

CADIA VALLEY OPERATIONS
CADIA HILL TAILINGS COMPLETION MODIFICATION
MODIFICATION 13
NOISE REVIEW

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A	Final	14 March 2019	Roman Haverkamp	John Wassermann
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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

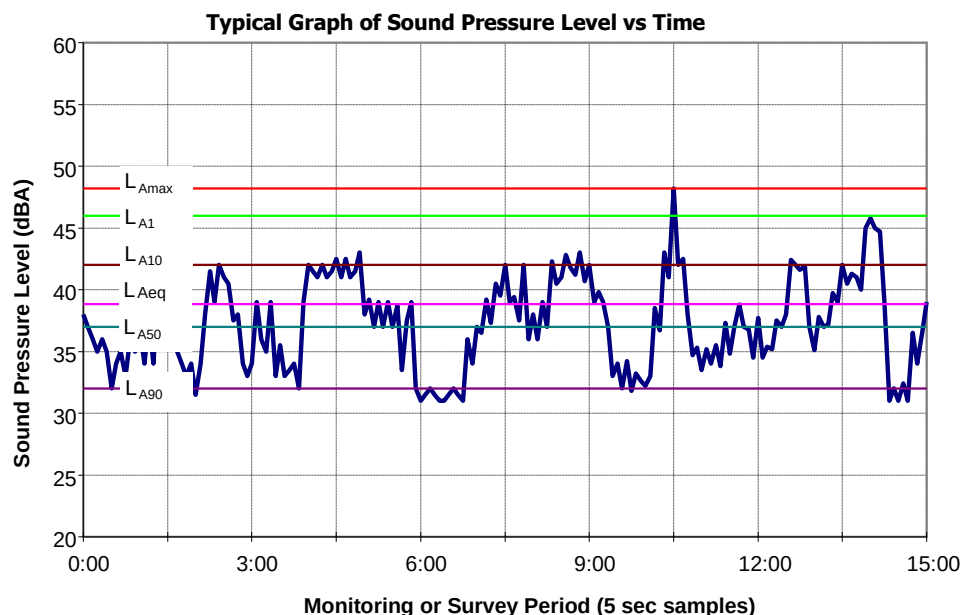
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.



1 INTRODUCTION

Cadia Holdings Pty Limited (CHPL) is the owner and operator of the Cadia Valley Operations (Cadia), and is a wholly owned subsidiary of Newcrest Mining Limited. Cadia is located approximately 25 kilometres south-west of Orange, in the Central Tablelands of New South Wales (NSW) (Figure 1-1).

On 9 March 2018, CHPL identified a limited breakthrough of tailings material at the embankment of the Northern Tailings Storage Facility (NTSF). The slumping of the embankment was fully contained within the Southern Tailings Storage Facility (STSF) that is located immediately downstream. No external environmental impacts arose from the incident (i.e. all tailings and waste rock material in the slumping area were wholly contained within the STSF).

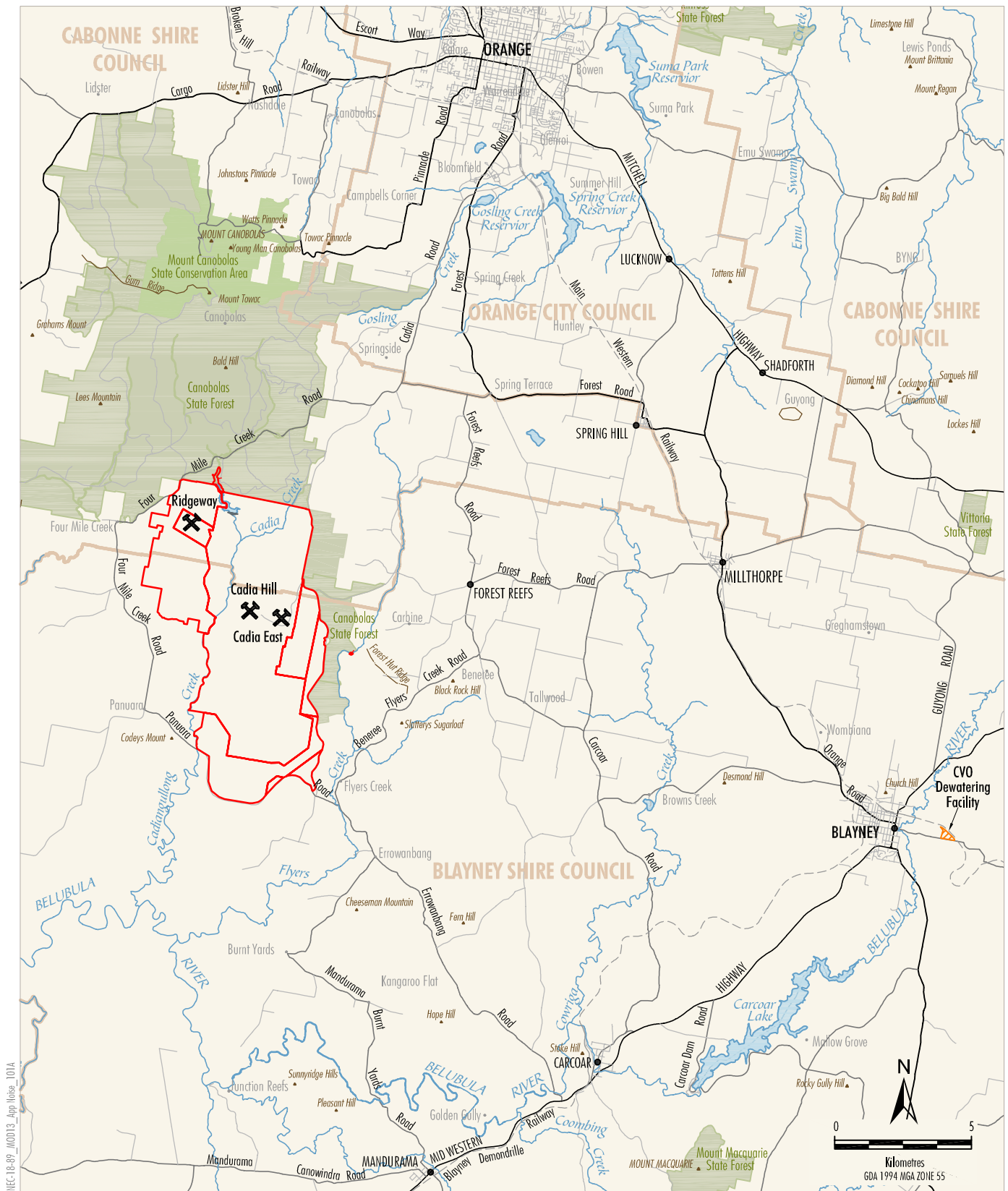
CHPL is currently investigating the factors that led to the limited breakthrough of tailings material at the embankment of the NTSF, including exploring engineering solutions to repair the embankment. In the interim, CHPL identified the opportunity to deposit tailings within the completed Cadia Hill open pit.

Following approval of Modification 11, deposition of tailings into the Cadia Hill open pit to a consolidated level of 420 metres Australian Height Datum (m AHD) commenced on 5 May 2018. On 24 September 2018, approval of the Cadia Hill Tailings Continuation Modification (Modification 12) was granted to increase the consolidated tailings level to 560 m AHD. Modification's 11 and 12 provide capacity for approximately 4 years of tailings deposition at the permitted annual ore processing rates, forming part of the overall tailings management strategy at Cadia.

CHPL has identified the opportunity to deposit additional tailings within the Cadia Hill open pit. On this basis, CHPL proposes a further modification to Project Approval 06_0295 under Section 4.55 of the NSW *Environmental Planning and Assessment Act, 1979* to increase the tailings level to its full capacity, at a pre-consolidation level of approximately 713 m AHD (Figure 1-2).

The main activities associated with the Cadia Hill Tailings Completion Modification (Modification 13 [herein referred to as the Modification]), include:

- increasing the tailings level from 560 m AHD (consolidated tailings level) to 713 m AHD (pre-consolidation tailings level);
- an additional 177 million tonnes of capacity, equivalent to approximately seven years of additional deposition to this facility;
- decommissioning and closure of the existing ventilation adit VR101, located in the Cadia Hill open pit, which would be inundated by tailings;
- installation of a new ventilation adit within the currently approved disturbance footprint (outside of the Cadia Hill open pit);
- construction of additional buttressing for the STSF embankment; and
- a pit lake (i.e. a "wet cover") as the final landform of the Cadia Hill open pit, consistent with the approved final landform.



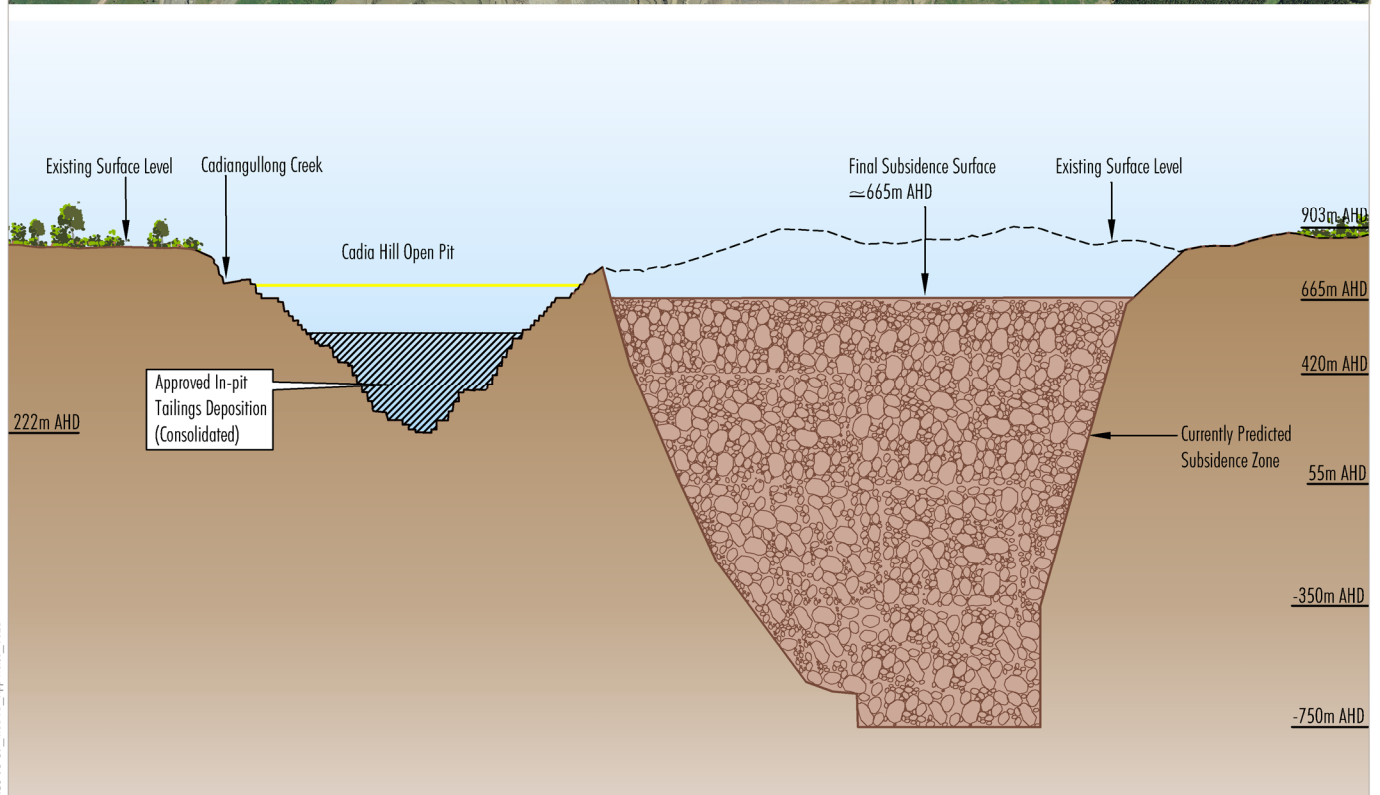
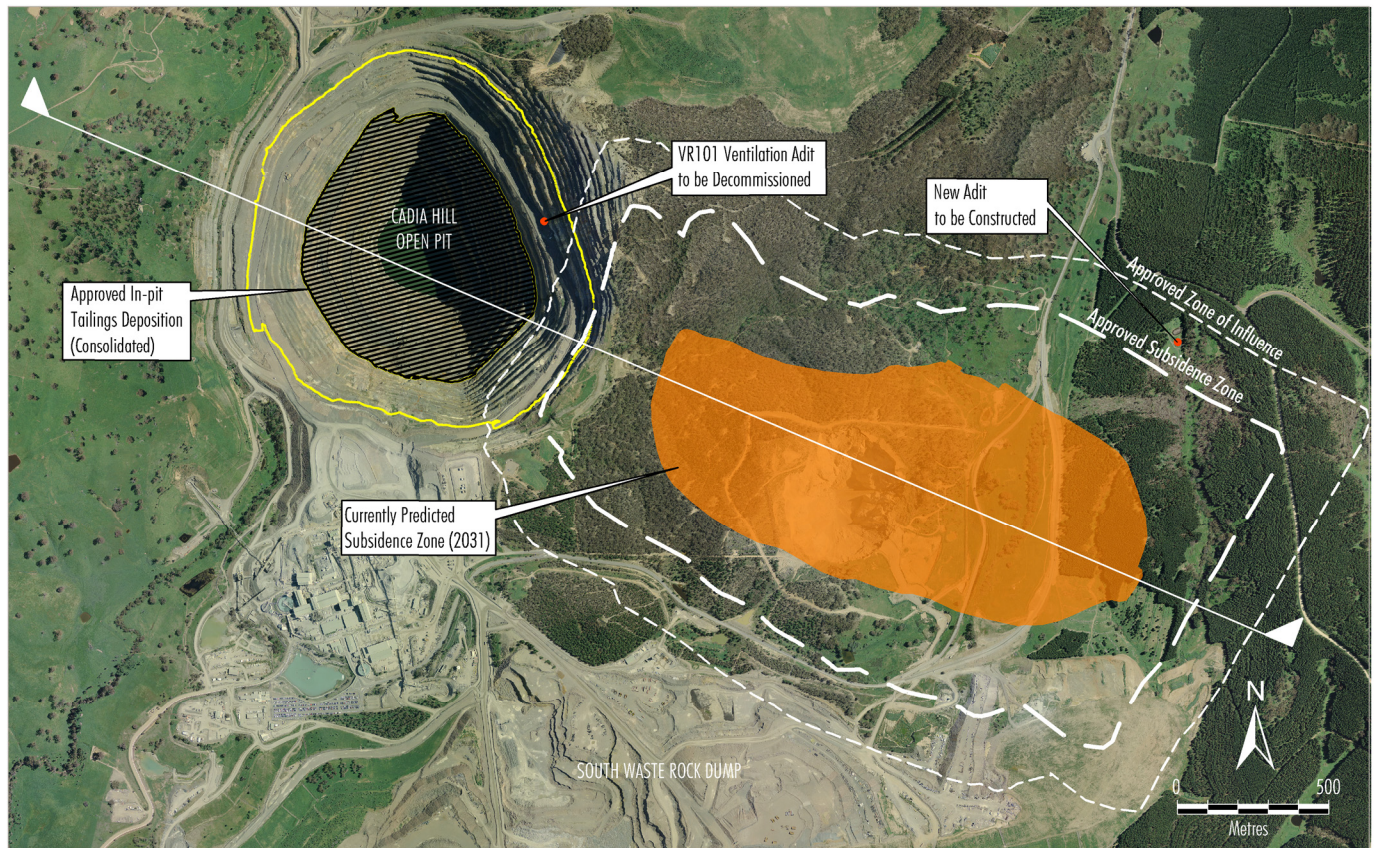
- LEGEND**
- Mining Lease/Mining Lease Application Boundary
 - Local Government Area
 - Road
 - Railway
 - NSW State Forest
 - NPWS Reserve

Source: Department of Lands NSW (2006);
Department of Industry (2017)



CADIA VALLEY OPERATIONS
Regional Location

Figure 1-1



LEGEND

— Proposed Modification In-pit Tailings Deposition (Pre-consolidated)

Source: CHPL (2008; 2018); After AGE (2018)



CADIA VALLEY OPERATIONS

Conceptual Long Section of the
Cadia Hill Open Pit and the Cadia East
Subsidence Zone

Figure 1-2

Wilkinson Murray Pty Limited (WMPL) was commissioned by CHPL to prepare a noise review for the Modification addressing operational and construction noise associated with the new ventilation adit.

The review is based on the following NSW noise policies and guidelines:

- *NSW Industrial Noise Policy (INP)* (Environment Protection Authority [EPA], 2000).
- *Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018).

The *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009) was also considered, however construction associated with the Modification was conservatively assessed cumulatively with operational noise in this noise review.

It is noted that the *Noise Policy for Industry* was released in October 2017 (EPA, 2017).

It was decided to assess the noise levels in accordance with the *INP* for the following two reasons:

- the Modification does not constitute a significant change to existing plant, equipment or processes (especially since the fan associated with the proposed ventilation adit will operate within the underground mine); and
- assessment using *INP* methodology to allow a direct comparison with previous noise assessments is advantageous (Wilkinson Murray Pty Limited, 2015; Wilkinson Murray Pty Limited, 2017; Wilkinson Murray Pty Limited, 2018).

Wilkinson Murray has also reviewed attended compliance noise monitoring results and noise complaints for 2017 and 2018.

2 DESCRIPTION OF MODIFICATION

The Modification would include the installation and operation of a new ventilation adit within the currently approved disturbance footprint (outside of the Cadia Hill open pit).

Figure 2-1 shows the proposed ventilation adit location.

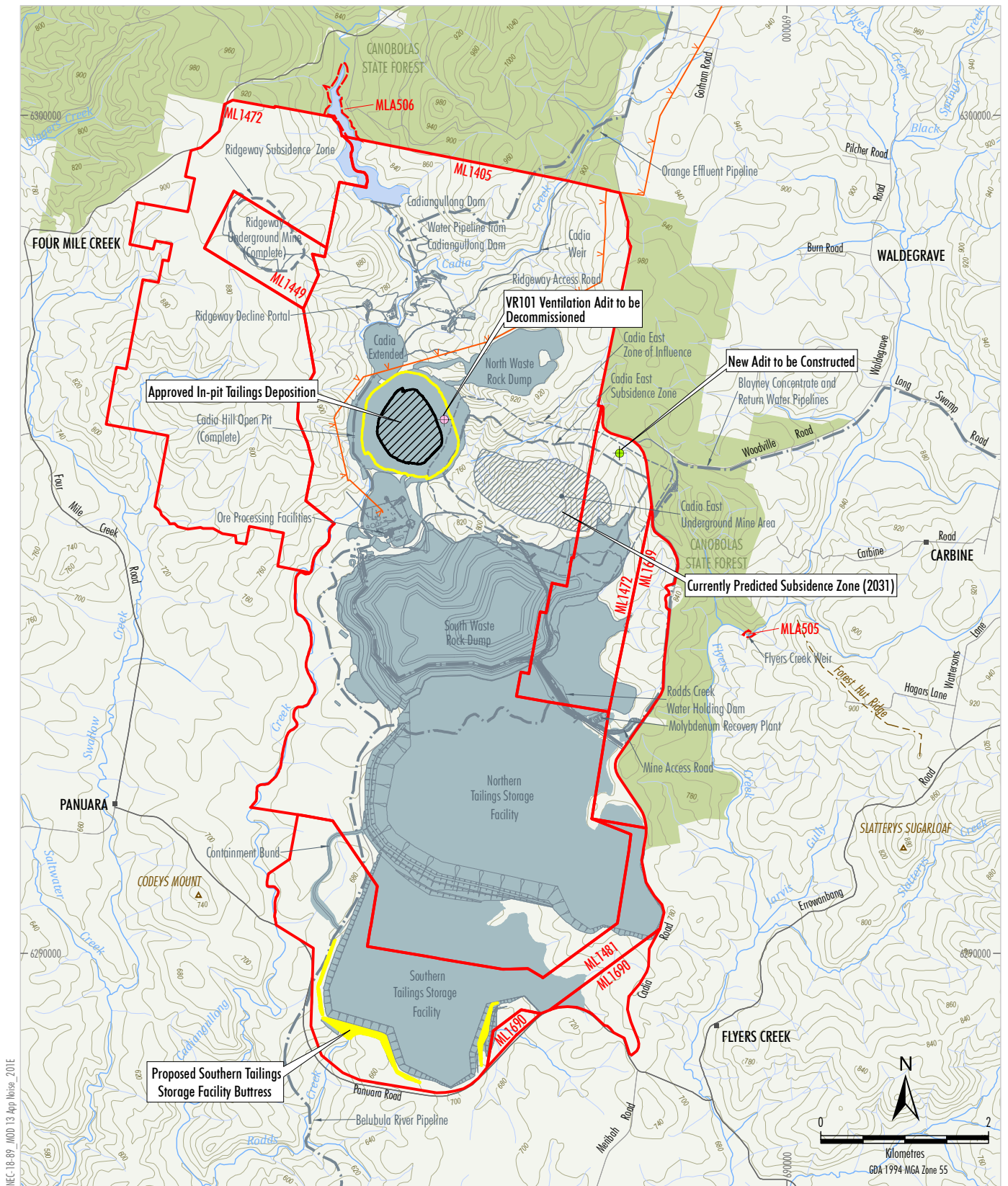


Figure 2-1

3 NOISE SENSITIVE RECEIVERS

Figure 3-1a and Figure 3-1b identify the nearest potentially affected sensitive receivers to the Cadia mine site.

Figure 3-1a

Ref No	Landholder	Ref No	Landholder	Ref No	Landholder	Ref No	Landholder
1	CHRISTOU GT & JA	125	CONTANGO AGRICULTURAL COMPANY PTY LIMITED	338	LEE GJ & MR	2062	WONGALONG PTY LIMITED
2	NOCK ER	127	HAY EJ & JA	339	SEAMAN JWA & SG	2063	MOAD DD & JT
4	NOCK DGT & ER	130	SHEA LV	341	CHRYSTALL SH and GRIFFITH GJ	2064	THREE TREES HOLDINGS PTY LTD
6	BARNES GJ	131	ALEXANDER KJ and WYSE JM	343	PHILLIPS CM	2072	MCKENZIE RC
7	KENNEDY AP & SJ	133	BAKER LC & LR	344	HUGHES BG & LJR	2073	STRATON SDE
8	WINDBERG HD & JE	133	BAKER L & LR	347	BURKE PD & VM	2074	DTQ HOLDINGS PTY LTD
9	CANE JA & JP	135	WILLIAMSON GJ	348	ANGLICAN PROPERTY TRUST DIOCESE OF BATHURST	2075	HARRIS AA & GL
11	WANNAN JA & JS	137	ELLIS LA & MP	349	KNIGHT EM & PA	2076	BASFORD CL & WB
13	TILSTON PE & VJ	138	BAILEY A & AC	350	CHARRY AA & MI	2077	LYNCH JJ & RJ
14	TAYLOR CM & DJ	140	CARSON DE	351	BARNES MM	2078	CLARKE W and HURST G
15	WOLF EM & GH	141	NYDEGGER RR	352	ROYAL AJE & JA	2100	ISBISTER MR and KING JK
20	PENSON AJ & DJ	147	HAMILTON JC & V	354	MINISTER FOR EDUCATION AND TRAINING	2101	GODFREY GB & JR
23	SMITH HE & TI	150	ANGULLONG PTY LIMITED	355	DRING GWO	2102	CLARK DB
25	HICKS PJ	153	JONES WW	356	FADAE M and SAMIMI M & M & S & S	2103	COOPER PJ
30	PEPPER-EDWARDS DL & MS	156	BURTON MP & RJ	357	PHILLIPS NJ	2104	MCDONALD KM & WA
31	COWPER JH	160	SCHNEIDER PE	358	WESTON JA	2105	D & D SEARLE PROPERTY PTY LTD
32	COLSON AM & C	161	MAY RW & VR	361	KIRBY PJ	2106	MUNRO PS
33	GARDINER KJ & SL	165	CRESSWELL DS & SA	362	PHILLIPS NJ	2106	FISHER BH & EW
34	WATTERSON AC	166	DICKERSON TL	373	RAPLEY CE & PJ	2107	MUNRO DC
35	CANTRILL JH	168	MAY RW	374	HOLMES J & JB	2109	MEYENN DL & KL
37	CANTRILL JM	171	KNOX GA	380	WATTS AC & WJ	2110	CRISP JA & TM
38	O'CONNOR JA & JL	173	THE UNITING CHURCH IN AUSTRALIA PROPERTY TRUST (NSW)	396	WILKENS KA & MK	2111	MEYENN RJ & VA
39	HUNT CM & GB	179	MASTERS NJ & TE	397	DICKERSON BM & LN	2112	TAYLOR DW & RA
40	J. F. MCBETH PTY LIMITED	182	BEACH BJ	398	PEARCE MA	2113	HICKS TV
41	KNOX CW	185	MAY BG	400	HILLIER DW & KM	2114	BATMON PROPERTY PTY LTD
42	Mac TIER IR	190	PASCOE HG	401	MCKENZIE FE & RJ	2115	NEWTON RE
44	COLMAN AR	192	WATTERSON AC & JK	402	BOWMAN GA	2116	SHARP EL & TC
46	ROANNY PTY LIMITED	193	SCOTT KP & MJ	403	TURK DJ & JB	2117	WINDBERG JR & KL
49	ROWETH AG	195	FAULKNER MF & WE	404	WILSON SJ	2118	RINGBAUER JA & PJ
50	NIXON CT	196	CAMPBELL M and FOSTER JE	405	WILLING JW & LR	2119	GIFFORD J & KJ
53	KNOX CW & HE	197	SOUTHWELL PD	406	RILES DJ & SJ	2120	WATTERSON LC
54	GERATHY JB	198	MASTERS EP & K & SR	407	BURTON DJ & MJ	2121	OVENDEN FJ & RM
57	ROWETH AK	199	OBORN GR	414	WRIGHT DG & JH	2122	KNOX CW & GA
58	A A KNOX PASTORAL CO PTY LTD	201	HILLIAR CC	415	HOOPER DJ	2123	COTTAGE ELA and PATRECH JT
59	TRIMMER WA	202	SCOTT PA	416	HOOPER BM & LD	2124	HARRIES JM
60	PAINE DA	203	COLQUHOUN PW & VI	417	WEIGHT JM and WOOD SJ	2125	HAMDAISY PTY LIMITED
61	RAYNER JE	204	MCLEOD MK and RODDA DJ	419	PASCOE DJ & SP	2126	STONE DJ & KA
62	GREEN DJ	205	THE STATE OF NEW SOUTH WALES	420	WILSON DH	2127	DONLAN BK & KP
65	BARRY SG and HARRIS TM	206	MUNRO JL	421	PASH DJ	2128	MAKSACHEFF AI & DJ
67	COLEMAN CJ & EM	207	MELLROSS PE and PASCOE SE & WD	422	BARTIMOTE NJ & SJ	2129	CLINTON DW
72	MASTERS RJ & SR	208	WILSON RTC & SJ	423	STURGESS MM	2130	BAILEY CA
76	WEBB DI & KL	210	KILBY BP	424	BURTON DJ & MJ	2131	BAILEY A & AC & BA & NC
82	DERRIG CV & JP	229	KNOX HE and A A KNOX PASTORAL CO PTY LTD	2001	THE MINISTER FOR PUBLIC WORKS	2132	BLUNT DF & SE
84	STANSFIELD CJ & DJ	230	BRAEBURN GRAZING COMPANY PTY LIMITED	2002	STATE FOREST NEW SOUTH WALES	2133	RETALLACK FM & ML
87	PINKERTON GM & NE	247	THE COUNCIL OF THE SHIRE OF BLAYNEY	2003	HER MOST GRACIOUS MAJESTY QUEEN ELIZABETH THE SECOND	2134	COWEN GW & JM
88	BAKER AW & LF	251	BLACKWOOD AK & JF	2008	CABONNE SHIRE COUNCIL	2135	GREEN GA & SJ
90	WICKS AJ & BJ	257	BUNCARWAL PTY LIMITED	2010	REYNOLDS BP	2136	GREEN SJ
91	PINKERTON GM	259	CROUCH GM	2012	COLEMAN DIA & FG	2137	GREEN SI
92	MAYVILLE PTY LIMITED	262	KING R and MATILKA L & MJ	2013	COLEMAN MC & ST	2138	SAXON SUPER PTY LTD
93	CORCORAN JP	280	POTTS KA & WA	2014	DOUGLAS S	2139	HOWARTH AR
94	STREATFEILD JJ & KM	281	KRIDEN INVESTMENTS PTY LIMITED	2015	THE COUNCIL OF THE SHIRE OF LYNDRHURST	2140	MACKILLOP FC
97	JONES BW & DRC	282	CLARKE NJ	2018	TAYLOR SC & SG	2141	KINGHORNE JM
98	JONES CF & JK	283	STANCAZ PTY LIMITED	2019	TRIMMER B	2142	REDMOND GL
99	STREATFEILD HCM	284	BROWN DG and CARSON-BROWN GL	2024	TAYLOR H & HM	2143	ROWETH CK
104	CADIA HOLDINGS PTY LIMITED	285	HICKS BJ & RH	2024	HOOPER CW & J	2144	ROWETH CK & FJ
105	HUGHES KA	286	MCNAB EJ	2025	THE COUNCIL OF THE CITY OF ORANGE	2145	LOWE L
107	WILLIAMS KC	287	LOVE AC and MCCracken DCA	2028	MILLER BS & KF	2146	GRIFFIN RJ
108	SHEA B & PA	288	DUNCAN T	2030	BADIYAN SS and SAMIMI D & M & S & S	2147	EVANS CT and PETERSON JC
110	BRITTON BG and GRANT LP	298	FARRELL PN	2032	MATHEWS KW & ME	2148	THORNTON WHITE I and WHITE A
111	THE TRUSTEES OF THE ROMAN CATHOLIC CHURCH FOR THE DIOCESE OF BATHURST	302	DE SANTIS CA	2034	COULSON JA	2149	DALZELL FI & JA
112	FRAZIER W and GAINSFORD FWW	303	MIDDLETON BL & JP	2035	ANNETTS JA	2150	MUIR TC
113	RAPLEY LK & NT	304	MASTRANGELI N	2036	COWAN KL	2151	LARNACH SE
114	MASTERS EP & K	305	SMITH KJ & PA	2039	MILWARD HC	2152	DICKSON GA
115	ROSS AJ & PL	314	KELSALL AD & GL	2040	SMITH M	2153	PLATINGA A & JS
116	KOVAC JS and MCFARLAND CD	324	VERGA PTY LIMITED	2041	WILLIAMS MA & T	2154	OBORN CT
117	CASHMAN RI and DAVIS JM	330	PLAYFAIR SC	2042	BALDWIN BJ & JR	2155	COLEMAN DE & MA
118	TOLHURST S	334	GRIFFITHS NH	2055	GARLUCK GR	2156	BENNETT DW
121	GERSBACH MR	335	CAMPBELL AR	2058	TAYLOR JC	2157	WILSON CJ & DH & HJ & PA
123	HARRIS ME	336	HONEYMAN SA and NEWTON RG	2059	HEALY SPRINGS PTY LIMITED	2160	QUILTY NS & EE
124	CHRISTOPHERSON RM & TJ					2161	SMITH SJ & HARROW DP

Source: Land and Property Information (2017)



CADIA VALLEY OPERATIONS

Landholder List

Figure 3-1b

4 ATTENDED NOISE MONITORING RESULTS & NOISE COMPLAINTS

4.1 Attended Noise Compliance Monitoring Results (2017/2018)

Results from the biannual attended noise compliance monitoring conducted by Advitech Pty Limited (Advitech) around Cadia in 2017 and 2018 demonstrate compliance with the relevant impact assessment criteria. Results from various compliance noise monitoring reports by Advitech (2017a; 2017b; 2018a; 2018b) have been copied below. Review of the data indicates that compliance with the noise criteria was achieved at all times and Cadia was inaudible on many occasions.

Table 4-1 Noise Compliance Monitoring Results - May/June 2017

Location	Period	CVO Contribution (L_{Aeq})		L_{A1} , 1min Source	Criteria	Compliance Assessment
		Mes1	Mes2			
Bonnie Glen	Day L_{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L_{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L_{Aeq} , 15min	Inaudible	Inaudible		36	
	L_{A1} , 1min	55	53	Barking Dogs	45	
Rosebank	Day L_{Aeq} , 15min	31	33		43	Compliant
	Evening L_{Aeq} , 15min	34	33		38	
	Night L_{Aeq} , 15min	29	31		36	
	L_{A1} , 1min	34	36	n/a ²	45	
Warrengong	Day L_{Aeq} , 15min	40	42		43	Compliant
	Evening L_{Aeq} , 15min	<24	<26		38	
	Night L_{Aeq} , 15min	29	31		35	
	L_{A1} , 1min	34	35	n/a ²	45	
South Log	Day L_{Aeq} , 15min	28	29		43	Compliant
	Evening L_{Aeq} , 15min	23	21		38	
	Night L_{Aeq} , 15min	22	22		38	
	L_{A1} , 1min	42	44	n/a ²	45	
Northwest	Day L_{Aeq} , 15min	36	36		43	Compliant
	Evening L_{Aeq} , 15min	30	31		38	
	Night L_{Aeq} , 15min	28	28		38	
	L_{A1} , 1min	38	40	n/a ²	45	
Willow Creek	Day L_{Aeq} , 15min	<32	<30		43	Compliant
	Evening L_{Aeq} , 15min	21	22		38	
	Night L_{Aeq} , 15min	24	23		35	
	L_{A1} , 1min	41	31	n/a ²	45	
Chesterfield	Day L_{Aeq} , 15min	26	26		43	Compliant
	Evening L_{Aeq} , 15min	31	29		38	
	Night L_{Aeq} , 15min	32	28		35	
	L_{A1} , 1min	35	34	n/a ²	45	

Note 1: L_{90} reported as CVO sources contributed to background noise levels only during measurement.

Note 2: L_{A1} level equivalent to or less than the criteria, no further assessment undertaken.

Table 4-2 Noise Compliance Monitoring Results - October/November 2017

Location	Period	CVO Contribution (L _{Aeq})		L _{A1} , 1min Source	Criteria	Compliance Assessment
		Mes1	Mes2			
Bonnie Glen	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	Inaudible	Inaudible		36	
	L _{A1} , 1min	30	41	n/a ²	45	
Rosebank	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	24	26		36	
	L _{A1} , 1min	34	31	n/a ²	45	
Warrengong	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	28	27		38	
	Night L _{Aeq} , 15min	28	27		35	
	L _{A1} , 1min	35	43	n/a ²	45	
South Log	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	Inaudible	Inaudible		38	
	L _{A1} , 1min	47	46	Livestock	45	
Northwest	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	20	20		38	
	L _{A1} , 1min	34	31	n/a ²	45	
Willow Creek	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	28	30		38	
	Night L _{Aeq} , 15min	24	22		35	
	L _{A1} , 1min	33	38	n/a ²	45	
Chesterfield	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	30	30		38	
	Night L _{Aeq} , 15min	30	27		35	
	L _{A1} , 1min	34	34	n/a ²	45	

Note 1: L₉₀ reported as CVO sources contributed to background noise levels only during measurement.

Note 2: L_{A1} level equivalent to or less than the criteria, no further assessment undertaken.

Table 4-3 Noise Compliance Monitoring Results - May/June 2018

Location	Period	CVO Contribution (L_{Aeq})		$L_{A1, 1min}$ Source	Criteria	Compliance Assessment
		Mee1	Mee2			
Bonnie Glen	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant
	Evening $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	Night $L_{Aeq, 15min}$	Inaudible	Inaudible		36	
	$L_{A1, 1min}$	35	33	n/a^2	45	
Rosebank	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant
	Evening $L_{Aeq, 15min}$	<25	<25		38	
	Night $L_{Aeq, 15min}$	<25	<25		36	
	$L_{A1, 1min}$	40	43	n/a^2	45	
Warrengong	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant
	Evening $L_{Aeq, 15min}$	27	27		38	
	Night $L_{Aeq, 15min}$	<25	<25		35	
	$L_{A1, 1min}$	49	39	Barking Dogs	45	
South Log	Day $L_{Aeq, 15min}$	<30	<30		43	Compliant
	Evening $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	Night $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	$L_{A1, 1min}$	37	35	Livestock	45	
Northwest	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant
	Evening $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	Night $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	$L_{A1, 1min}$	36	36	n/a^2	45	
Willow Creek	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant
	Evening $L_{Aeq, 15min}$	28	28		38	
	Night $L_{Aeq, 15min}$	Inaudible	Inaudible		35	
	$L_{A1, 1min}$	32	42	n/a^2	45	
Chesterfield	Day $L_{Aeq, 15min}$	Inaudible	Inaudible		43	Compliant ³
	Evening $L_{Aeq, 15min}$	Inaudible	Inaudible		38	
	Night $L_{Aeq, 15min}$	35	36		35	
	$L_{A1, 1min}$	44	45	Gusting Wind	45	

Note 1: L_{A0} reported as CVO sources contributed to background noise levels only during measurement.

Note 2: L_{A1} level equivalent to or less than the criteria, no further assessment undertaken.

Note 3: CVO Contribution is above criteria level for night period, but result corresponds with meteorological conditions under which the criteria do not apply.

Table 4-4 Noise Compliance Monitoring Results - October/November 2018

Location	Period	CVO Contribution (L _{Aeq})		L _{A1} , 1min Source	Criteria	Compliance Assessment
		Mes1	Mes2			
Bonnie Glen	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	21	21		36	
	L _{A1} , 1min	37	33	n/a ¹	45	
Rosebank	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	Inaudible	Inaudible		36	
	L _{A1} , 1min	33	40	n/a ¹	45	
Warrengong	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	26	26		38	
	Night L _{Aeq} , 15min	27	28		35	
	L _{A1} , 1min	43	46	Livestock	45	
South Log	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	Inaudible	Inaudible		38	
	L _{A1} , 1min	44	42	n/a ¹	45	
Northwest	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	31	29		38	
	L _{A1} , 1min	37	37	n/a ¹	45	
Willow Creek	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	<30	<30		35	
	L _{A1} , 1min	42	46	Gusting Wind	45	
Chesterfield	Day L _{Aeq} , 15min	Inaudible	Inaudible		43	Compliant
	Evening L _{Aeq} , 15min	Inaudible	Inaudible		38	
	Night L _{Aeq} , 15min	Inaudible	Inaudible		35	
	L _{A1} , 1min	40	42	n/a ¹	45	

Note 1: L_{A1} level equivalent to or less than the criteria, no further assessment undertaken.

4.2 Summary of Noise Complaints (2017/2018)

Review of Cadia's Annual Environmental Management Report 2016/17 (Newcrest Mining Limited, 2017) indicates that no noise complaints were received during 2016-17 time period.

Four noise complaints were received during the 2017-18 period as indicated by Cadia's Annual Environmental Management Report 2017/18 (Newcrest Mining Limited, 2018). They have been reproduced below. Review of the noise complaints indicate that they all relate to noise generated by a water bombing aircraft used for dust suppression (i.e. not the Ore Processing Facilities area).

Table 4-5 Noise Complaints – 2017/2018

20 Mar 2018	Flyers Creek	Noise	A Flyers Creek resident contacted Cadia regarding the use of water bombing aircraft for dust suppression purposes.	Cadia advised that aerial application of dust suppressant to the tailings storage facilities was being conducted to minimise dust emissions. The application was being carried out during daylight hours and excluding weekends and public holidays and the aircraft were flying at a minimum height of 500ft. Cadia committed to varying the flight path to minimise noise impact.
21 Mar 2018	Forest Reefs	Noise	A Forest Reefs resident contacted Cadia regarding the use of water bombing aircraft for dust suppression purposes.	Cadia advised that aerial application of dust suppressant to the tailings storage facilities was being conducted to minimise dust emissions. The application was being carried out during daylight hours and excluding weekends and public holidays and the aircraft were flying at a minimum height of 500ft. Cadia committed to varying the flight path to minimise noise impact.
27 Mar 2018	Tallwood	Noise	A Tallwood resident contacted Cadia regarding the use of water bombing aircraft for dust suppression purposes.	Cadia advised that aerial application of dust suppressant to the tailings storage facilities was being conducted to minimise dust emissions. The application was being carried out during daylight hours and excluding weekends and public holidays and the aircraft were flying at a minimum height of 500ft. Cadia committed to varying the flight path to minimise noise impact.
29 Mar 2018	Forest Reefs	Noise	A Forest Reefs resident contacted Cadia regarding the use of water bombing aircraft for dust suppression purposes.	Cadia advised that aerial application of dust suppressant to the tailings storage facilities was being conducted to minimise dust emissions. The application was being carried out during daylight hours and excluding weekends and public holidays and the aircraft were flying at a minimum height of 500ft. Cadia committed to varying the flight path to minimise noise impact.

5 NOISE IMPACT REVIEW

5.1 Project Approval Impact Assessment Criteria

The NSW *INP* states that the intrusiveness and amenity criteria have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the *INP* are achieved, then it is unlikely that most people would consider the resultant noise levels excessive.

The Project Approval (06_0295) sets noise criteria for Cadia (Schedule 3) consistent with the *INP*. The criteria relevant to the assessment of the Cadia mine site are reproduced in Tables 5-1 to 5-3.

Table 5-1 Noise Impact Assessment Criteria (dBA)

Location	Day ($L_{Aeq,15min}$)	Evening ($L_{Aeq,15min}$)	Night ($L_{Aeq,15min}$)	Night ($L_{A1,1min}$)
Mining Operations				
41-CW Knox ('Meribah'), 43-CJ Healey* ('Triangle Park'), 138-AC & A Bailey ('Mayburies'), 45-CC Colman* ('Mirrabooka'), 246-CK Channell and KP & DV Donlan* ('Eastburn'), 209-JI McLennan* ('Northwest'), 171-GA Knox ('South Log').	43	38	38	45
1-GT & JA Christou ('Coorabin'), 137-MP & LA Ellis* ('Argyle'), 169-RL & SL Chamberlain* ('Weemalla').	43	38	37	45
44-AR Colman ('Triangle Flat'), 105-KA Hughes ('Barton Park'), 133-LC & LR Baker ('Bonnie Glen').	43	38	36	45
Other privately-owned land.	43	38	35	45

dBA = A – weighted decibels.

* Indicates property has changed ownership and therefore has an updated property number. The following are properties that have changed property numbers that are shown in Table 5-1

43-CJ Healey ('Triangle Park') > 2122-Knox CW & GA

45-CC Colman ('Mirrabooka') > 2123-Cottage ELA & Patrech JT

246-CK Channell and KP & DV Donlan ('Eastburn') > 2127-Donlan BK & KP

209-JI McLennan ('Northwest') > 2121-Ovenden FJ & RM

137-MP & LA Ellis ('Argyle') > 2128-Maksacheff AI & DJ

169-RL & SL Chamberlain* ('Weemalla') > 2126-Stone DJ & KA

Condition 3, Schedule 3, states that if noise generated by Cadia exceeds the criteria in Table 5-2 at any residence on privately-owned land or on more than 25% of any privately-owned land, CHPL shall, upon receiving a written request for acquisition from the landowner, acquire the land.

Table 5-2 Land Acquisition Criteria (dBA)

Location	Day ($L_{Aeq,15min}$)	Evening ($L_{Aeq,15min}$)	Night ($L_{Aeq,15min}$)
<i>Mining Operations</i>			
All privately-owned land	43	43	40

The Project Approval (06_0295) also provided cumulative noise criteria (Condition 4, Schedule 3) consistent with the *INPs* amenity criteria.

Table 5-3 Cumulative Noise Criteria (dBA)

Location	Day ($L_{Aeq,period}$)	Evening ($L_{Aeq,period}$)	Night ($L_{Aeq,period}$)
<i>Mining Operations</i>			
All privately-owned land	50	45	40

The cumulative noise criteria are based on the energy average noise level over the entire day, evening or night period rather than the 15-minute interval that applies for the noise impact assessment criteria. As can be seen from the above, the criteria contained in Table 5-1 are lower (i.e. more stringent) than those in Table 5-3. Hence, compliance with the noise impact assessment criteria would indicate compliance with the cumulative noise criteria. Therefore, given that there are no other industrial noise sources in the area, the noise assessment for Cadia with the Modification is presented in comparison with the noise impact assessment criteria (Table 5-1), rather than the cumulative noise criteria.

Because the operational noise is expected to be a relatively constant source at low levels, the Modification is not expected to result in any additional noise impact relating to sleep disturbance. Therefore, $L_{A1,1min}$ noise levels (see Table 5-1) are not considered as part of this assessment.

5.2 Assessment Methodology

5.2.1 General Methodology

Potential noise impacts generated by construction activities associated with the Modification have been addressed in this review. It is considered reasonable to assess construction noise as part of general operations since additional noise impacts potentially generated by construction activities would be combined with those generated by the rest of the site. As such, it is proposed that the Project Approval impact assessment criteria outlined in Table 4-1 (derived from the *INP* intrusiveness criteria) should be used to assess construction noise. Noise generated by the construction and operation of the proposed ventilation adit was modelled individually and the predicted noise levels at the identified receivers were added to the approved noise levels from the Relocation of Molybdenum Recovery Plant Modification (Modification 10) noise assessment (Wilkinson Murray, 2018).

The resultant noise levels were then compared against the relevant noise criteria set in the Project Approval (06_0295) (Tables 4-1 and 4-2) to determine whether any potential increase in noise associated with the Modification would trigger any exceedances.

It is noted that the *Noise Policy for Industry* was released in October 2017 (EPA, 2017).

It was decided to assess the noise levels in accordance with the *INP* for the following two reasons:

- the Modification does not constitute a significant change to existing plant, equipment or processes (especially since the fan associated with the proposed ventilation adit will operate within the underground mine); and
- assessment using *INP* methodology to allow a direct comparison with previous noise assessments is advantageous (Wilkinson Murray Pty Limited, 2015; Wilkinson Murray Pty Limited, 2017; Wilkinson Murray Pty Limited, 2018).

The additional infrastructure associated with the Modification would be constructed and operate on a 24-hour basis. Therefore, noise levels associated with the Modification were predicted for the day (7.00am-6.00pm), evening (6.00pm-10.00pm) and night (10.00pm-7.00am) assessment periods.

5.2.2 Noise Sources Associated with Modification

Operational noise associated with the Modification was predicted based on the upper end of the sound power level (SWL) range used for similar upcast ventilation shafts in comparable mining operations. The assessment assumes a SWL of 113 dBA obtained from measurements conducted for Ulan Coal Mine (WMPL, 2013).

Construction of the shaft would be carried out via the use of a raise borer which drills in the upward direction towards the surface. An estimated SWL of 112 dBA was assumed for the raise borer machine located at the surface.

5.2.3 Noise Modelling Software

Operational noise levels at nearby receivers were calculated using the Environmental Noise Model (ENM) in the original Environmental Assessment (EA) noise assessment (WMPL, 2009). This model has been endorsed by the EPA for environmental noise assessments. The ENM (WMPL, 2009) takes account of the location of nearby noise sensitive receivers and surrounding terrain. In addition, the model takes into account noise attenuation due to geometric spreading of sound over distance, atmospheric absorption, shielding and the effect of acoustically soft ground. It can also be used to predict noise levels under various meteorological conditions, defined by a combination of temperature gradient, wind speed and wind direction.

Noise levels associated with the Modification used the same noise modelling procedure as used by WMPL for the Noise and Blasting Impact Assessment of the Cadia East Project (WMPL, 2009).

5.2.4 Meteorological Conditions

The *INP* generally directs the use of a single set of adverse meteorological data to use in the assessment of noise impacts. However, the original EA noise assessment (WMPL, 2009) adopted a more rigorous approach where noise levels at sensitive receivers are calculated under a varied set of existing meteorological conditions (wind speed and direction and temperature inversion strength), using meteorological data obtained from the Ridgeway station. Measured statistical occurrences of these conditions over a discrete period are then applied to the results, and a 10th percentile exceedance level calculated (i.e. the level that is exceeded 10% of the time), which is then compared with relevant criteria.

The noise assessment for the Modification used the 10th percentile exceedance approach based on the same set of existing meteorological conditions for consistency with the original EA. For further detail, please refer to the Noise and Blasting Impact Assessment of the Cadia East Project (WMPL, 2009).

5.3 Noise Assessment

5.3.1 Noise Assessment of Modification Operations

Table 5-4 presents the predicted noise levels generated at Cadia with the proposed Modification in place. Approved noise levels without the Modification and noise impact assessment criteria are also included. Noise levels are presented at a selection of the nearest and potentially most exposed receivers, rounded to the nearest decibel (dB). Compliance at those receivers would imply compliance at all surrounding noise-sensitive receivers.

Table 5-4 Predicted Noise Levels – Modification

Receiver ID	Approved L _{Aeq,15min} Noise Levels (dBA)			Approved + Proposed Modification L _{Aeq,15min} Noise Levels (dBA)			Impact Assessment Criteria L _{Aeq,15min} Noise Levels (dBA)		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
14	21	19	22	22	20	23	43	38	35
20	21	20	22	22	21	23	43	38	35
2160	25	23	26	26	25	28	43	38	35
31b	28	28	28	29	29	29	43	38	35
105a	21	17	19	21	17	19	43	38	36
125 ¹	22	19	19	23	21	21	43	38	35
125 ²	19	15	17	20	17	18	43	38	35
125 ³	21	18	19	22	20	21	43	38	35
153a	30	30	30	32	32	32	43	38	35
205 ⁴	36	35	35	36	35	35	43	38	35
2002c	24	23	25	24	23	25	43	38	35
2113	30	30	30	31	31	31	43	38	35
2116	19	15	16	21	17	18	43	38	35
2121	27	19	30	28	21	31	43	38	38

Notes: 1) Structure located near centre of Property 125
 2) Structure located at northern end of Property 125
 3) Structure located at southern end of Property 125
 4) Crown Land

A review of Table 5-4 shows that the proposed Modification would result in an increase of 0 to 2 dB when compared with the approved noise levels at the potentially most exposed receivers.

All levels in place are found to comply with the noise impact assessment criteria with the Modification and it is expected that compliance would continue to be achieved at all identified receivers surrounding Cadia.

In view of the above, the proposed Modification is not expected to impact on the acoustic amenity of receivers in the vicinity of Cadia.

5.3.2 Noise Assessment of Modification Construction Works

Table 5-5 presents the predicted daytime noise levels generated at Cadia during the construction period at the nearest and potentially most exposed receivers. Approved noise levels without the Modification and noise impact assessment criteria are also included. Noise levels are presented at a selection of the nearest receivers, rounded to the nearest dB.

Table 5-5 Predicted Noise Levels – Construction Works

Receiver ID	Approved L _{Aeq,15min} Noise Levels (dBA)			Approved + Proposed Modification L _{Aeq,15min} Noise Levels (dBA)			Impact Assessment Criteria L _{Aeq,15min} Noise Levels (dBA)		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
14	21	19	22	22	20	23	43	38	35
20	21	20	22	21	21	22	43	38	35
2160	25	23	26	26	24	27	43	38	35
31b	28	28	28	28	29	29	43	38	35
105a	21	17	19	21	17	19	43	38	36
125 ¹	22	19	19	23	20	21	43	38	35
125 ²	19	15	17	20	16	18	43	38	35
125 ³	21	18	19	22	20	21	43	38	35
153a	30	30	30	31	31	32	43	38	35
205 ⁴	36	35	35	36	35	35	43	38	35
2002c	24	23	25	24	23	25	43	38	35
2113	30	30	30	31	31	31	43	38	35
2116	19	15	16	20	17	18	43	38	35
2121	27	19	30	28	21	31	43	38	38

Notes: 1) Structure located near centre of Property 125
 2) Structure located at northern end of Property 125
 3) Structure located at southern end of Property 125
 4) Crown Land

A review of Table 5-5 shows that no exceedances of the impact assessment criteria are predicted and the resultant noise levels during the construction period have increased by 0 to 2 dB when compared with the approved noise levels.

In view of the above, the short-term construction works associated with the proposed Modification are not expected to impact on the acoustic amenity of receivers in the vicinity of Cadia.

6 CONCLUSION

CHPL is proposing to install and operate a new ventilation adit within the currently approved disturbance footprint (outside of the Cadia Hill open pit).

Potential noise impacts associated with the Modification and construction works have been considered in the noise review.

Noise predictions indicate that operational and construction noise levels associated with the proposed Modification comply with the impact assessment criteria at all identified receivers. As such, the proposed Modification is not expected to impact on the acoustic amenity of receivers in the vicinity of Cadia.

7 REFERENCES

Advitech Pty Limited (2017a) *Compliance Noise Monitoring May/June 2017*. Report prepared for Newcrest Mining Limited.

Advitech Pty Limited (2017b) *Compliance Noise Monitoring October/November 2017*. Report prepared for Newcrest Mining Limited.

Advitech Pty Limited (2018a) *Compliance Noise Monitoring May/June 2018*. Report prepared for Newcrest Mining Limited.

Advitech Pty Limited (2018b) *Compliance Noise Monitoring October/November 2018*. Report prepared for Newcrest Mining Limited.

Cadia Holdings Pty Limited (2009) *Cadia East Project Environmental Assessment*.

Department of Environment and Climate Change (2009) *Interim Construction Noise Guideline*

Environmental Protection Authority (2000) *Industrial Noise Policy*.

Environment Protection Authority (2017) *Noise Policy for Industry*.

Newcrest Mining Limited (2017) *Cadia Valley Operations Annual Environmental Management Report 2016/17*.

Newcrest Mining Limited (2018) *Cadia Valley Operations Annual Environmental Management Report 2017/18*.

New South Wales Government (2018) *Voluntary Land Acquisition and Mitigation Policy*.

Wilkinson Murray Pty Limited (2009) *Noise and Blasting Impact Assessment*. Report prepared for Cadia Holdings Pty Limited.

Wilkinson Murray Pty Limited (2013) *Ulan Coal Mine – Modelling of Current Operations*. Report prepared for Ulan Coal Mines Ltd.

Wilkinson Murray Pty Limited (2015) *Cadia Valley Operations - Processing Rate Modification Noise Assessment*. Report prepared for Cadia Holdings Pty Limited.

Wilkinson Murray Pty Limited (2017) *Cadia East Surface Preconditioning Program*. Letter report prepared for Cadia Holdings Pty Limited.

Wilkinson Murray Pty Limited (2018) *Cadia Valley Operations – Relocation of Molybdenum Recovery Plant Relocation Modification 10 - Noise Review*. Report prepared for Cadia Holdings Pty Limited.