima Narrow band frequency analysis
12 Brisbane St 6/10/17 8:55am F684

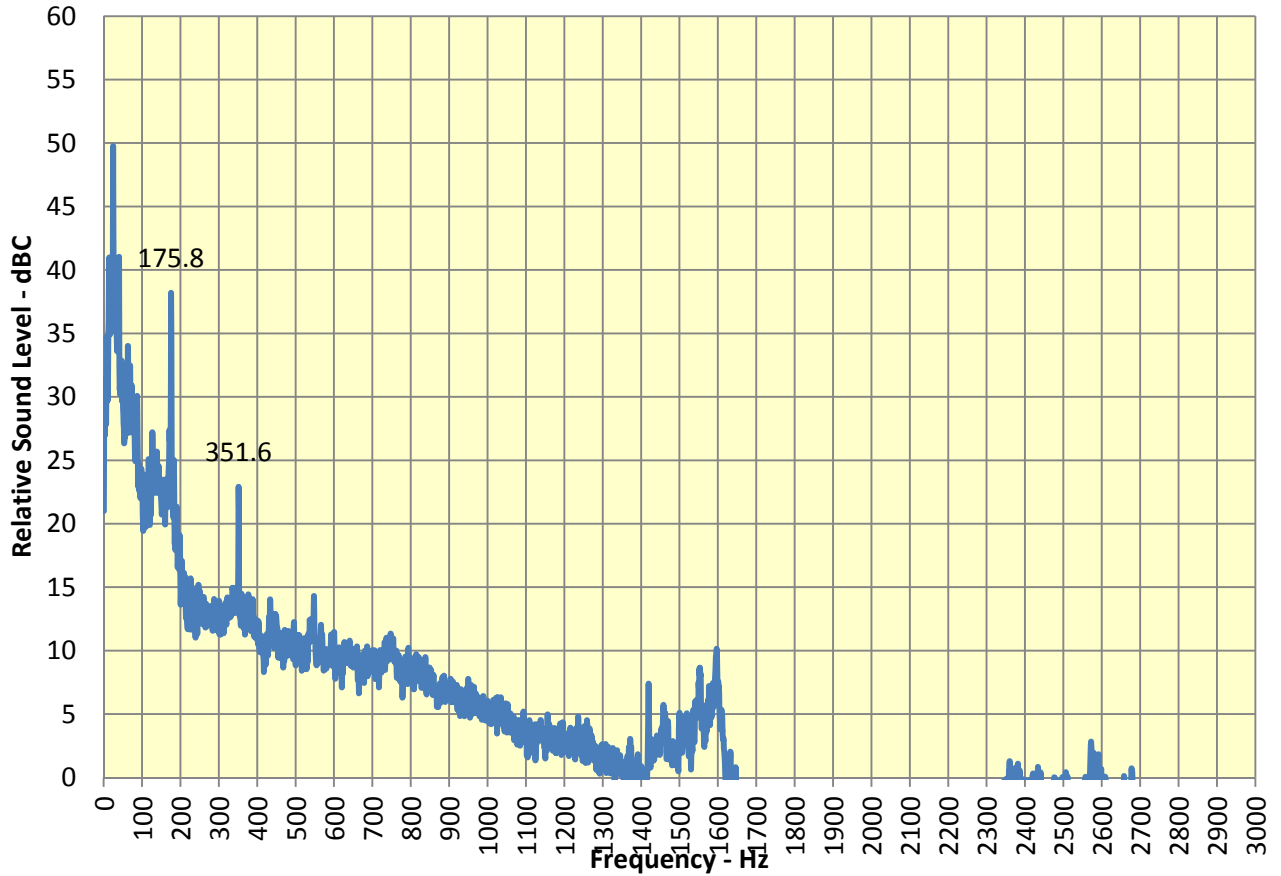
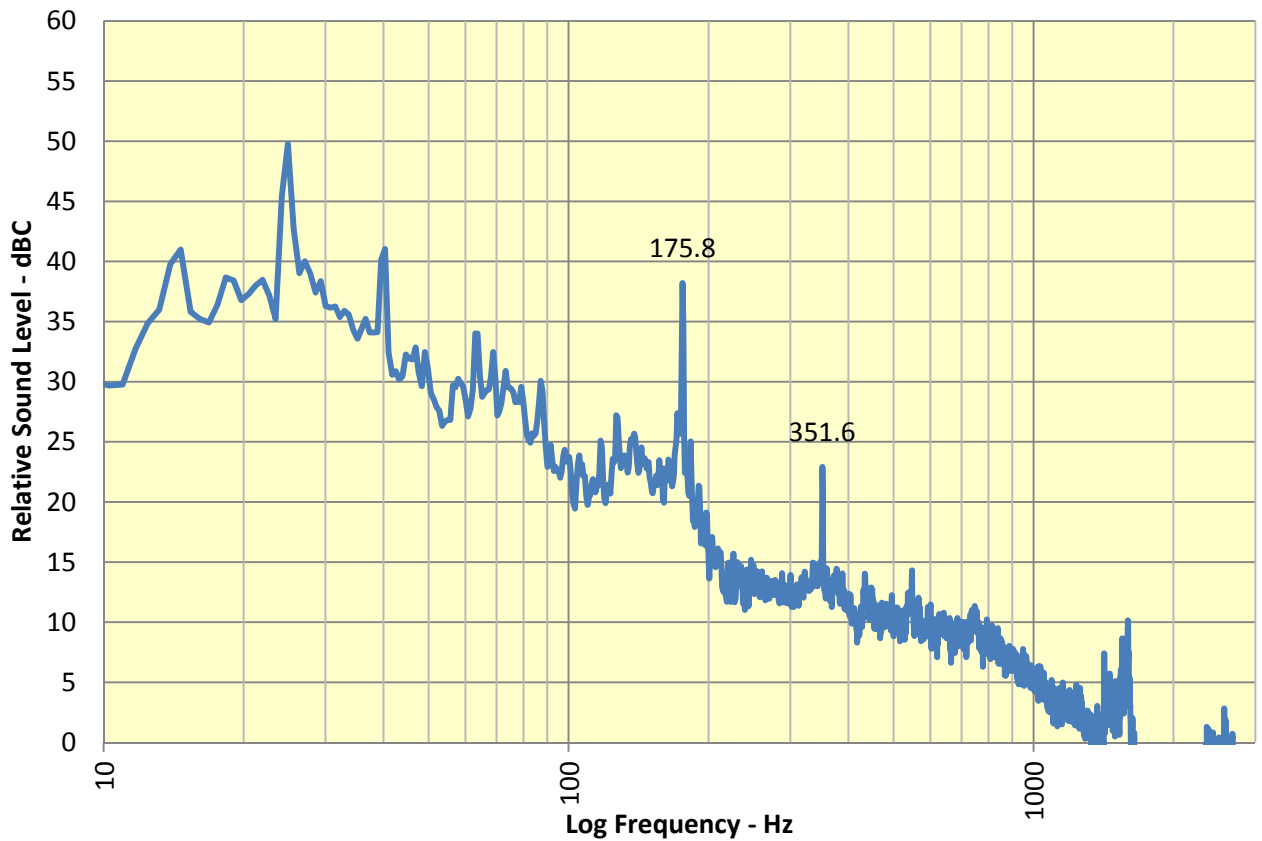
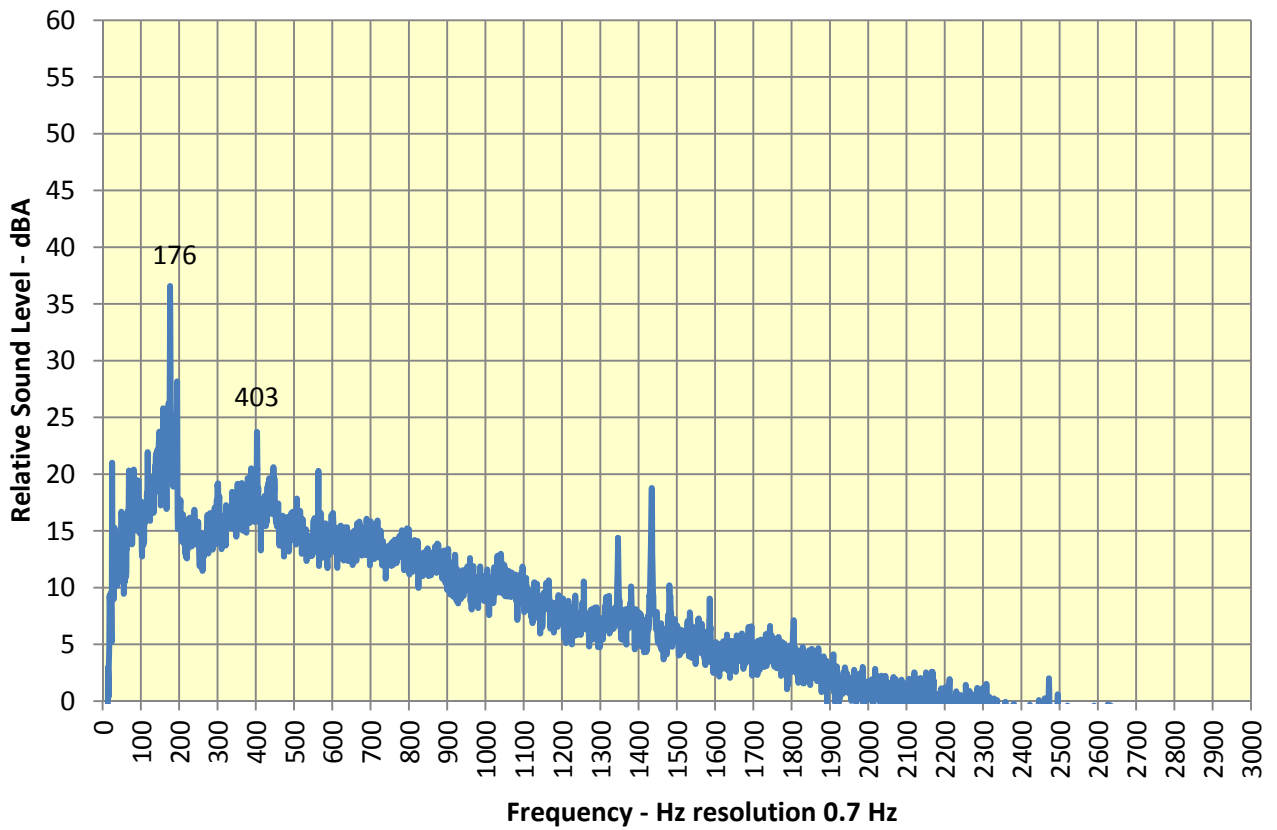


Figure 4.75A: Boral Cement Berrima Narrow band frequency analysis
12 Brisbane St 6/10/17 8:55am F684



**Figure 4.76: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 12 Brisbane St. 16/10/17 10:30pm**



**Figure 4.76A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 12 Brisbane St. 16/10/17 10:30pm**

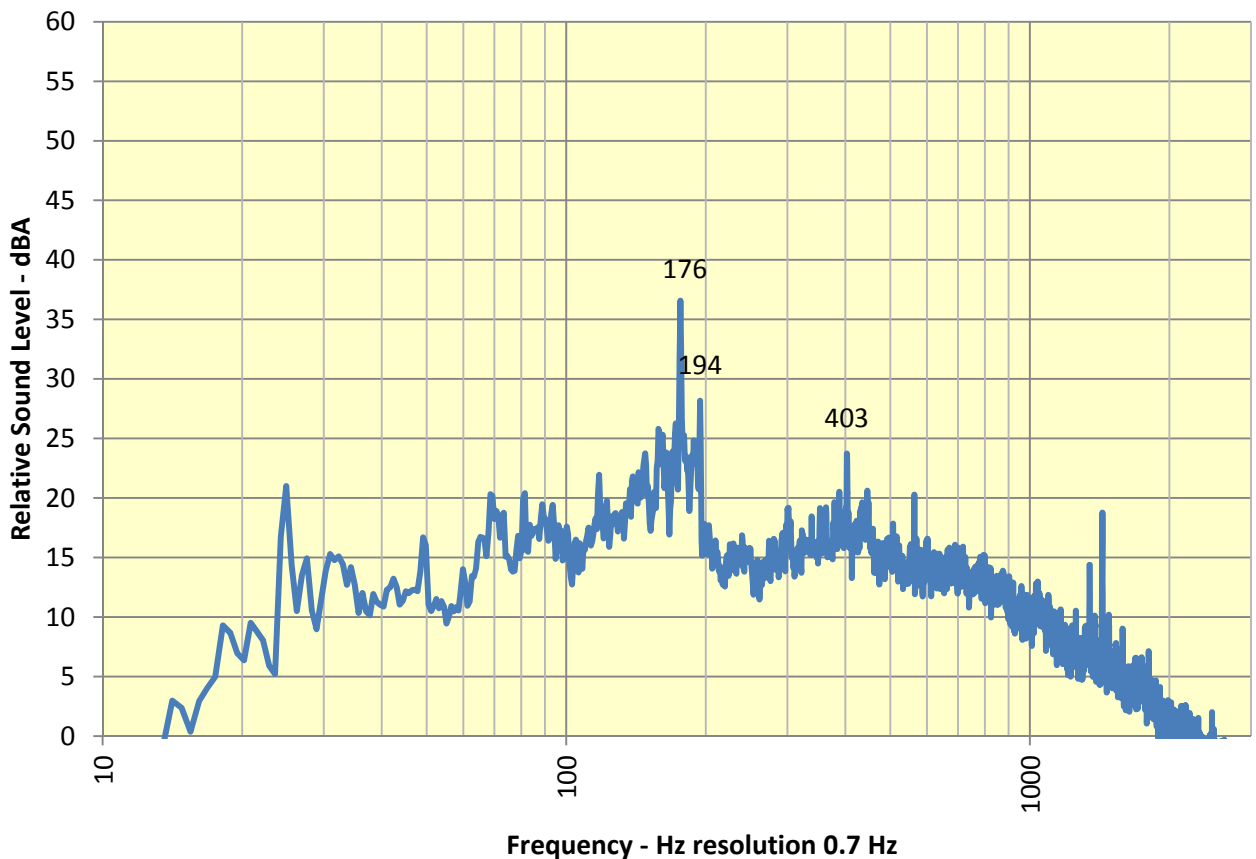


Figure 4.77: Boral Cement Berrima Narrow band frequency analysis
Argyle St 19/9/17 18:52pm F680

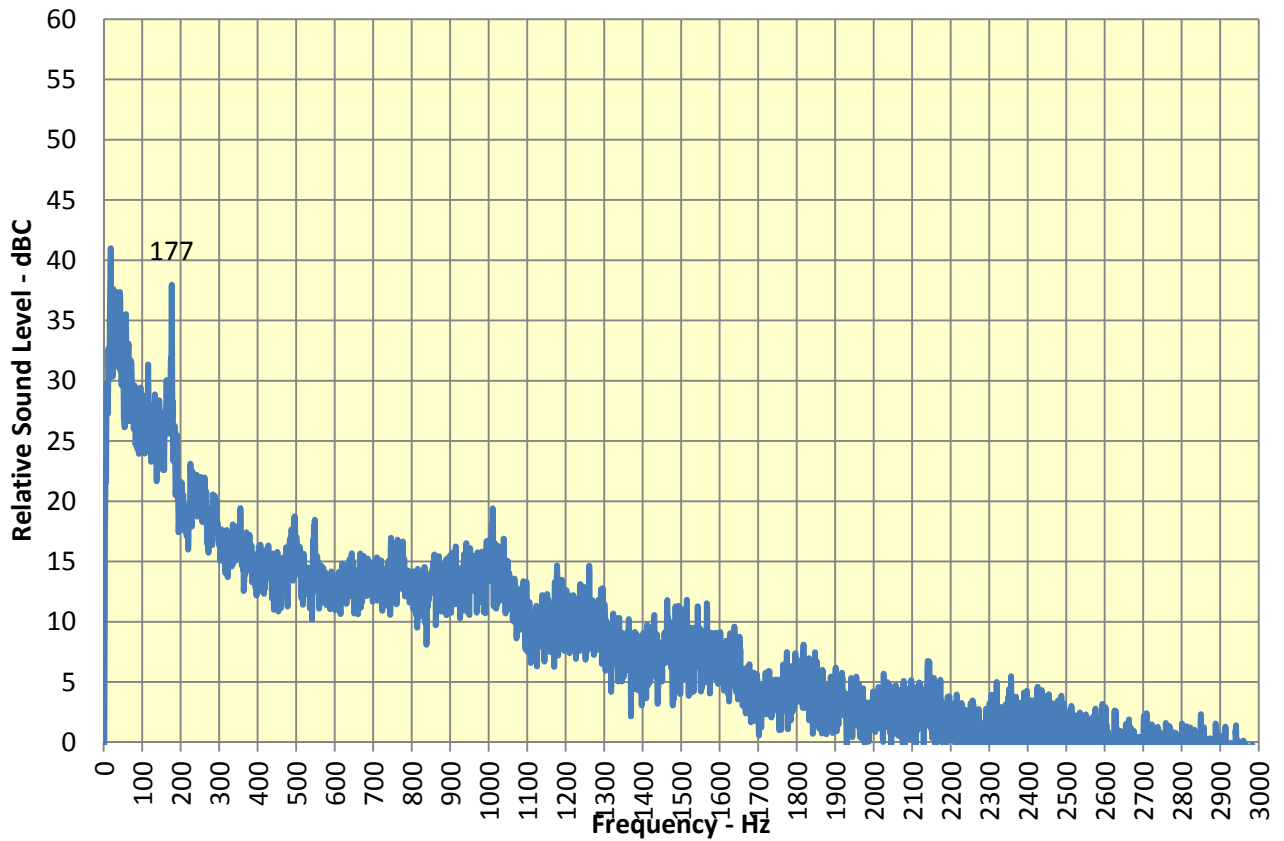
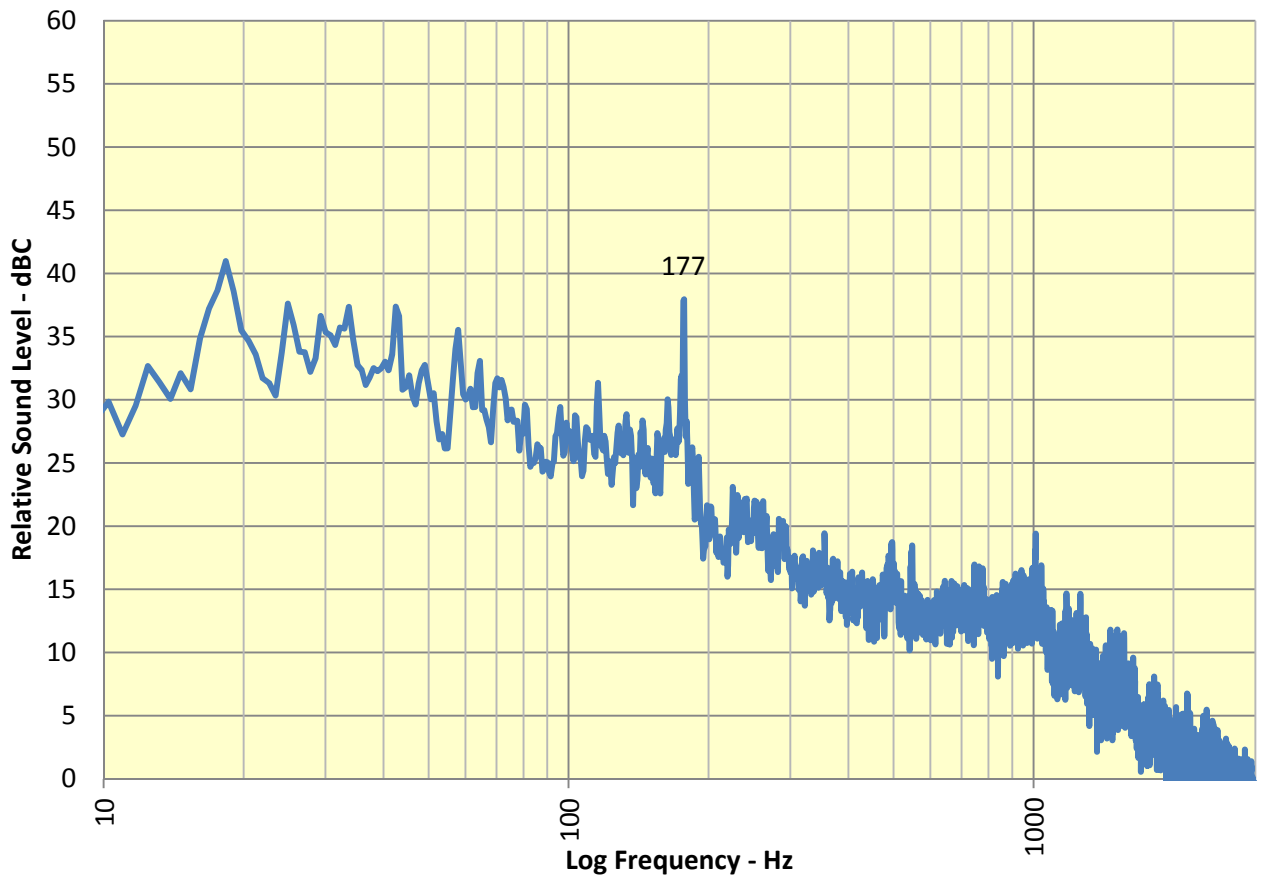
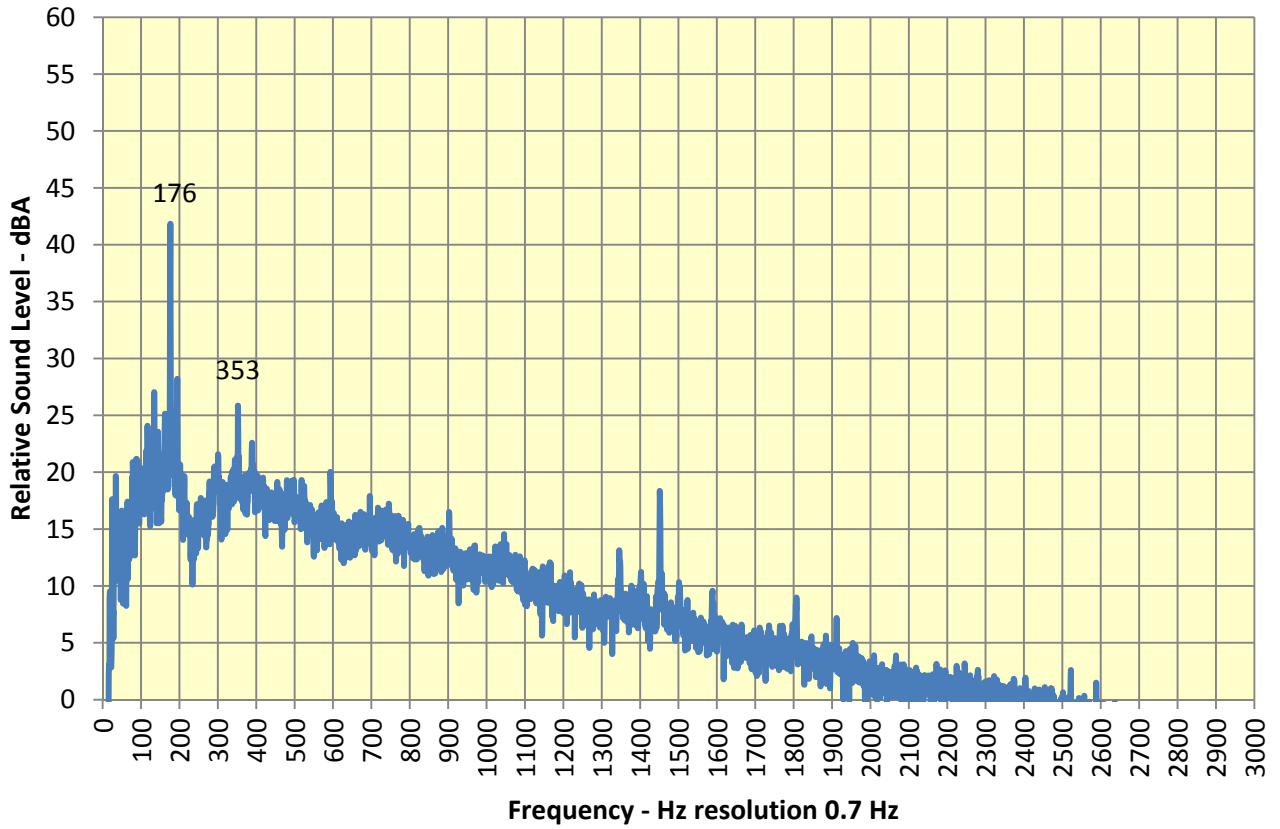


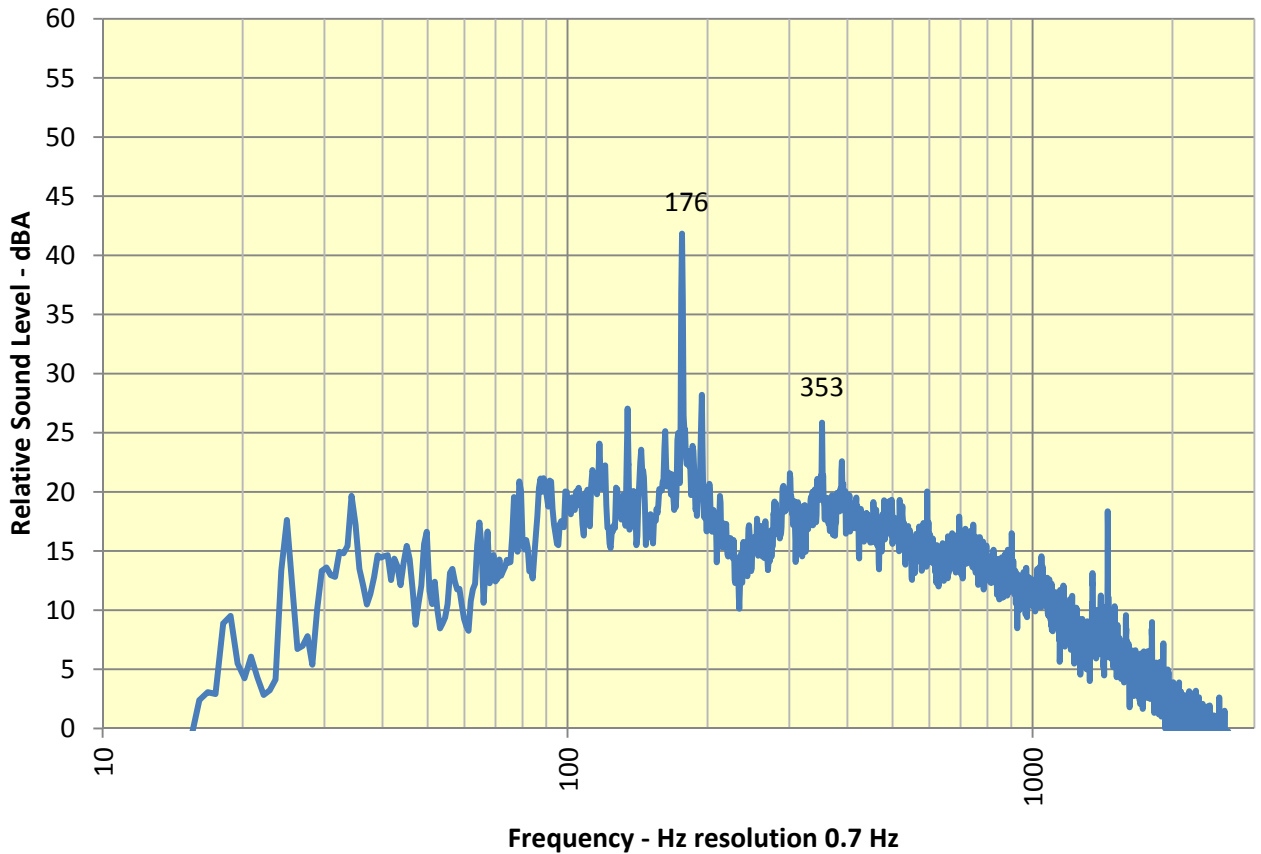
Figure 4.77A: Boral Cement Berrima Narrow band frequency analysis
ArgyleSt 19/9/17 18:52am F680



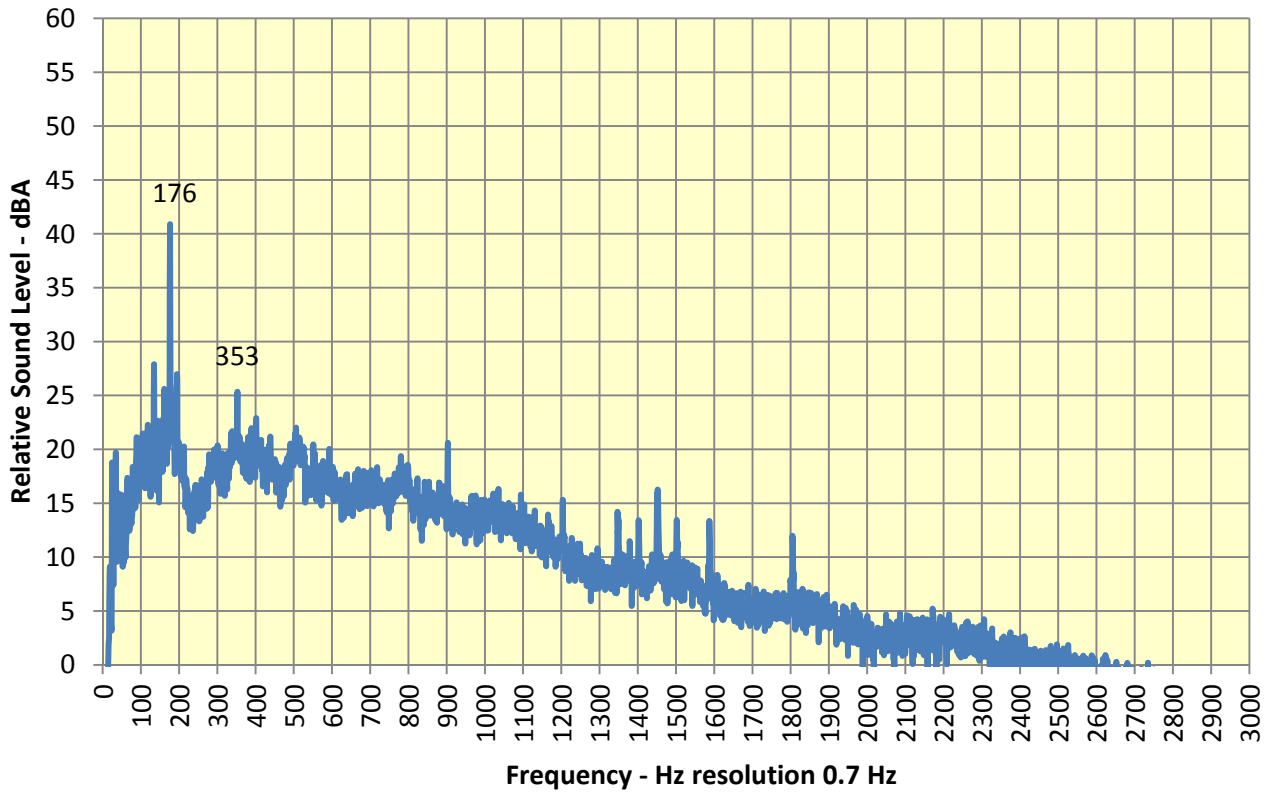
**Figure 4.78: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 Argyle St 16/10/17 11:10pm**



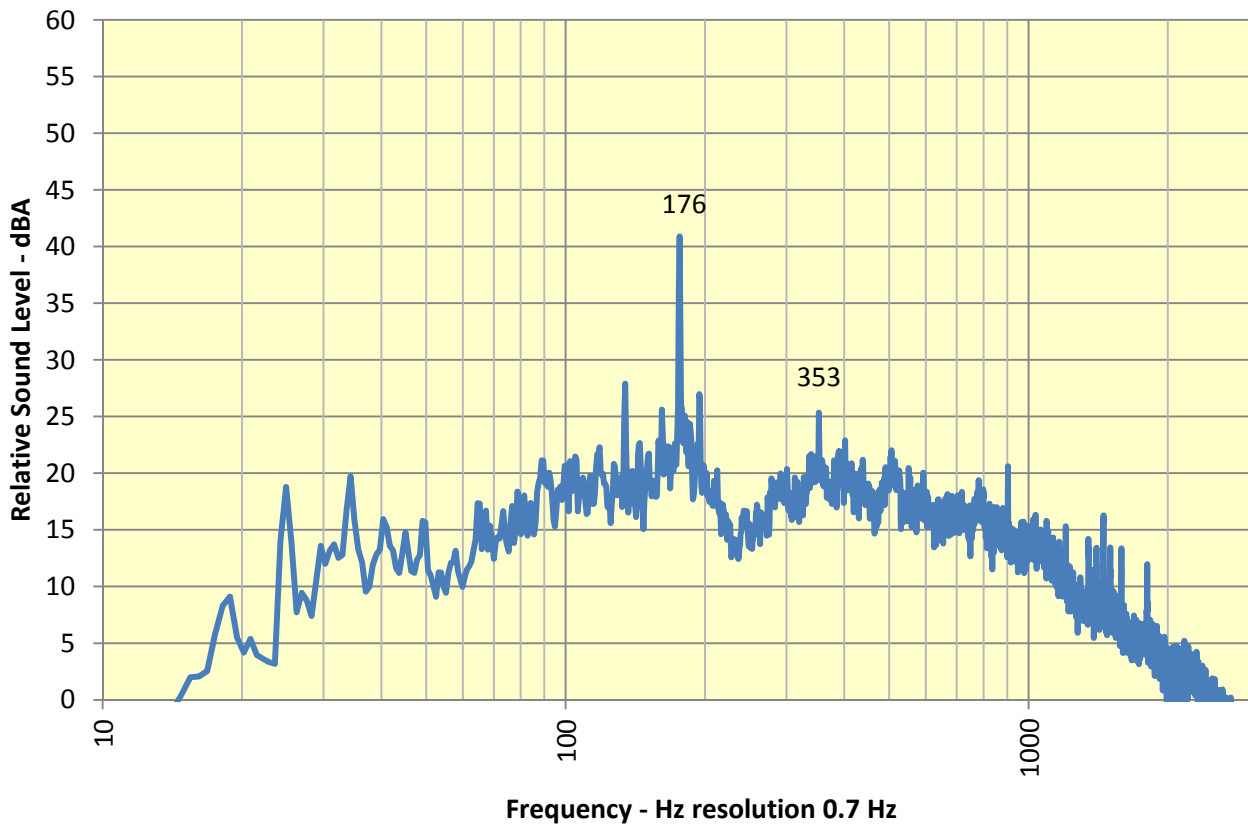
**Figure 4.78A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 Argyle St 16/10/17 11:10pm**



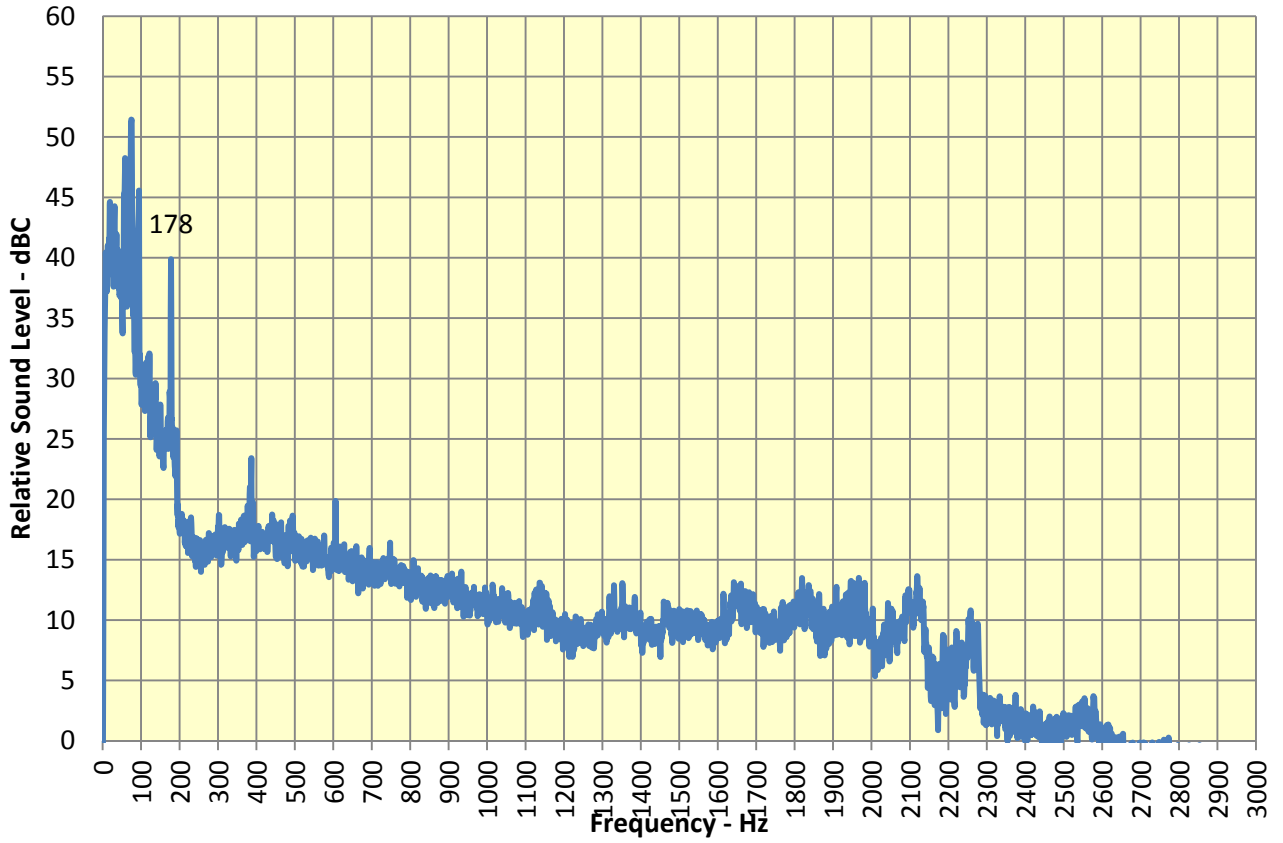
**Figure 4.79: Boral Cement Berrima Annual Environmental Noise -
Attended monitoring narrow-band spectrum Night time
Argyle St 16/10/17 11:20pm**



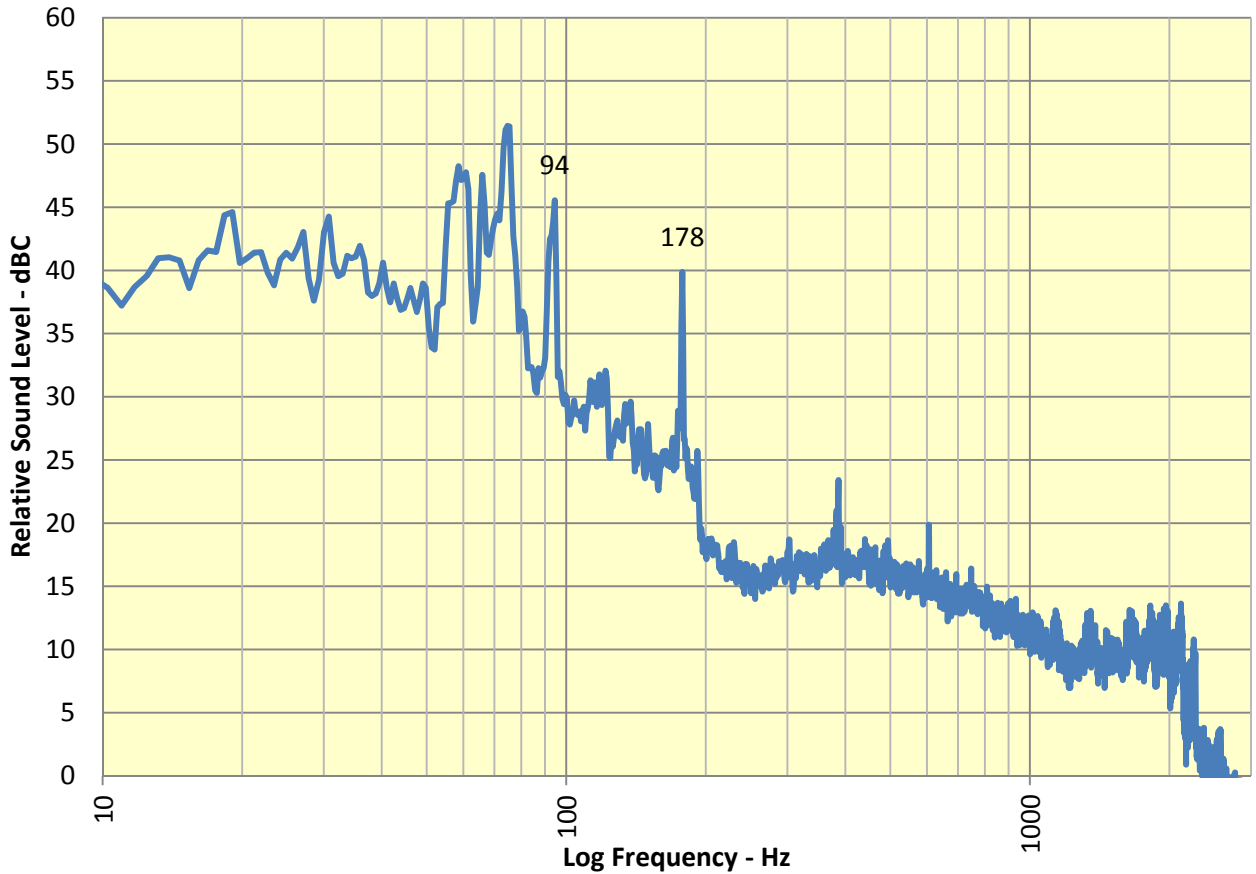
**Figure 4.79A: Boral Cement Berrima Annual Environmental Noise -
Attended monitoring narrow-band spectrum Night time
Argyle St 16/10/17 11:20pm**



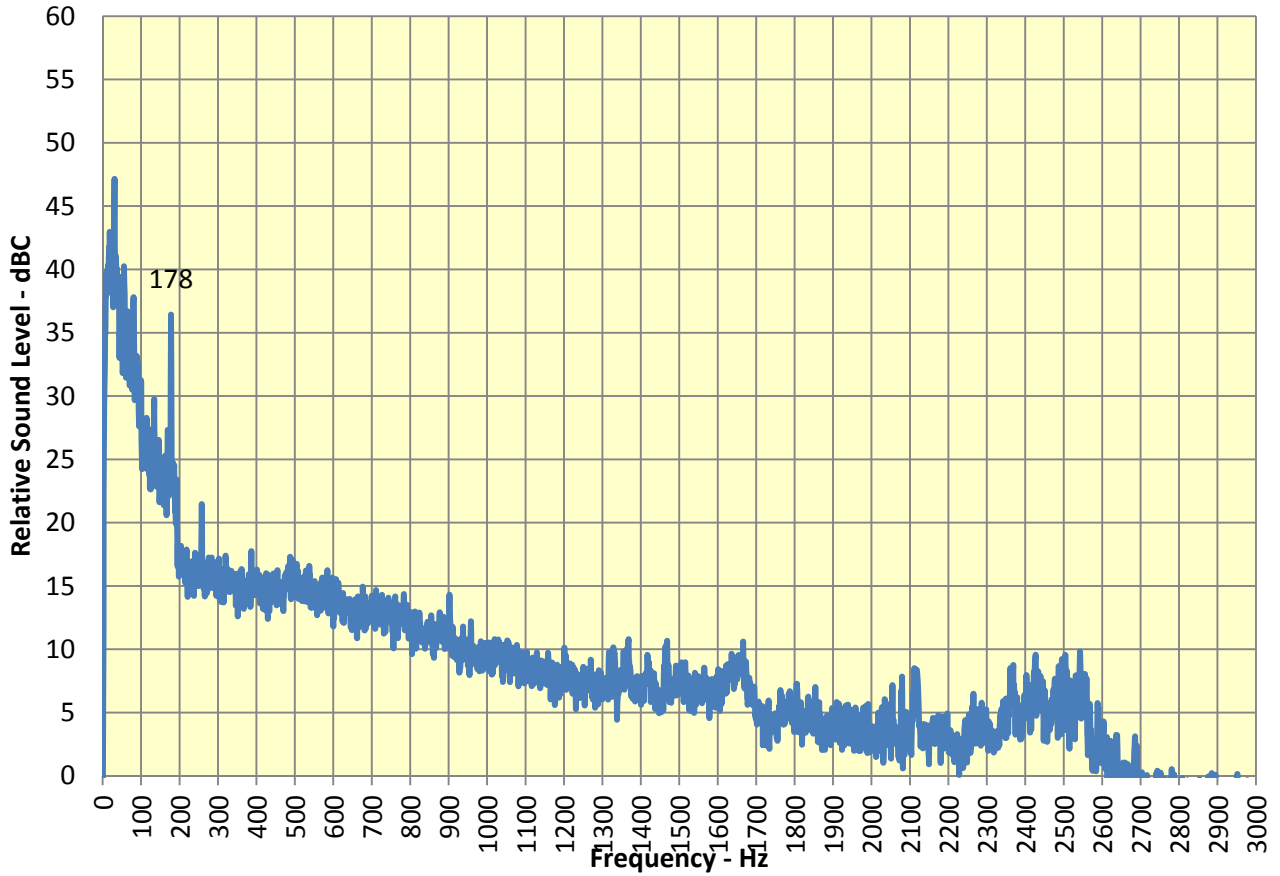
**Figure 4.80: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 19/9/17 8:49am F675 early**



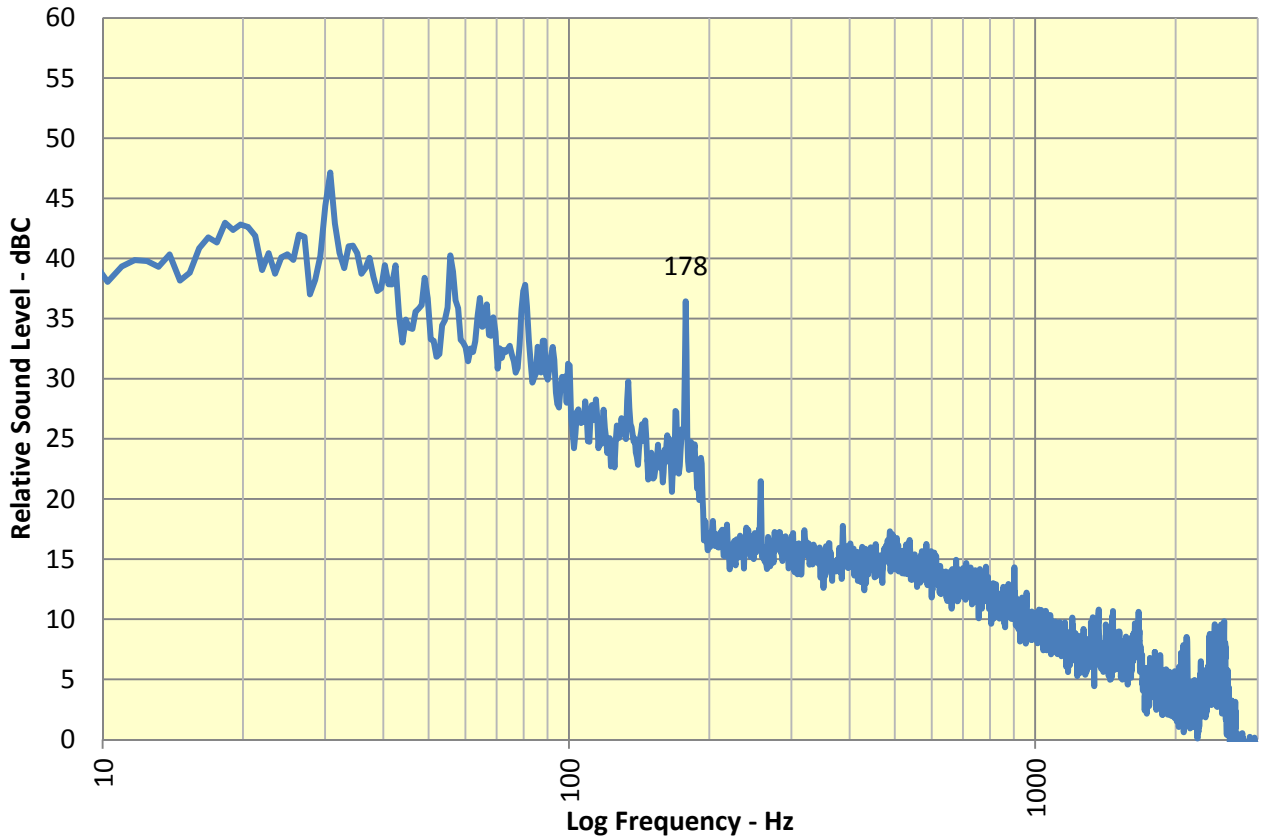
**Figure 4.80A: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 19/9/17 8:49am F675 early**



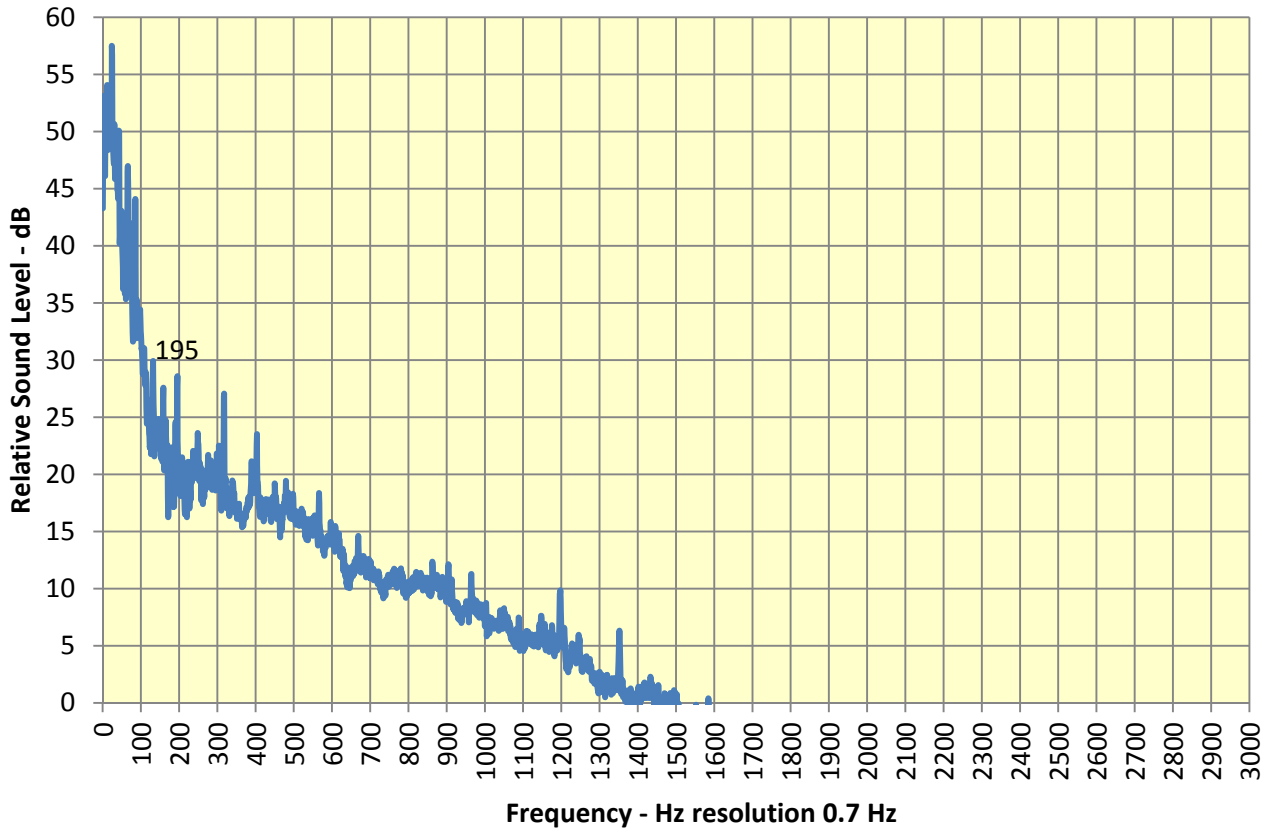
**Figure 4.81: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 19/9/17 8:49am F675 late**



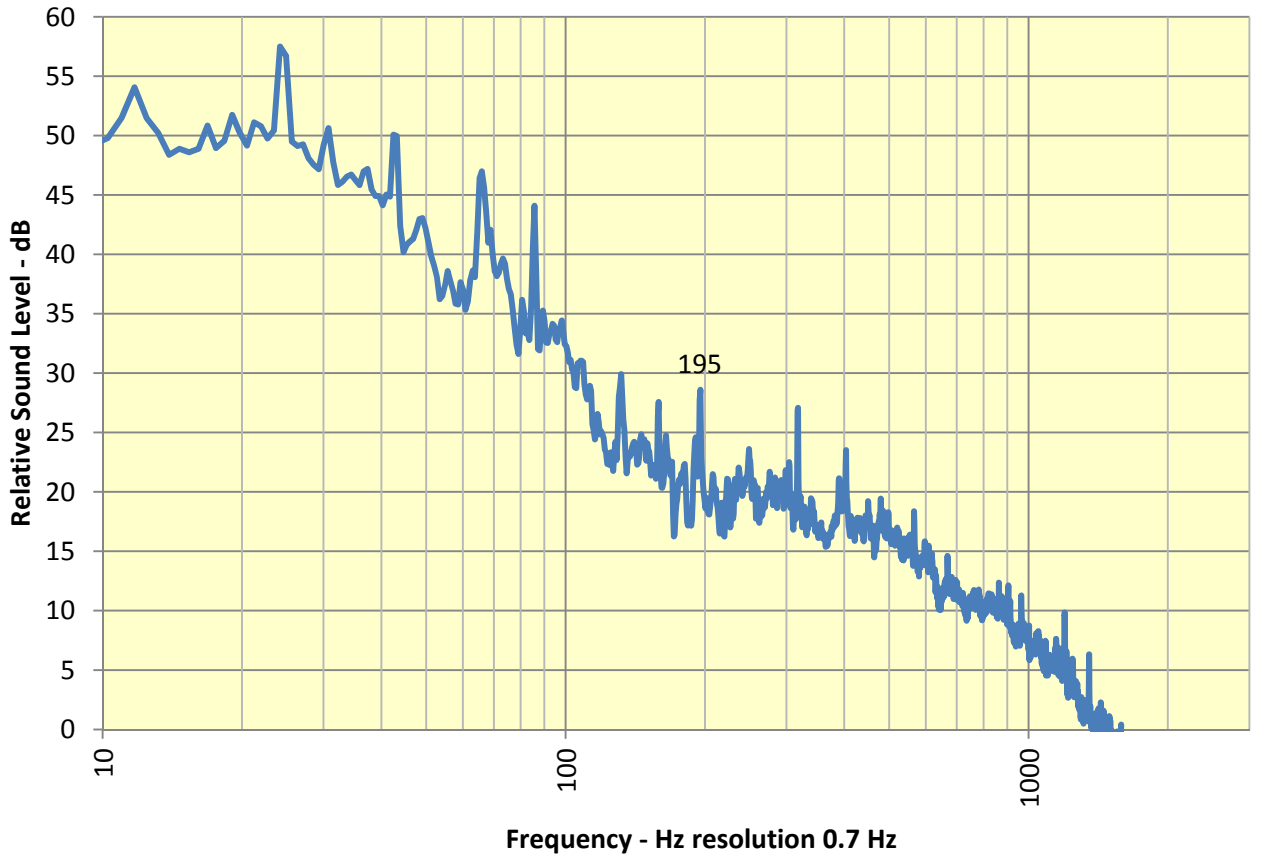
**Figure 4.81A: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 19/9/17 8:49am F675 late**



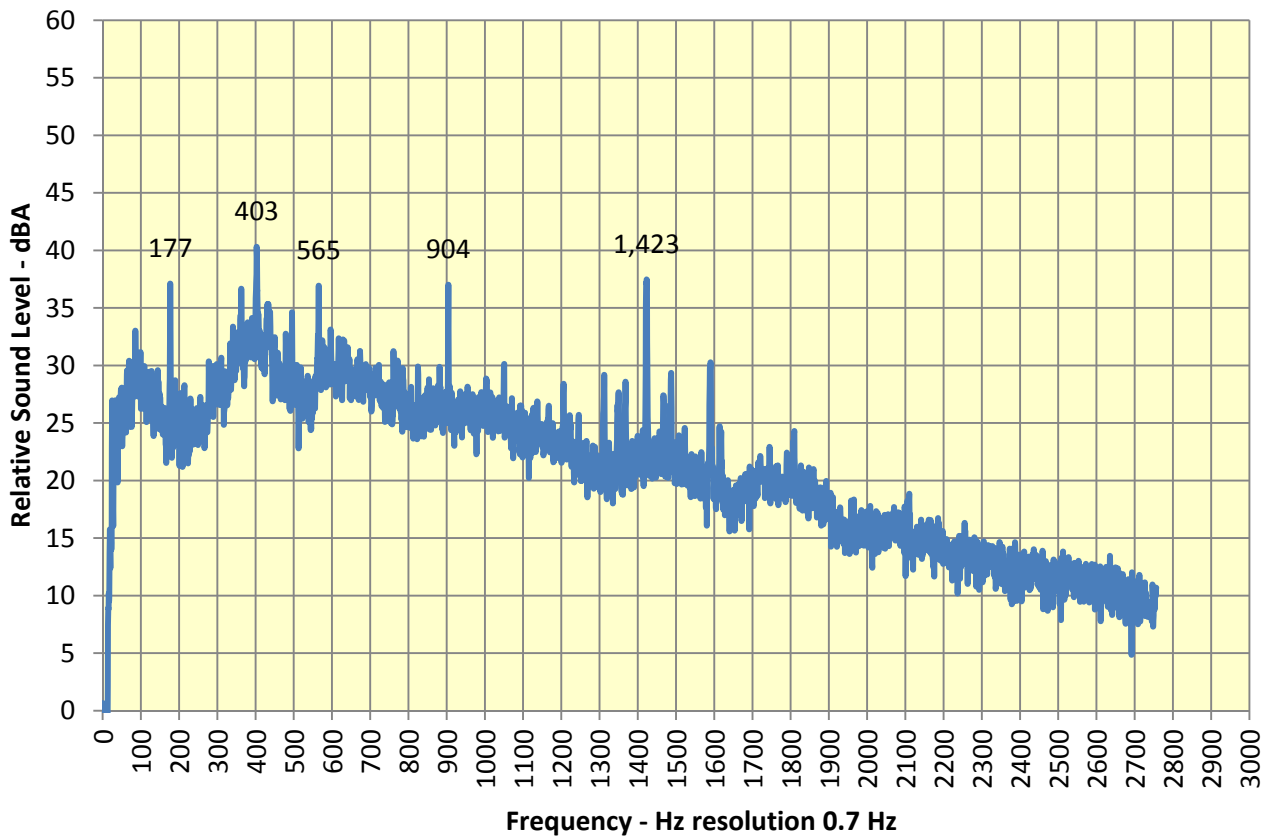
**Figure 4.82: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Northern Fence 19/9/17 11:20am**



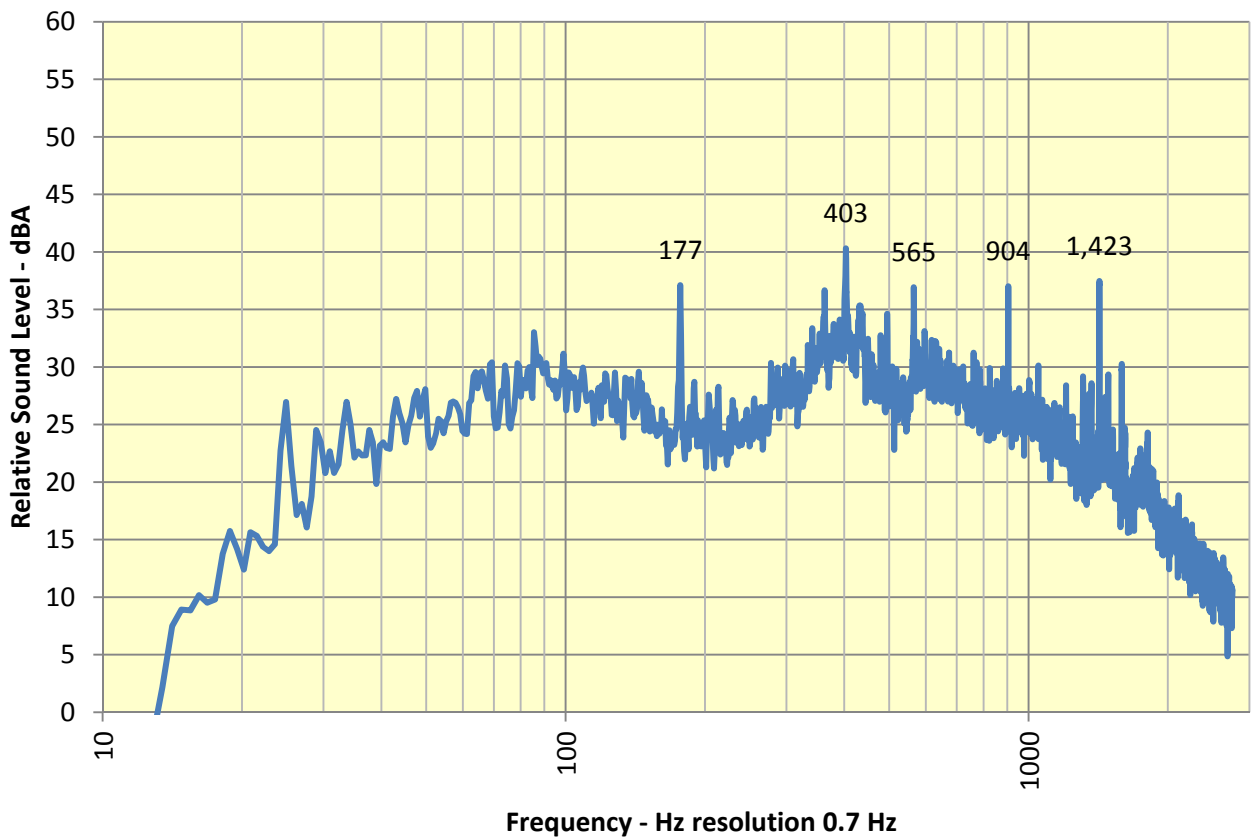
**Figure 4.82: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Northern Fence 19/9/17 11:20am**



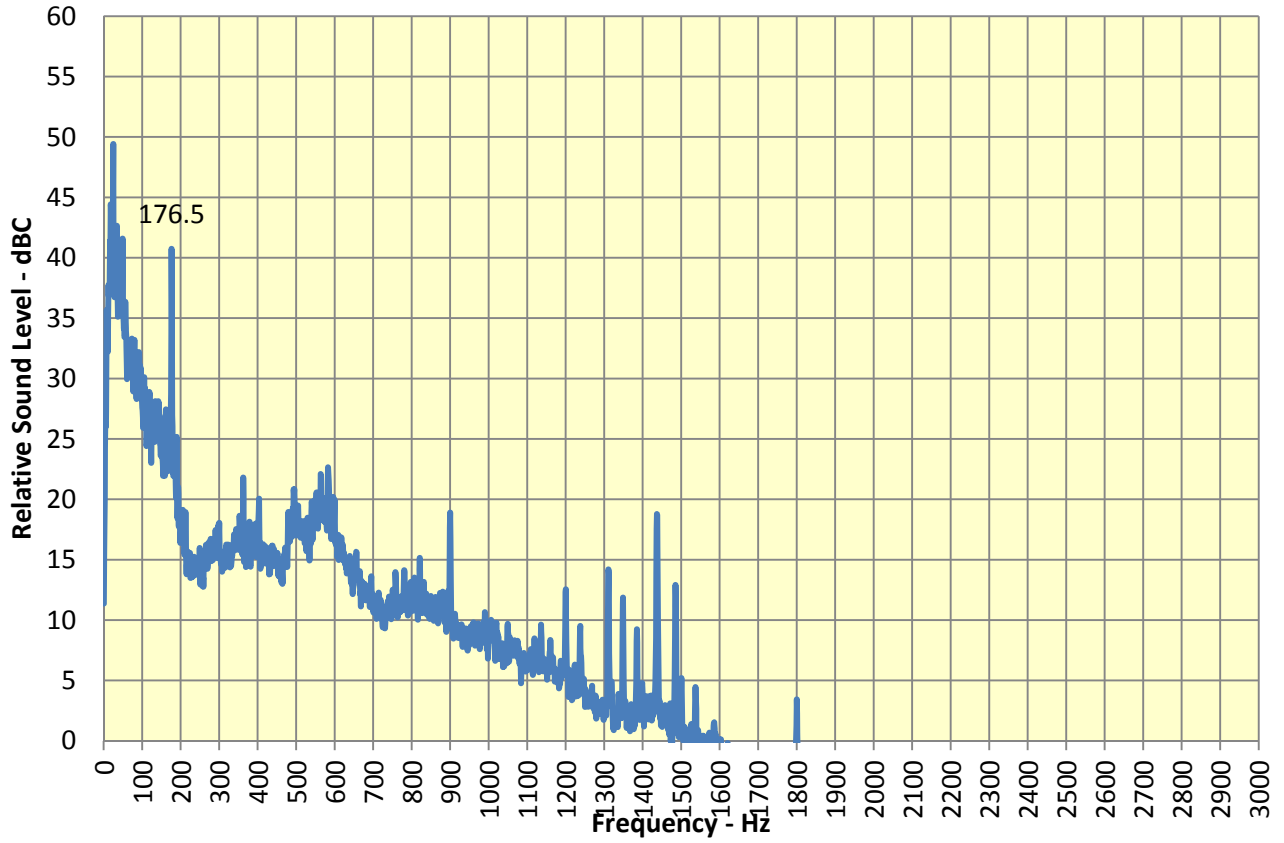
**Figure 4.83: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Northern Fence 6/10/17 9:10 am**



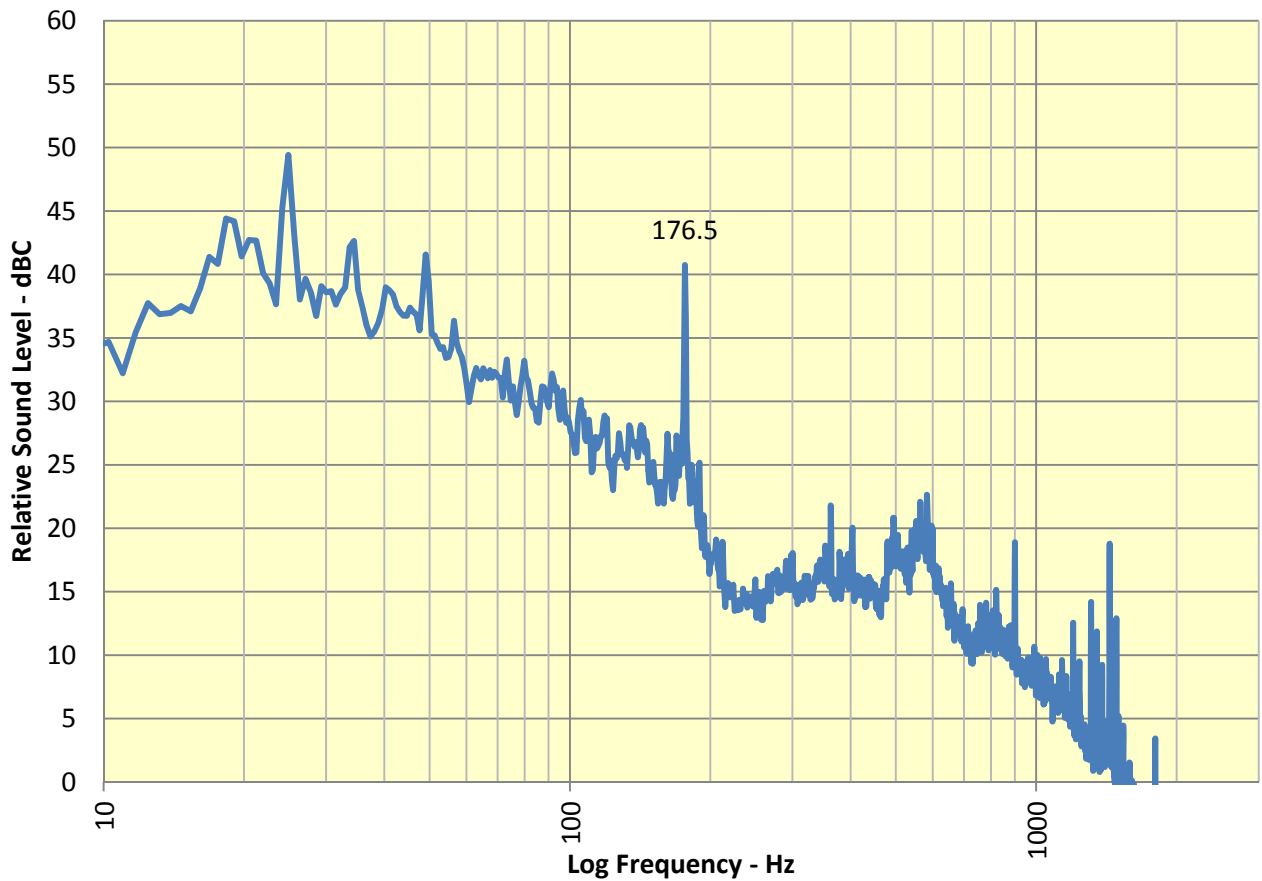
**Figure 4.83A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Northern Fence 6/10/17 9:10 am**



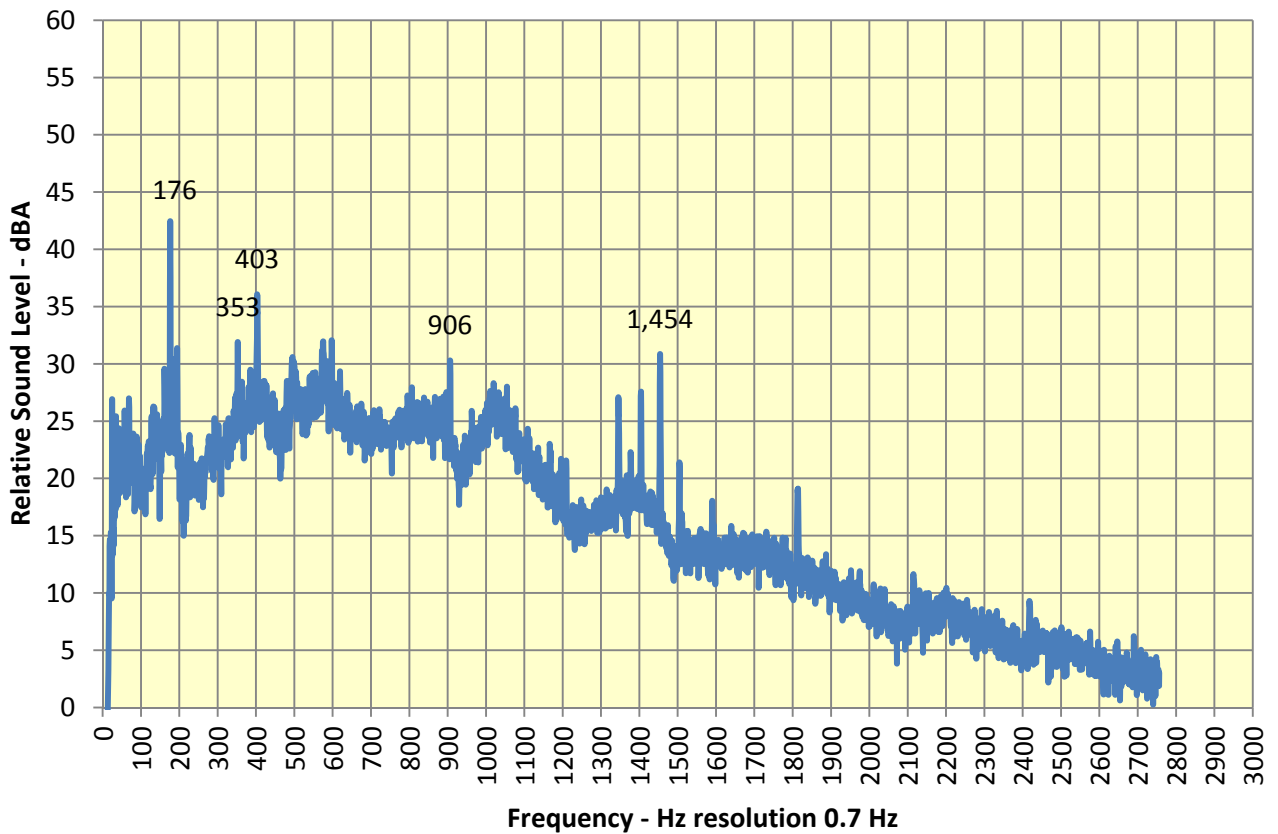
**Figure 4.84: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 6/10/17 9:36am F685**



**Figure 4.84A: Boral Cement Berrima Narrow band frequency analysis
Northern Boundary 6/10/17 9:36am F685**



**Figure 4.85: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 Northern Fence 16/10/17 11:49pm**



**Figure 4.85A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Night time
 Northern Fence 16/10/17 11:49pm**

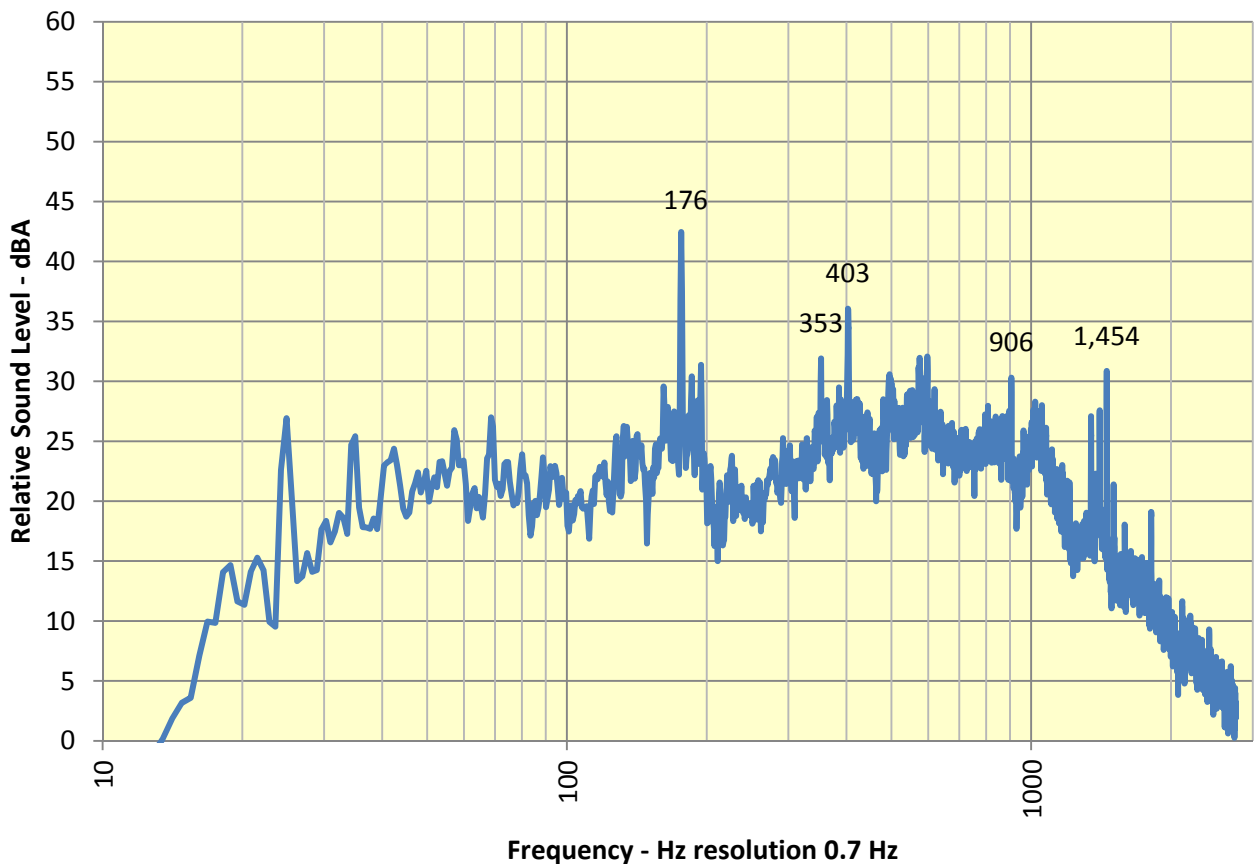


Figure 4.86: Boral Cement Berrima Narrow band frequency analysis
Store Yard Close 19/9/17 10:56am F676

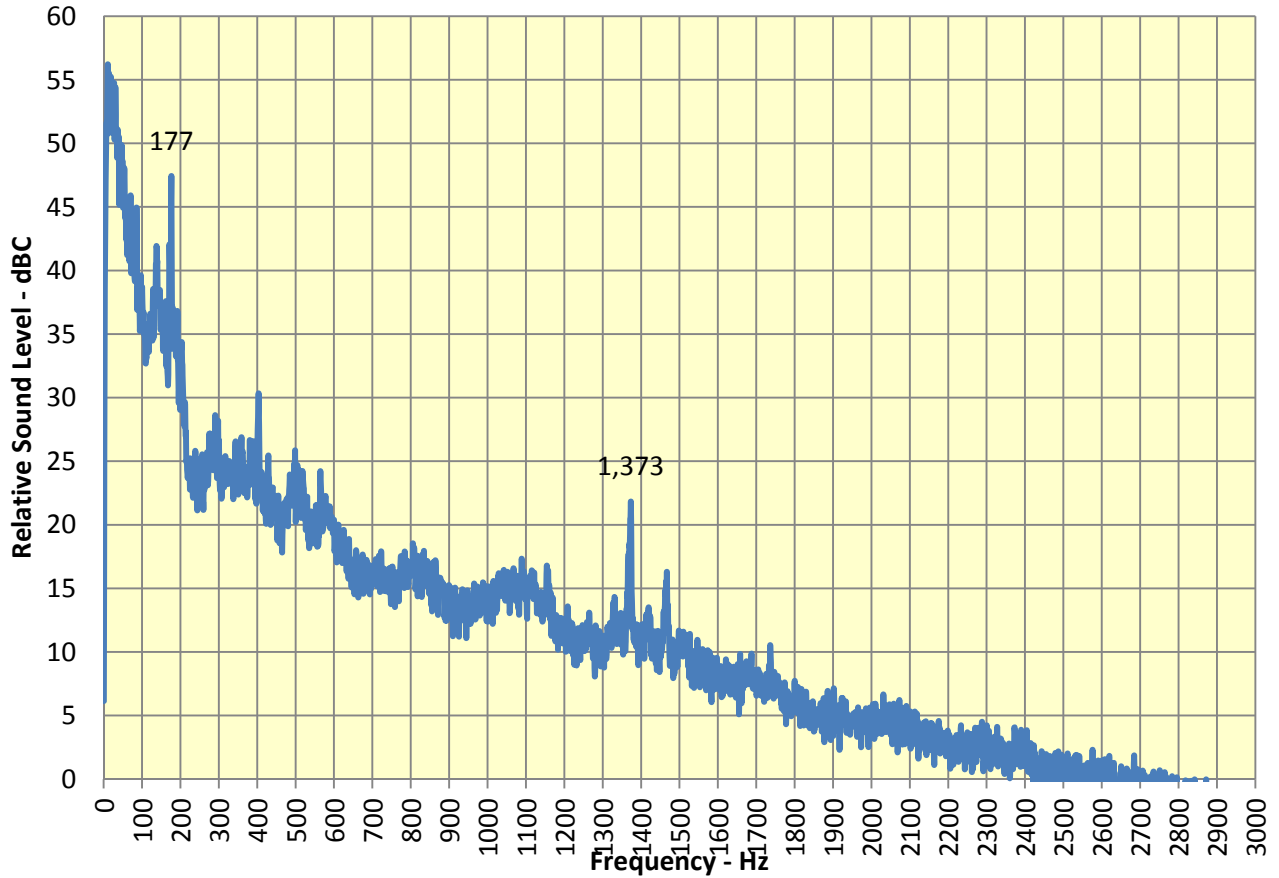
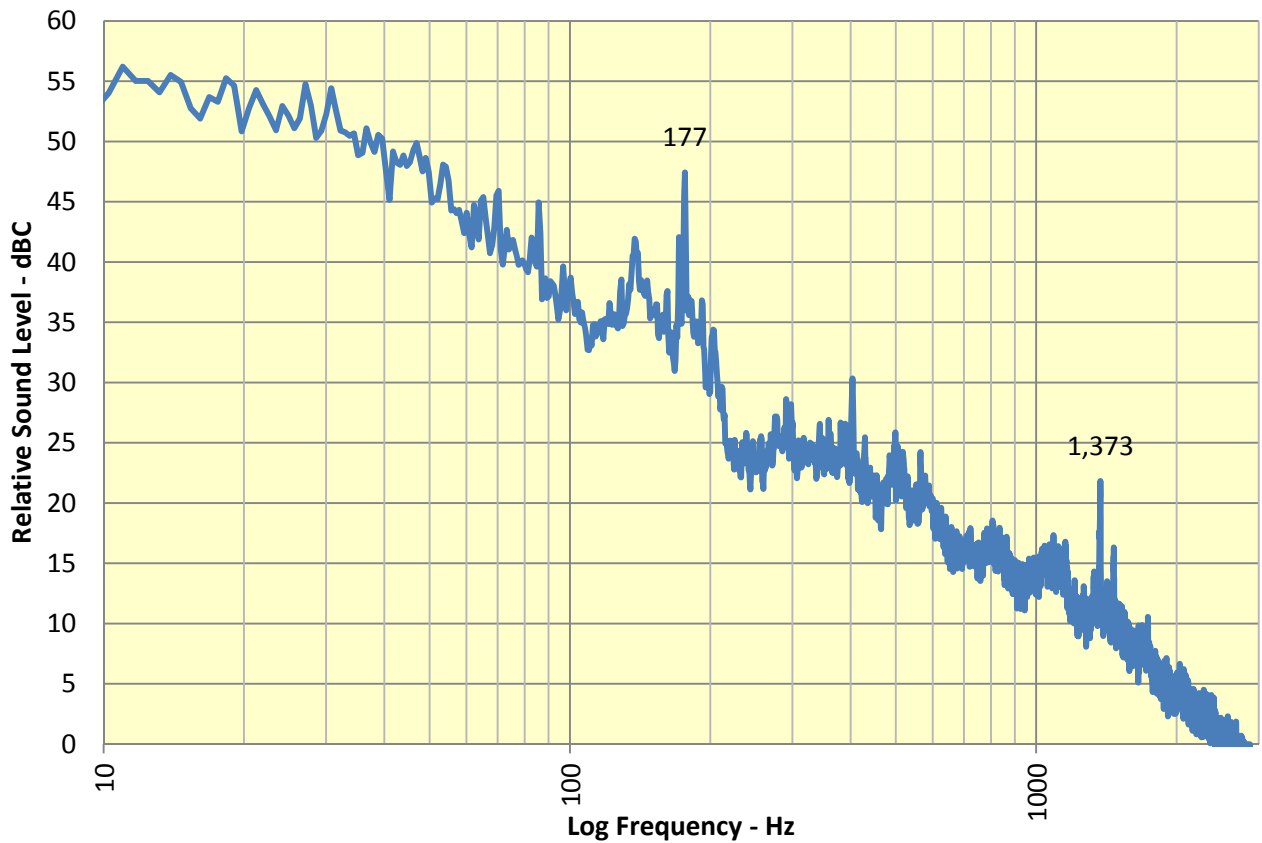
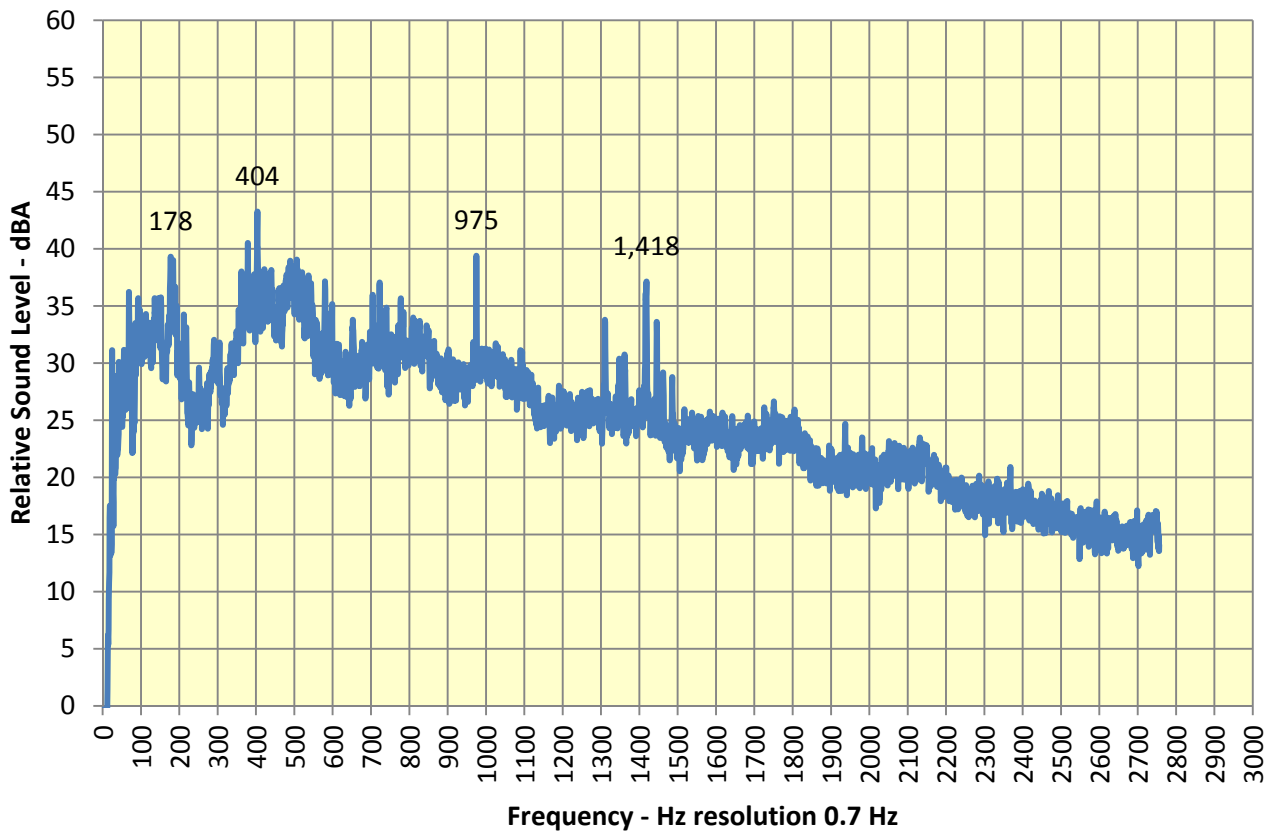


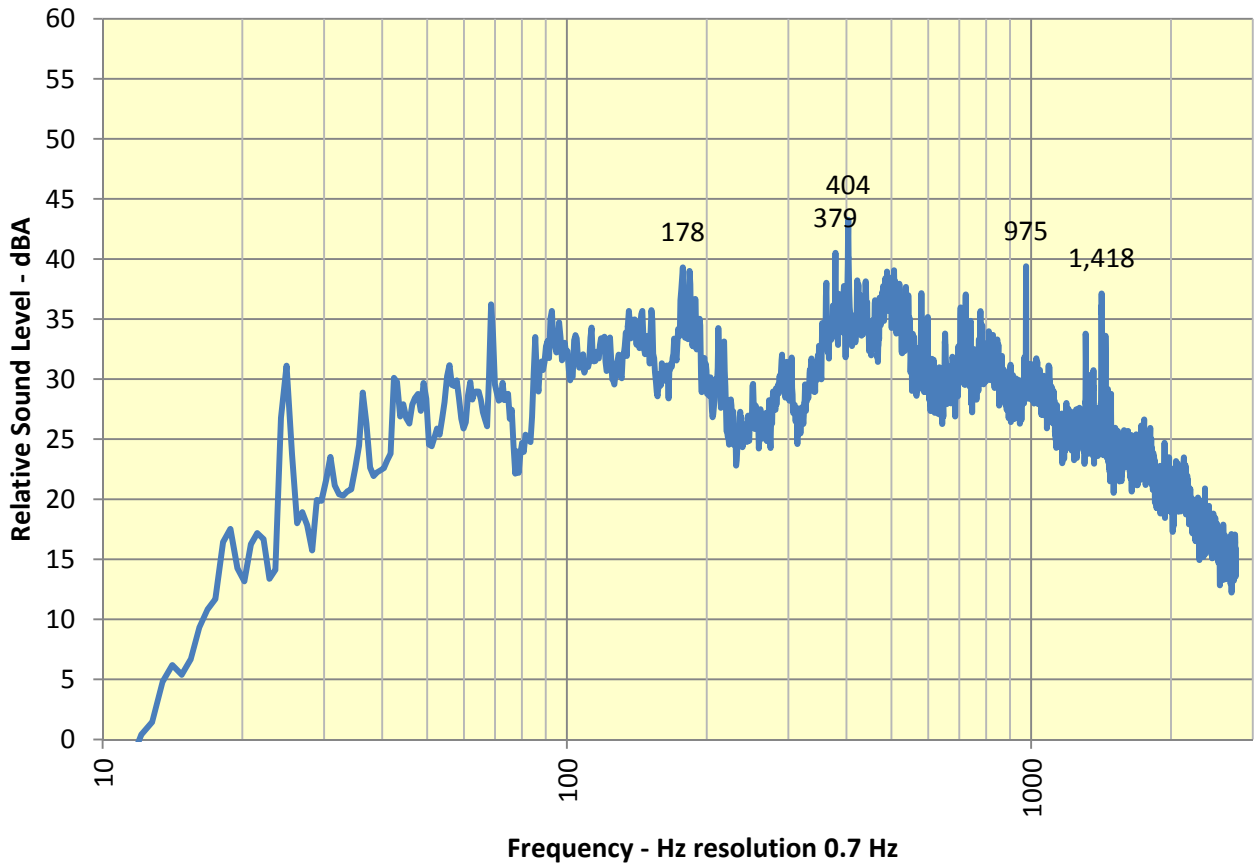
Figure 4.86A: Boral Cement Berrima Narrow band frequency analysis
Store Yard Close 19/9/17 10:56am F676



**Figure 4.87: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Stock Yard 6/10/17 12:30pm**



**Figure 4.87A: Boral Cement Berrima Annual Environmental Noise -
 Attended monitoring narrow-band spectrum Day time
 Stock Yard 6/10/17 12:30pm**



APPENDIX 2 – COMMUNITY COMPLAINTS REGISTER APRIL 2018



Boral Cement Berrima Cement Works - Community Complaints Licence Year 1st May 2017 to 30th April 2018

Incident No.	Incident Date	Person Type	Risk Rating	Incident Type	Incident Description
17-26377	15/05/2017	Public	Low	Environment	Received text message that resident reported dust on the car. Car was washed the day before.
17-26378	16/05/2017	Public	Low	Environment	Resident sent a text at 7:30 am regarding dust on the car.
17-26379	18/05/2017	Public	Low	Environment	Resident called reception to report dust on car. He left a contact phone number.
17-34334	18/06/2017	Public	Medium	Environment	Community complaint - dust on car.
17-34225	20/06/2017	Public	Medium	Environment	Community complaint - dust on cars.
17-34248	20/06/2017	Public	Medium	Environment	Community complaint - dust on car.
17-34250	21/06/2017	Public	Medium	Environment	Community complaint - dust on car.
17-34253	23/06/2017	Public	Medium	Environment	Community complaint - dust on car.
17-34254	27/06/2017	Public	Medium	Environment	Community complaint - dust on car.
17-46675	25/08/2017	Public	Low	Near Miss, Environment	Resident called to complain about dust on the car deposit over night.
17-46679	27/08/2017	Public	Low	Near Miss, Environment	Resident sent SMS regarding dust on car overnight. Dust was very fine and grey color but not gritty.
17-52021	04/09/2017	Public	Low	Near Miss, Environment	Resident called to complain about dust on the car.
17-48401	11/09/2017	Public	Low	Environment	Dust Complaint received from resident of New Berrima regarding dust on car.
17-58927	27/10/2017	Public	Low	Environment	Resident sent an SMS that she found clinker dust on her car in the morning. She had to leave for work but the car was on the driveway.
17-69020	06/12/2017	Public	Low	Environment	Resident called to report dust on her car in the form of milky white powder. There was some wet weather during the night before.
18-5173	07/01/2018	Public	Low	Environment	Resident sent SMS to complain about dust on the car.
18-19503	08/04/2018	Public	Low	Near Miss, Environment	Resident called to report dust on her car deposited on Saturday night.
18-21657	28/04/2018	Public	Low	Environment	Resident from New Berrima send SMS to report dust on the car (milky white).
18-21662	28/04/2018	Public	Low	Environment	Resident from New Berrima called and left message on reception answering machine to report dust on car for the night on 27/5/18.
18-21659	29/04/2018	Public	Low	Environment	Resident from New Berrima sent SMS about dust on her car from the night of Sat 28/4/18.

APPENDIX 3 – ANNUAL TESTING COMPLIANCE REPORT



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MITCHAM VIC 3132

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52 Cooper Road
COCKBURN CENTRAL WA 6164

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ABN: 86 600 381 413

Report Number R004658-1

**Annual Emission Testing Compliance Report
Boral Cement Ltd, Berrima**

Document Information

Client Name: Boral Cement Ltd, Berrima
 Report Number: R004658-1
 Date of Issue: 8 September 2017
 Attention: Gabriel Paicu
 Address: Taylor Avenue
 NEW BERRIMA NSW 2577
 Testing Laboratory: Ektimo (ETC) ABN 74 474 273 172

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
Preliminary Report	-	-	-	-	-
Draft Report	R004658-1[DRAFT]	5 September 2017	JWe/ADo	ADa	SCo
Final Report	R004658-1	8 September 2017	JWe/ADo	ADa	SCo
Amend Report	-	-	-	-	-

Template Version: 170714

Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Report Authorisation



Aaron Davis
Client Manager

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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1 EXECUTIVE SUMMARY

Ektimo was engaged by Boral Cement Ltd (Berrima) to perform air emission monitoring as requested.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 2 – No.6 Kiln Stack	13 July 2017	Nitrogen oxides, carbon dioxide, oxygen
	14 July 2017	Solid particles, fine particulates (PM ₁₀) by particle size analysis (PSA), coarse particulates, hazardous substances – metals (type 1 & 2 substances Sb, As, Cd, Pb, Hg, Be,Cr, Co, Mn, Ni, Se, V, Sn)
EPA 4 – No.6 Cement Mill Stack Duct 1	11 July 2017	Solid particles
EPA 4 – No.6 Cement Mill Stack Duct 2	11 July 2017	
EPA 5 – No. 6 Kiln Cooler Stack	18 July 2017	
EPA 10 – No.7 Cement Mill Stack	12 July 2017	

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated

The sampling methodologies chosen by Ektimo are those recommended by the NSW Office of Environment and Heritage (as specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007*).

All results are reported on a dry basis at STP. Unless otherwise indicated, the methods cited in this report have been performed without deviation.

Plant operating conditions have been noted in the report.

2 LICENCE COMPARISON

The following licence comparison table shows that all analytes highlighted in green are below the licence limit set by the NSW EPA as per licence 1698 (last amended on 23/12/2016).


EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 10% O ₂)
EPA 2 - Kiln Stack No. 6	Mercury	mg/m ³	0.1	0.0068	0.0054
	Hazardous substances	mg/m ³	1.0	<0.03	<0.03
	Solid particles	mg/m ³	95	16	12
	Nitrogen oxides	mg/m ³	1000	780	690
	Cadmium	mg/m ³	0.1	<0.0003	<0.0002
EPA 4 - Cement Mill Stack No.6 Duct 1	Solid particles	mg/m ³	100	29	NA
EPA 4 - Cement Mill Stack No.6 Duct 2	Solid particles	mg/m ³	100	3.8	NA
EPA 5 - Kiln Cooler Stack No. 6	Solid particles	mg/m ³	100	6.9	NA
EPA 10 - Cement Mill Stack No.7	Solid particles	mg/m ³	20	15	NA

3 RESULTS

3.1 EPA 2 – No.6 Kiln Stack

Date	13-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal




Stack Parameters			
Moisture content, %v/v	11		
Gas molecular weight, g/g mole	30.4 (wet)	32.0 (dry)	
Gas density at STP, kg/m ³	1.36 (wet)	1.43 (dry)	
% Oxygen correction & Factor	10 %	0.88	

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	0840 & 1455
Temperature, °C	110
Velocity at sampling plane, m/s	27
Volumetric flow rate, discharge, m ³ /s	190
Volumetric flow rate (wet STP), m ³ /s	130
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	630000

Gas Analyser Results	Sampling time	Average 0942-1041			Minimum 0942-1041			Maximum 0942-1041		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Combustion Gases										
Nitrogen oxides (as NO ₂)		780	690	89	650	580	75	910	810	100
		Concentration %			Concentration %			Concentration %		
Carbon dioxide		21.8			21.1			22.3		
Oxygen		8.6			8.5			8.8		

Date	14-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal



Stack Parameters		
Moisture content, %v/v	11	
Gas molecular weight, g/g mole	30.8 (wet)	32.5 (dry)
Gas density at STP, kg/m ³	1.38 (wet)	1.45 (dry)
% Oxygen correction & Factor	10 %	0.78

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	0845 & 1105
Temperature, °C	129
Velocity at sampling plane, m/s	26
Volumetric flow rate, discharge, m ³ /s	180
Volumetric flow rate (wet STP), m ³ /s	120
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	590000

Isokinetic Results	Sampling time	Average			Test 1 855-1100			Test 2 855-1100		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Solid Particles		16	12	1.6	16	12	1.7	15	12	1.6
Fine particulates (PM10)	(PSA)	9.7	7.6	1	9	7	0.95	10	8.2	1.1
Coarse Particulates		5.8	4.6	0.62	7	5.5	0.74	4.7	3.7	0.5

Isokinetic Sampling Parameters	
Sampling time, min	120
Isokinetic rate, %	99
Velocity difference, %	4

Date	14-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details

Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal

**Stack Parameters**

Moisture content, %v/v	11	
Gas molecular weight, g/g mole	30.9 (wet)	32.5 (dry)
Gas density at STP, kg/m ³	1.38 (wet)	1.45 (dry)
% Oxygen correction & Factor	10 %	0.79

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1105 & 1320
Temperature, °C	130
Velocity at sampling plane, m/s	26
Volumetric flow rate, discharge, m ³ /s	180
Volumetric flow rate (wet STP), m ³ /s	120
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	600000

Isokinetic Results

Sampling time	Average			Test 1 1110-1315			Test 2 1110-1315		
	Concentration mg/m ³	Corrected to		Concentration mg/m ³	Corrected to		Concentration mg/m ³	Corrected to	
		10% O2 mg/m ³	Mass Rate g/s		10% O2 mg/m ³	Mass Rate g/s		10% O2 mg/m ³	Mass Rate g/s
Antimony	<0.003	<0.002	<0.0003	<0.003	<0.003	<0.0004	<0.003	<0.002	<0.0003
Arsenic	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0001
Cadmium	<0.0003	<0.0002	<0.00003	<0.0003	<0.0003	<0.00004	<0.0003	<0.0002	<0.00003
Lead	0.0038	0.003	0.00041	0.006	0.0047	0.00064	0.0016	0.0013	0.00018
Mercury	0.0068	0.0054	0.00073	0.0063	0.0049	0.00067	0.0074	0.0058	0.00079
Beryllium	<0.0007	<0.0005	<0.00007	<0.0007	<0.0006	<0.00008	<0.0007	<0.0005	<0.00007
Chromium	0.0018	0.0014	0.00019	0.0029	0.0023	0.00031	0.00061	0.00048	0.000065
Cobalt	<0.0005	<0.0004	<0.00006	<0.0005	<0.0004	<0.00006	<0.0005	<0.0004	<0.00005
Manganese	0.0073	0.0057	0.00078	0.0074	0.0058	0.00079	0.0072	0.0056	0.00076
Nickel	0.0014	0.0011	0.00015	0.0012	0.00097	0.00013	0.0017	0.0013	0.00018
Selenium	≤0.0042	≤0.0033	≤0.00045	0.0041	0.0033	0.00044	<0.004	<0.003	<0.0005
Vanadium	<0.0008	<0.0006	<0.00009	<0.0008	<0.0007	<0.00009	<0.0008	<0.0006	<0.00008
Tin	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0001
Hazardous Substances									
Upper Bound									
Total Type 1 Substances	<0.02	<0.01	<0.002	≤0.017	≤0.014	≤0.0019	≤0.014	≤0.011	≤0.0015
Total Type 2 Substances	<0.02	<0.01	<0.002	≤0.019	≤0.015	≤0.0021	≤0.017	≤0.013	≤0.0018
Total Type 1 & 2 Substances	<0.03	<0.03	<0.004	≤0.037	≤0.029	≤0.0039	≤0.031	≤0.024	≤0.0033
Isokinetic Sampling Parameters									
Sampling time, min				120			120		
Isokinetic rate, %				96			99		
Velocity difference, %				-2			-2		

3.2 EPA 4 – No.6 Cement Mill Stack Duct 1

Date	11-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 4: No.6 Cement Mill Stack Duct 1
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Testing paused from 1002 to 1050 for mill stoppage		

Sampling Plane Details

Sampling plane dimensions	1160 x 1160 mm
Sampling plane area	1.35 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Stairs 20 m
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 0.5 D
No. traverses & points sampled	3 15
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters

Moisture content, %v/v	3.1	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	0920 & 1135
Temperature, °C	77
Velocity at sampling plane, m/s	17
Volumetric flow rate, discharge, m ³ /s	22
Volumetric flow rate (wet STP), m ³ /s	16
Volumetric flow rate (dry STP), m ³ /s	15
Mass flow rate (wet basis), kg/hour	73000

Isokinetic Results

Sampling time	Average		Test 1 930-1133		Test 2 930-1133	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	29	0.45	35	0.53	24	0.36
Isokinetic Sampling Parameters						
Sampling time, min			75		75	
Isokinetic rate, %			94		103	
Velocity difference, %			2		2	

3.3 EPA 4 – No.6 Cement Mill Stack Duct 2

Date	11-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 4: No.6 Cement Mill Stack Duct 2
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details

Sampling plane dimensions	700 x 1160 mm
Sampling plane area	0.812 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Stairs 20 m
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 0.5 D
No. traverses & points sampled	3 9
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters

Moisture content, %v/v	3.2	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1135 & 1250
Temperature, °C	81
Velocity at sampling plane, m/s	17
Volumetric flow rate, discharge, m ³ /s	14
Volumetric flow rate (wet STP), m ³ /s	9.9
Volumetric flow rate (dry STP), m ³ /s	9.6
Mass flow rate (wet basis), kg/hour	46000

Isokinetic Results

Sampling time	Average		Test 1 1140-1245		Test 2 1140-1245	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	3.8	0.037	3.6	0.034	4	0.039
Isokinetic Sampling Parameters						
Sampling time, min			63		63	
Isokinetic rate, %			99		101	
Velocity difference, %			<1		<1	

3.4 EPA 5 – No.6 Kiln Cooler Stack

Date	18-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 5: No.6 Kiln Cooler Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Steven Weekes, Ryan Collins	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	2400 mm
Sampling plane area	4.52 m ²
Sampling port size, number	4" Flange (x2)
Access & height of ports	Stairs 25 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 5 D
Upstream disturbance	Junction 6 D
No. traverses & points sampled	2 16
Sample plane compliance to AS4323.1	Satisfactory

Comments
The discharge is assumed to be composed of dry air and moisture

Stack Parameters		
Moisture content, %v/v	1.5	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1015 & 1155	
Temperature, °C	99	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, discharge, m ³ /s	70	
Volumetric flow rate (wet STP), m ³ /s	47	
Volumetric flow rate (dry STP), m ³ /s	47	
Mass flow rate (wet basis), kg/hour	220000	

Isokinetic Results	Sampling time	Average		Test 1 1020-1140		Test 2 1020-1141	
		Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles		6.9	0.32	9.2	0.43	4.6	0.22
Isokinetic Sampling Parameters							
Sampling time, min				80		80	
Isokinetic rate, %				100		96	
Velocity difference, %				<1		<1	

3.5 EPA 10 – No.7 Cement Mill Stack

Date	12-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 10: No.7 Cement Mill Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Steven Weekes	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details

Sampling plane dimensions	1520 x 1800 mm
Sampling plane area	2.74 m ²
Sampling port size, number	3" BSP (x5)
Access & height of ports	Stairs
Duct orientation & shape	Inclined Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 2 D
No. traverses & points sampled	5 20
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

Stack Parameters

Moisture content, %v/v	2.8	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1020 & 1214
Temperature, °C	90
Velocity at sampling plane, m/s	6.4
Volumetric flow rate, discharge, m ³ /s	18
Volumetric flow rate (wet STP), m ³ /s	12
Volumetric flow rate (dry STP), m ³ /s	12
Mass flow rate (wet basis), kg/hour	57000

Isokinetic Results

Sampling time	Average		Test 1 1030-1210		Test 2 1030-1210	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	15	0.18	19	0.22	12	0.14
Isokinetic Sampling Parameters						
Sampling time, min			100		100	
Isokinetic rate, %			98		100	
Velocity difference, %			<1		<1	

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Boral Cement Ltd (Berrima)'s records for complete process conditions.

5 TEST METHODS

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	-	✓	NA
Molecular weight	NSW TM-23	USEPA 3A	not specified	✓	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Temperature	NSW TM-2	NA	2%	✓	NA
Flow rate	NSW TM-2	NA	8%	✓	NA
Velocity	NSW TM-2	NA	7%	✓	NA
Solid particles	NSW TM-15	NSW TM-15	5%	✓	✓
Coarse particulates	NSW OM-9	NSW OM-9	not specified	✓	✓
Particulate matter < 10µm (PM ₁₀) by particle size analysis	-	HRL In-house	-	-	x ¹
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse	15%	✓	✓ ²
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse	15%	✓	✓ ²
Nitrogen oxides (NO _x)	NSW TM-11	NSW TM-11	12%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

1. Analysis performed by HRL Technology using a Malvern Instruments Mastersizer laser particle size analyser. NATA Accreditation does not cover the performance of this service.
2. Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 28/7/17 in report number 171838

6 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

Ektimo (EML) and Ektimo (ETC) are accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo (EML) and Ektimo (ETC) are accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025. – General Requirements for the Competence of Testing and Calibration Laboratories. ISO/IEC 17025 requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Compliance Manager.

NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.

A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

7 DEFINITIONS

The following symbols and abbreviations may be used in this test report:

STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PM ₁₀	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
BSP	British standard pipe
NT	Not tested or results not required
NA	Not applicable
D ₅₀	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. The D ₅₀ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D ₅₀ of that cyclone and less than the D ₅₀ of the preceding cyclone.
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
DER	WA Department of Environment & Regulation
DECC	Department of Environment & Climate Change (NSW)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
NATA	National Association of Testing Authorities
RATA	Relative Accuracy Test Audit
AS	Australian Standard
USEPA	United States Environmental Protection Agency
Vic EPA	Victorian Environment Protection Authority
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
CARB	Californian Air Resources Board
TM	Test Method
OM	Other approved method
CTM	Conditional test method
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
NIOSH	National Institute of Occupational Safety and Health
XRD	X-ray Diffractometry

APPENDIX 4 – ANNUAL EMISSION TESTING NPI REPORT



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Report Number R004658

**Annual Emission Testing NPI Report
Boral Cement Ltd, Berrima**

Document Information

Client Name: Boral Cement Ltd (Berrima)
 Report Number: R004658
 Date of Issue: 8 September 2017
 Attention: Gabriel Paicu
 Address: Taylor Avenue
 NEW BERRIMA NSW 2577
 Testing Laboratory: Ektimo (ETC) ABN 74 474 273 172

Report Status

Format	Document Number	Report Date	Prepared By	Reviewed By (1)	Reviewed By (2)
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Amend Report	-	-	-	-	-

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Amendment Record

Document Number	Initiator	Report Date	Section	Reason
Nil	-	-	-	-

Report Authorisation



Aaron Davis
Client Manager

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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1 EXECUTIVE SUMMARY

Ektimo was engaged by Boral Cement Ltd (Berrima) to perform air emission monitoring as requested.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 2 – No.6 Kiln Stack	13 July 2017	Speciated volatile organic compounds (VOC), nitrogen oxides, carbon monoxide, carbon dioxide, oxygen, dioxins and furans (PCDD & PCDF), polycyclic aromatic hydrocarbons (PAH's)
	14 July 2017	Solid particles, fine particulates (PM ₁₀) by particle size analysis (PSA), fine particulates (PM _{2.5}) by particle size analysis (PSA), coarse particulates, sulfur dioxide, sulfur trioxide, metals (type 1 & 2) including copper, zinc and thallium
	17 July 2017	Total fluoride, hydrogen chloride, chlorine, hexavalent chromium
EPA 4 – No.6 Cement Mill Duct 1	11 July 2017	Solid particles
EPA 4 – No.6 Cement Mill Duct 2	11 July 2017	
EPA 5 – No. 6 Kiln Cooler Stack	18 July 2017	
EPA 10 – No.7 Cement Mill Stack	12 July 2017	

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated

The sampling methodologies chosen by Ektimo are those recommended by the NSW Office of Environment and Heritage (as specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007*).

All results are reported on a dry basis at STP. Unless otherwise indicated, the methods cited in this report have been performed without deviation.

Plant operating conditions have been noted in the report.

2 RESULTS SUMMARY


EPA	Parameter	Units	Detected values 11-18 July 2017	Detected values (corrected to 10% O ₂)
EPA 2 - Kiln Stack No. 6	Mercury	mg/m ³	0.0068	0.0054
	Cadmium	mg/m ³	<0.0003	<0.0002
	Hazardous substances (Type 1 + 2)	mg/m ³	<0.03	<0.03
	Copper	mg/m ³	0.00084	0.00066
	Thallium	mg/m ³	<0.001	<0.001
	Zinc	mg/m ³	0.011	0.0089
	Solid particles	mg/m ³	16	12
	Coarse particulates	mg/m ³	5.8	4.6
	PM ₁₀ (by PSA)	mg/m ³	9.7	7.6
	PM _{2.5} (by PSA)	mg/m ³	4.4	3.4
	Nitrogen oxides	mg/m ³	780	690
	Carbon dioxide	%	21.8	NA
	Oxygen	%	8.6	NA
	Carbon monoxide	mg/m ³	570	510
	Total fluoride	mg/m ³	<0.02	<0.02
	Chlorine	mg/m ³	<0.01	<0.009
	Hydrogen chloride	mg/m ³	2.3	1.9
	Sulfur trioxide	mg/m ³	1.5	1.2
	Sulfur dioxide	mg/m ³	≤0.024	≤0.019
	Hexavalent chromium	mg/m ³	<0.003	<0.003
	Total VOC (as n-propane)	mg/m ³	2.7	2.4
Dioxins & furans (I-TEQ middle bound)	ng/m ³	0.00047	0.00041	
PAHs (BaP-TEQ middle bound)	ng/m ³	120	100	
EPA 4 - Cement Mill Stack No.6 Duct 1	Solid particles	mg/m ³	29	NA
EPA 4 - Cement Mill Stack No.6 Duct 2	Solid particles	mg/m ³	3.8	NA
EPA 5 - Kiln Cooler Stack No. 6	Solid particles	mg/m ³	6.9	NA
EPA 10 - Cement Mill Stack No. 7	Solid particles	mg/m ³	15	NA

3 RESULTS

3.1 EPA 2 – No.6 Kiln Stack

Date	13-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal



Stack Parameters			
Moisture content, %v/v	11		
Gas molecular weight, g/g mole	30.4 (wet)	32.0 (dry)	
Gas density at STP, kg/m ³	1.36 (wet)	1.43 (dry)	
% Oxygen correction & Factor	10 %	0.88	
Gas Flow Parameters			
Flow measurement time(s) (hhmm)	0840 & 1455		
Temperature, °C	110		
Velocity at sampling plane, m/s	27		
Volumetric flow rate, discharge, m ³ /s	190		
Volumetric flow rate (wet STP), m ³ /s	130		
Volumetric flow rate (dry STP), m ³ /s	110		
Mass flow rate (wet basis), kg/hour	630000		

Gas Analyser Results	Sampling time	Average 0942-1041			Minimum 0942-1041			Maximum 0942-1041		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Combustion Gases										
Nitrogen oxides (as NO ₂)		780	690	89	650	580	75	910	810	100
Carbon monoxide		570	510	66	360	320	41	950	840	110
		Concentration %			Concentration %			Concentration %		
Carbon dioxide		21.8			21.1			22.3		
Oxygen		8.6			8.5			8.8		

Date	13-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Dioxins & Furans (PCDDs & PCDFs)	Sampling time	Average			Test 1			Test 2		
		Concentration ng/m ³	Corrected to		Concentration ng/m ³	Corrected to		Concentration ng/m ³	Corrected to	
			10% O2 ng/m ³	Mass Rate ng/min		10% O2 ng/m ³	Mass Rate ng/min		10% O2 ng/m ³	Mass Rate ng/min
2,3,7,8-TCDF		0.000063	0.000055	0.43	0.000033	0.000029	0.22	0.000092	0.000082	0.63
2,3,7,8-TCDD		<0.0003	<0.0002	<2	<0.0004	<0.0003	<3	<0.0001	<0.0001	<1
1,2,3,7,8-PeCDF		≤0.000015	≤0.000014	≤0.11	<0.00001	<0.000009	<0.07	0.000021	0.000019	0.15
2,3,4,7,8-PeCDF		≤0.00018	≤0.00016	≤1.2	<0.0001	<0.00009	<0.7	0.00027	0.00024	1.8
1,2,3,7,8-PeCDD		<0.00008	<0.00007	<0.6	<0.00008	<0.00007	<0.5	<0.00009	<0.00008	<0.6
1,2,3,4,7,8-HxCDF		<0.00002	<0.00002	<0.1	<0.000006	<0.000005	<0.04	<0.00004	<0.00003	<0.2
1,2,3,6,7,8-HxCDF		<0.00002	<0.00002	<0.2	<0.00001	<0.000009	<0.07	<0.00004	<0.00003	<0.2
2,3,4,6,7,8-HxCDF		<0.00001	<0.00001	<0.08	<0.000006	<0.000005	<0.04	<0.00002	<0.00002	<0.1
1,2,3,7,8,9-HxCDF		<0.000006	<0.000005	<0.04	<0.000006	<0.000005	<0.04	<0.000005	<0.000005	<0.04
1,2,3,4,7,8-HxCDD		<0.000009	<0.000008	<0.06	<0.00001	<0.000009	<0.07	<0.000009	<0.000008	<0.06
1,2,3,6,7,8-HxCDD		<0.000009	<0.000008	<0.06	<0.00001	<0.000009	<0.07	<0.000009	<0.000008	<0.06
1,2,3,7,8,9-HxCDD		<0.000009	<0.000008	<0.06	<0.00001	<0.000009	<0.07	<0.000009	<0.000008	<0.06
1,2,3,4,6,7,8-HpCDF		0.0000035	0.0000031	0.024	0.0000027	0.0000024	0.019	0.0000043	0.0000038	0.029
1,2,3,4,7,8,9-HpCDF		<0.000002	<0.000001	<0.01	<0.000002	<0.000002	<0.01	<0.000001	<0.000001	<0.009
1,2,3,4,6,7,8-HpCDD		0.0000051	0.0000045	0.035	0.0000037	0.0000032	0.025	0.0000066	0.0000058	0.045
OCDF		<0.0000002	<0.0000002	<0.001	<0.0000002	<0.0000002	<0.001	<0.0000002	<0.0000001	<0.001
OCDD		0.0000065	0.0000058	0.045	0.0000058	0.0000051	0.04	0.0000073	0.0000064	0.05
Total TCDF isomers		0.0077	0.0068	53	0.0035	0.0031	24	0.012	0.011	82
Total TCDD isomers		≤0.0013	≤0.0011	≤8.7	<0.002	<0.002	<10	0.0006	0.00053	4.1
Total PeCDF isomers		≤0.0023	≤0.002	≤16	<0.001	<0.001	<9	0.0032	0.0028	22
Total PeCDD isomers		<0.001	<0.0009	<7	<0.001	<0.0009	<7	<0.001	<0.0009	<7
Total HxCDF isomers		≤0.0008	≤0.0007	≤5.5	<0.0004	<0.0003	<3	0.0012	0.0011	8.3
Total HxCDD isomers		≤0.0004	≤0.00035	≤2.7	<0.0004	<0.0003	<3	0.00041	0.00036	2.8
Total HpCDF isomers		0.00035	0.00031	2.4	0.00027	0.00024	1.9	0.00043	0.00038	2.9
Total HpCDD isomers		0.0011	0.00097	7.5	0.00085	0.00075	5.8	0.0013	0.0012	9.3
Total PCDDs + PCDFs		0.018	0.016	130	0.01	0.0092	71	0.026	0.023	180
I-TEQ										
Lower Bound		0.00022	0.0002	1.5	0.000045	0.00004	0.31	0.0004	0.00035	2.7
Middle Bound		0.00047	0.00041	3.2	0.00036	0.00032	2.5	0.00057	0.00051	3.9
Upper Bound		0.00071	0.00063	4.9	0.00067	0.00059	4.6	0.00075	0.00066	5.2

Isokinetic Sampling Parameters	Test 1	Test 2
PAHs, Dioxins & Furans		
Sampling time, min	360	360
Isokinetic rate, %	96	97
Velocity difference, %	<1	<1

Date	13-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Polycyclic Aromatic Hydrocarbons (PAHs)	Sampling time	Average			Test 1			Test 2		
		Corrected to			Corrected to			Corrected to		
		Concentration ng/m ³	10% O2 ng/m ³	Mass Rate ng/min	Concentration ng/m ³	10% O2 ng/m ³	Mass Rate ng/min	Concentration ng/m ³	10% O2 ng/m ³	Mass Rate ng/min
Naphthalene		88000	78000	610000000	150000	130000	1000000000	28000	25000	190000000
2-Methylnaphthalene		23000	21000	160000000	37000	32000	250000000	10000	9100	71000000
Acenaphthylene		1400	1300	98000000	1900	1700	130000000	920	820	63000000
Acenaphthene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Fluorene		110	99	7700000	150	140	11000000	71	63	4900000
Phenanthrene		1200	1000	8000000	1600	1400	11000000	710	630	4900000
Anthracene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Fluoranthene		150	130	10000000	230	200	16000000	71	63	4900000
Pyrene		≤56	≤50	≤3900000	77	68	5300000	<40	<30	<2000000
Benz(a)anthracene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Chrysene		≤55	≤48	≤3800000	<40	<30	<3000000	71	63	4900000
Benz(b)fluoranthene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Benz(k)fluoranthene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Benz(e)pyrene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Benz(a)pyrene		74	65	5100000	77	68	5300000	71	63	4900000
Perylene		<40	<30	<3000000	<40	<30	<3000000	<40	<30	<2000000
Indeno(1,2,3-cd)pyrene		74	65	5100000	77	68	5300000	71	63	4900000
Dibenz(ah)anthracene		74	65	5100000	77	68	5300000	71	63	4900000
Benz(ghi)perylene		74	65	5100000	77	68	5300000	71	63	4900000
Total 16 PAHs		97000	85000	660000000	150000	130000	1000000000	41000	36000	280000000
Total 19 PAHs		110000	100000	790000000	190000	170000	1300000000	41000	36000	280000000
BaP-TEQ										
Lower Bound		110	98	7600000	120	100	7900000	110	95	7400000
Middle Bound		120	100	8000000	120	110	8300000	110	99	7700000
Upper Bound		120	110	8400000	130	110	8800000	120	100	8100000

Isokinetic Sampling Parameters	Test 1	Test 2
PAHs, Dioxins & Furans		
Sampling time, min	360	360
Isokinetic rate, %	96	97
Velocity difference, %	<1	<1

Total VOCs (as n-Propane)	Sampling time	Average			Test 1			Test 2		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Total		2.7	2.4	0.3	3.2	2.8	0.37	2.1	1.9	0.24


VOC (speciated)	Sampling time	Average			Test 1			Test 2		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Detection limit ⁽¹⁾		<0.2	<0.2	<0.02	<0.2	<0.2	<0.02	<0.2	<0.2	<0.02
Benzene		3.8	3.4	0.44	4.6	4.1	0.53	3.1	2.7	0.35
Toluene		1	0.91	0.12	1.3	1.2	0.15	0.74	0.66	0.085

(1) Unless otherwise reported, the following target compounds were found to be below detection:

Ethanol, Isopropanol, 1,1-Dichloroethene, Dichloromethane, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Carbon tetrachloride, Butanol, 1-Methoxy-2-propanol, Trichloroethene, Toluene, 1,1,2-trichloroethane, Tetrachloroethene, Chlorobenzene, Ethylbenzene, m + p-Xylene, Styrene, o-Xylene, 2-Butoxyethanol, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, Propylbenzene, 1,3,5-trimethylbenzene, tert-Butylbenzene, 1,2,4-trimethylbenzene, 1,2,3-trimethylbenzene, Acetone, Pentane, Acrylonitrile, n-Hexane, Methyl ethyl ketone, Ethyl acetate, Cyclohexane, 2-Methylhexane, 2,3-Dimethylpentane, Isopropyl acetate, 3-Methylhexane, Ethyl acrylate, Heptane, Methyl methacrylate, Propyl acetate, Methylcyclohexane, MIBK, 2-Hexanone, Octane, Butyl acetate, 1-methoxy-2-propyl acetate, Butyl acrylate, Nonane, Cellosolve acetate, alpha-Pinene, beta-Pinene, Decane, 3-Carene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

Date	14-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal



Stack Parameters		
Moisture content, %w/v	11	
Gas molecular weight, g/g mole	30.8 (wet)	32.5 (dry)
Gas density at STP, kg/m ³	1.38 (wet)	1.45 (dry)
% Oxygen correction & Factor	10 %	0.78

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	0845 & 1105
Temperature, °C	129
Velocity at sampling plane, m/s	26
Volumetric flow rate, discharge, m ³ /s	180
Volumetric flow rate (wet STP), m ³ /s	120
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	590000

Isokinetic Results	Sampling time	Average			Test 1 855-1100			Test 2 855-1100		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Solid Particles		16	12	1.6	16	12	1.7	15	12	1.6
Fine particulates (PM10)	(PSA)	9.7	7.6	1	9	7	0.95	10	8.2	1.1
Fine particulates (PM2.5)	(PSA)	4.4	3.4	0.46	3.8	3	0.4	4.9	3.9	0.52
Coarse Particulates		5.8	4.6	0.62	7	5.5	0.74	4.7	3.7	0.5
Sulfur dioxide		≤0.024	≤0.019	≤0.0026	<0.01	<0.008	<0.001	0.039	0.03	0.0041
Sulfuric acid mist and sulfur trioxide(as SO ₃)		1.5	1.2	0.16	1.4	1.1	0.15	1.5	1.2	0.16
Isokinetic Sampling Parameters										
Sampling time, min					120			120		
Isokinetic rate, %					99			100		
Velocity difference, %					4			4		

Date	17-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details

Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal

**Stack Parameters**

Moisture content, %v/v	11	
Gas molecular weight, g/g mole	30.7 (wet)	32.3 (dry)
Gas density at STP, kg/m ³	1.37 (wet)	1.44 (dry)
% Oxygen correction & Factor	10 %	0.80

Gas Flow Parameters


Flow measurement time(s) (hhmm)	0850 & 1105
Temperature, °C	129
Velocity at sampling plane, m/s	26
Volumetric flow rate, discharge, m ³ /s	190
Volumetric flow rate (wet STP), m ³ /s	120
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	610000

Isokinetic Results

Sampling time	Average			Test 1 855-1100			Test 2 855-1100		
	Corrected to			Corrected to			Corrected to		
	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Chloride (as HCl)	2.3	1.9	0.25	3.1	2.5	0.34	1.6	1.3	0.17
Chlorine	<0.01	<0.009	<0.001	<0.01	<0.01	<0.001	<0.01	<0.009	<0.001
Total fluoride (as HF)	<0.02	<0.02	<0.003	<0.03	<0.02	<0.003	<0.02	<0.02	<0.002
Isokinetic Sampling Parameters									
Sampling time, min				120			120		
Isokinetic rate, %				104			104		
Velocity difference, %				3			3		

Date	14-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal




Stack Parameters	
Moisture content, %v/v	11
Gas molecular weight, g/g mole	30.9 (wet) 32.5 (dry)
Gas density at STP, kg/m ³	1.38 (wet) 1.45 (dry)
% Oxygen correction & Factor	10 % 0.79

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	1105 & 1320
Temperature, °C	130
Velocity at sampling plane, m/s	26
Volumetric flow rate, discharge, m ³ /s	180
Volumetric flow rate (wet STP), m ³ /s	120
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	600000

Isokinetic Results	Sampling time	Average			Test 1 1110-1315			Test 2 1110-1315		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	10% O2 mg/m ³	Mass Rate g/s
Antimony		<0.003	<0.002	<0.0003	<0.003	<0.003	<0.0004	<0.003	<0.002	<0.0003
Arsenic		<0.001	<0.001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0001
Cadmium		<0.0003	<0.0002	<0.00003	<0.0003	<0.0003	<0.00004	<0.0003	<0.0002	<0.00003
Lead		0.0038	0.003	0.00041	0.006	0.0047	0.00064	0.0016	0.0013	0.00018
Mercury		0.0068	0.0054	0.00073	0.0063	0.0049	0.00067	0.0074	0.0058	0.00079
Beryllium		<0.0007	<0.0005	<0.00007	<0.0007	<0.0006	<0.00008	<0.0007	<0.0005	<0.00007
Chromium		0.0018	0.0014	0.00019	0.0029	0.0023	0.00031	0.00061	0.00048	0.000065
Cobalt		<0.0005	<0.0004	<0.00006	<0.0005	<0.0004	<0.00006	<0.0005	<0.0004	<0.00005
Manganese		0.0073	0.0057	0.00078	0.0074	0.0058	0.00079	0.0072	0.0056	0.00076
Nickel		0.0014	0.0011	0.00015	0.0012	0.00097	0.00013	0.0017	0.0013	0.00018
Selenium		≤0.0042	≤0.0033	≤0.00045	0.0041	0.0033	0.00044	<0.004	<0.003	<0.0005
Vanadium		<0.0008	<0.0006	<0.00009	<0.0008	<0.0007	<0.00009	<0.0008	<0.0006	<0.00008
Tin		<0.001	<0.001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0001
Copper		0.00084	0.00066	0.00009	0.00069	0.00054	0.000074	0.00099	0.00078	0.00011
Zinc		0.011	0.0089	0.0012	0.0093	0.0073	0.00099	0.013	0.011	0.0014
Thallium		<0.001	<0.001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0001
Hazardous Substances										
Upper Bound										
Total Type 1 Substances		<0.02	<0.01	<0.002	≤0.017	≤0.014	≤0.0019	≤0.014	≤0.011	≤0.0015
Total Type 2 Substances		<0.02	<0.01	<0.002	≤0.019	≤0.015	≤0.0021	≤0.017	≤0.013	≤0.0018
Total Type 1 & 2 Substances		<0.03	<0.03	<0.004	≤0.037	≤0.029	≤0.0039	≤0.031	≤0.024	≤0.0033
Isokinetic Sampling Parameters										
Sampling time, min					120			120		
Isokinetic rate, %					96			99		
Velocity difference, %					-2			-2		

Date	17-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 2: No.6 Kiln Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records		

Sampling Plane Details	
Sampling plane dimensions	3000 mm
Sampling plane area	7.07 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Elevator 30 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 8 D
Upstream disturbance	Junction 8 D
No. traverses & points sampled	2 24
Sample plane compliance to AS4323.1	Ideal



Stack Parameters	
Moisture content, %v/v	11
Gas molecular weight, g/g mole	30.8 (wet) 32.3 (dry)
Gas density at STP, kg/m ³	1.37 (wet) 1.44 (dry)
% Oxygen correction & Factor	10 % 0.79
Gas Flow Parameters	
Flow measurement time(s) (hhmm)	1105 & 1320
Temperature, °C	129
Velocity at sampling plane, m/s	27
Volumetric flow rate, discharge, m ³ /s	190
Volumetric flow rate (wet STP), m ³ /s	130
Volumetric flow rate (dry STP), m ³ /s	110
Mass flow rate (wet basis), kg/hour	620000

Isokinetic Results	Sampling time	Average			Test 1 1110-1315			Test 2 1110-1315		
		Concentration mg/m ³	Corrected to 10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	Corrected to 10% O2 mg/m ³	Mass Rate g/s	Concentration mg/m ³	Corrected to 10% O2 mg/m ³	Mass Rate g/s
Hexavalent chromium		<0.003	<0.003	<0.0004	<0.003	<0.003	<0.0004	<0.003	<0.002	<0.0003
Isokinetic Sampling Parameters										
Sampling time, min					120			120		
Isokinetic rate, %					105			102		
Velocity difference, %					2			2		

3.2 EPA 4 – No.6 Cement Mil Stack Duct 1

Date	11-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 4: No.6 Cement Mill Stack Duct 1
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Testing paused from 1002 to 1050 for mill stoppage		

Sampling Plane Details

Sampling plane dimensions	1160 x 1160 mm
Sampling plane area	1.35 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Stairs 20 m
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 0.5 D
No. traverses & points sampled	3 15
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters

Moisture content, %v/v	3.1	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	0920 & 1135
Temperature, °C	77
Velocity at sampling plane, m/s	17
Volumetric flow rate, discharge, m ³ /s	22
Volumetric flow rate (wet STP), m ³ /s	16
Volumetric flow rate (dry STP), m ³ /s	15
Mass flow rate (wet basis), kg/hour	73000

Isokinetic Results

Sampling time	Average		Test 1 930-1133		Test 2 930-1133	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	29	0.45	35	0.53	24	0.36
Isokinetic Sampling Parameters						
Sampling time, min			75		75	
Isokinetic rate, %			94		103	
Velocity difference, %			2		2	

3.3 EPA 4 – No.6 Cement Mill Stack Duct 2

Date	11-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 4: No.6 Cement Mill Stack Duct 2
Licence No.	1698	Location	New Berrima
Ektimo Staff	Aaron Davis / Steven Weekes	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details

Sampling plane dimensions	700 x 1160 mm
Sampling plane area	0.812 m ²
Sampling port size, number	3" BSP (x3)
Access & height of ports	Stairs 20 m
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 0.5 D
No. traverses & points sampled	3 9
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters

Moisture content, %v/v	3.2	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1135 & 1250
Temperature, °C	81
Velocity at sampling plane, m/s	17
Volumetric flow rate, discharge, m ³ /s	14
Volumetric flow rate (wet STP), m ³ /s	9.9
Volumetric flow rate (dry STP), m ³ /s	9.6
Mass flow rate (wet basis), kg/hour	46000

Isokinetic Results

Sampling time	Average		Test 1 1140-1245		Test 2 1140-1245	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	3.8	0.037	3.6	0.034	4	0.039
Isokinetic Sampling Parameters						
Sampling time, min			63		63	
Isokinetic rate, %			99		101	
Velocity difference, %			<1		<1	

3.4 EPA 5 – No.6 Kiln Cooler Stack

Date	18-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 5: No.6 Kiln Cooler Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Steven Weekes, Ryan Collins	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	2400 mm
Sampling plane area	4.52 m ²
Sampling port size, number	4" Flange (x2)
Access & height of ports	Stairs 25 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 5 D
Upstream disturbance	Junction 6 D
No. traverses & points sampled	2 16
Sample plane compliance to AS4323.1	Satisfactory

Comments
The discharge is assumed to be composed of dry air and moisture

Stack Parameters		
Moisture content, %v/v	1.5	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1015 & 1155	
Temperature, °C	99	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, discharge, m ³ /s	70	
Volumetric flow rate (wet STP), m ³ /s	47	
Volumetric flow rate (dry STP), m ³ /s	47	
Mass flow rate (wet basis), kg/hour	220000	

Isokinetic Results	Sampling time	Average		Test 1 1020-1140		Test 2 1020-1141	
		Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles		6.9	0.32	9.2	0.43	4.6	0.22
Isokinetic Sampling Parameters							
Sampling time, min				80		80	
Isokinetic rate, %				100		96	
Velocity difference, %				<1		<1	

3.5 EPA 10 – No.7 Cement Mill Stack

Date	12-07-2017	Client	Boral Cement Ltd (Berrima)
Report	R004658	Stack ID	EPA 10: No.7 Cement Mill Stack
Licence No.	1698	Location	New Berrima
Ektimo Staff	Steven Weekes	State	NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details

Sampling plane dimensions	1520 x 1800 mm
Sampling plane area	2.74 m ²
Sampling port size, number	3" BSP (x5)
Access & height of ports	Stairs
Duct orientation & shape	Inclined Rectangular
Downstream disturbance	Bend 0.5 D
Upstream disturbance	Bend 2 D
No. traverses & points sampled	5 20
Sample plane compliance to AS4323.1	Non-compliant



Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

Stack Parameters

Moisture content, %v/v	2.8	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1020 & 1214
Temperature, °C	90
Velocity at sampling plane, m/s	6.4
Volumetric flow rate, discharge, m ³ /s	18
Volumetric flow rate (wet STP), m ³ /s	12
Volumetric flow rate (dry STP), m ³ /s	12
Mass flow rate (wet basis), kg/hour	57000

Isokinetic Results

Sampling time	Average		Test 1 1030-1210		Test 2 1030-1210	
	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s	Concentration mg/m ³	Mass Rate g/s
Solid Particles	15	0.18	19	0.22	12	0.14
Isokinetic Sampling Parameters						
Sampling time, min			100		100	
Isokinetic rate, %			98		100	
Velocity difference, %			<1		<1	

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Boral Cement Ltd (Berrima)'s records for complete process conditions.

5 TEST METHODS

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	-	✓	NA
Molecular weight	NSW TM-23	USEPA 3A	not specified	✓	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Temperature	NSW TM-2	NA	2%	✓	NA
Flow rate	NSW TM-2	NA	8%	✓	NA
Velocity	NSW TM-2	NA	7%	✓	NA
Solid particles	NSW TM-15	NSW TM-15	5%	✓	✓
Coarse particulates	NSW OM-9	NSW OM-9	not specified	✓	✓
Particulate matter < 10µm (PM ₁₀) by particle size analysis	-	HRL In-house	-	-	x ¹
Particulate matter < 2.5µm (PM _{2.5}) by particle size analysis	-	HRL In-house	-	-	x ¹
Polycyclic aromatic hydrocarbons (PAH's)	NSW OM-6	NGCMS 11.27	21%	✓	✓ ²
Dioxins and furans (PCDD's and PCDF's)	NSW TM-18	NMI AUTL_02	16%	✓	✓ ³
Total (gaseous and particulate) metals and metallic compounds (Cu, Zn, Tl)	NSW TM-12, NSW TM-13, NSW TM-14	EnviroLab inhouse	15%	✓	✓ ⁴
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	EnviroLab inhouse	15%	✓	✓ ⁴
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	EnviroLab inhouse	15%	✓	✓ ⁴
Hexavalent chromium	NSW OM-4	EnviroLab inhouse	16%	✓	✓ ⁴
Sulfur trioxide and/or sulfuric acid mists and sulfur dioxide	NSW TM-3	Ektimo (EML Air) 235	16%	✓	✓ ⁵
Chlorine	NSW TM-7	Ektimo (EML Air) 235	14%	✓	✓ ⁶
Hydrogen chloride	NSW TM-8	Ektimo (EML Air) 235	14%	✓	✓ ⁶
Total fluoride	NSW TM-9	ALS Method QWI-EN/EA144C & Ektimo (EML Air) 235	17%	✓	✓ ^{6,7}
Nitrogen oxides (NO _x)	NSW TM-11	NSW TM-11	12%	✓	✓
Carbon monoxide	NSW TM-32	NSW TM-32	12%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Speciated volatile organic compounds (VOC's)	NSW TM-34	Ektimo (EML Air) 344	19%	✓	✓ ⁸

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

1. Analysis performed by HRL Technology using a Malvern Instruments Mastersizer laser particle size analyser. NATA Accreditation does not cover the performance of this service
2. Analysis performed by Australian Government National Measurement Institute, NATA accreditation number 198. Results were reported to Ektimo on 21/8/17 in report number # ORG17_039
3. Analysis performed by Australian Government National Measurement Institute, NATA accreditation number 198. Results were reported to Ektimo on 11/8/17 in report number # DAU17_150
4. Analysis performed by EnviroLab, NATA accreditation number 2901. Results were reported to Ektimo on 28/7/17 in report number 171838
5. Analysis performed by Ektimo (EML Air), NATA accreditation number 2732. Results were reported to Ektimo on 28/7/17 in report number R004658_SOx
6. Analysis performed by Ektimo (EML Air), NATA accreditation number 2732. Results were reported to Ektimo on 27/7/17 in report number R004658_Halides_Halogens
7. Analysis (solid fluoride only) performed by Australian Laboratory Services Pty Ltd, NATA accreditation number 825. Results were reported to Ektimo on 27/7/17 in report number EN1703107
8. Analysis performed by Ektimo (EML Air), NATA accreditation number 2732. Results were reported to Ektimo on 9/8/17 in report number R004658_SVOCs

6 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

Ektimo (EML) and Ektimo (ETC) are accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo (EML) and Ektimo (ETC) are accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025. – General Requirements for the Competence of Testing and Calibration Laboratories. ISO/IEC 17025 requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Compliance Manager.

NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.

A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

7 DEFINITIONS

The following symbols and abbreviations may be used in this test report:

STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PM ₁₀	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
BSP	British standard pipe
NT	Not tested or results not required
NA	Not applicable
D ₅₀	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. The D ₅₀ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D ₅₀ of that cyclone and less than the D ₅₀ of the preceding cyclone.
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
DER	WA Department of Environment & Regulation
DECC	Department of Environment & Climate Change (NSW)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
NATA	National Association of Testing Authorities
RATA	Relative Accuracy Test Audit
AS	Australian Standard
USEPA	United States Environmental Protection Agency
Vic EPA	Victorian Environment Protection Authority
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
CARB	Californian Air Resources Board
TM	Test Method
OM	Other approved method
CTM	Conditional test method
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
NIOSH	National Institute of Occupational Safety and Health
XRD	X-ray Diffractometry