WAGERUP RSA10 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

ALCOA OF AUSTRALIA

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Item	Page	Section	Comments

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EXECUTIVE SUMMARY

Alcoa propose to construct and operate a new residue storage area, RSA10, to the North of the existing RSA9 in the residue area adjacent to the Wagerup Alumina Refinery.

Operational noise emissions associated with the project are likely to originate from newly installed pumps and some existing pumps within the residue area, which will be relocated.

Construction activities are associated with the extraction of clay from a borrow pit to the North-East of the residue area and involve the use of mobile earth moving equipment. Construction activities will be limited to daytime hours[1], however, 2 water trucks may remain operational during night-time hours for dust suppression when required.

Alcoa's Wagerup Refinery noise model has been used to investigate the potential noise impacts associated with construction and operation of the RSA10 project.

The noise modelling has shown that:

- Predicted noise levels for new and relocated equipment associated with the RSA10 project are between 25 dB and 40 dB below ambient levels at the assessed receiving locations;
- When operational, the RSA10 project will result in no change (0.0 dB) to refinery noise emissions at the assessed receiving locations;
- Intrusive noise characteristics (i.e. tonality, impulsiveness and modulation) associated with RSA10 project operational equipment will not be evident at the assessed receiving locations.
- Daytime and night-time construction activities will comply with the *Environmental Protection (Noise) Regulations 1997* under regulation 13 provided that:
    - The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*"; and
    - The equipment used for the construction is the quietest reasonably available.

[1] 0700 to 1900 hours Monday to Saturday

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1 INTRODUCTION

This report presents an environmental noise impact assessment of Alcoa's proposed RSA10 project. The project involves construction and operation of a new residue storage area (RSA10) immediately North of the existing RSA9.

Operational noise emissions associated with the project are likely to originate from newly installed pumps. Some existing pumps within the residue area will also be relocated. Further details are provided in section 1.1.

Noise will also be generated from construction activities associated with the extraction of clay from a borrow pit to the North-East of the residue area.

The project is located in the North-West corner of the residue area at the Wagerup Alumina Refinery as shown in Figure 1-1.

Figure 1-1 : Location Map

1.1 Operational Noise Sources

New noise sources associated with the project include:

- A new 55 kW submersible decant pump located 6.5m below ground level;
- A new 30 kW submersible underdrain pump located 8m below ground level;
- A new 450kW sand booster pump;
- 2x temporary diesel pump
- 4x 20kW floating submersible and
- A new 520 kW sprinkler pump[2].

The project also involves relocation of an existing 450 kW sand booster pump and 13 kW submersible drain pump located 2m below ground level.

Locations of the new and relocated equipment are shown in Figure 1-2.

Figure 1-2 : RSA10 Operational Equipment Locations

[2] This additional sprinkler pump may be installed prior to the construction of the RSA10 project and is included in this scope for completeness of the assessment.

1.2 Construction Noise Sources

Construction involves extraction of clay from a borrow pit to the north-east of the residue area and transfer to the RSA10 area using a fleet of mobile equipment including:

- Up to 19 haul trucks;
- 4 graders;
- 2 compactors;
- 3 dozers;
- 3 excavators; and
- 2 water trucks.

Construction activities will be limited to daytime hours[3]for less than 3years beginning 2025, however, 2 water trucks may remain operational during night-time hours for dust suppression when required.

Figure 1-3 show the assumed locations of mobile equipment representing worst-case noise emissions for day and night-time construction activities respectively.

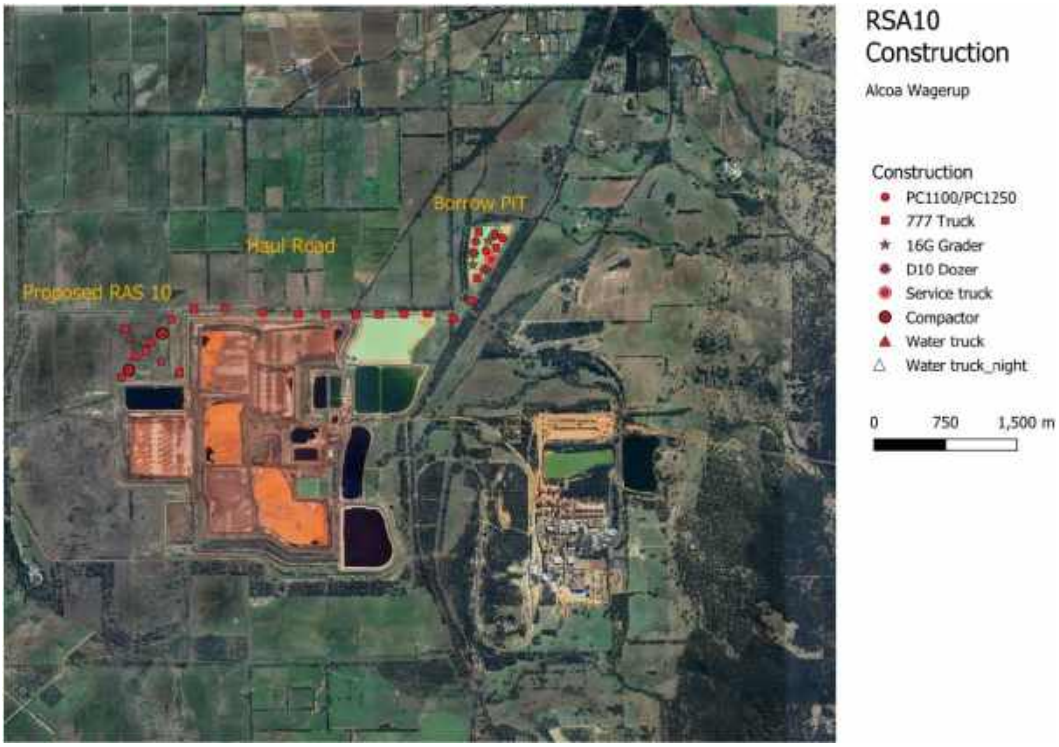

Figure 1-3 : Locations of Mobile Equipment Assumed for Daytime Construction Activities

[3] 0700 to 1900 hours Monday to Saturday

2 SUMMARY OF RELEVANT LEGISLATION

The relevant legislation applicable to noise associated with the RSA10 project includes:

- *The Environmental Protection (Noise) Regulations 1997*, which applies at Hamel; and
- *The Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval*, as amended in 2013 and 2014, (The Approval) which applies at eight locations (as defined in APPENDIX B) surrounding the refinery.

Operational L_{A10} noise limits applicable under this legislation are presented in section 2.1. Further details of the legislation are provided in APPENDIX A.

2.1 Operational Noise Limits at Approved Locations and Hamel

Table 2-1 presents L_{A10} Approved Levels for the eight locations defined in The Approval. presents the L_{A10} Assigned Levels at a location on Cornucopia Street in Hamel. Figure 2-1 shows these locations.

Table 2-1 : Wagerup Refinery Regulation 17 Approved Levels at Selected Locations

Time of Day	Noise Limit – L_{A10} dB(A)							
	L1	L2	L3	L4	L5	L6	L7	L8
0700 to 1900 hours Monday to Saturday	49	46	45	45	45	45	45	45
0900 to 1900 hours Sunday and public holidays	47	46	45	41	41	40	40	40
1900 to 2200 hours all days	47	46	45	41	41	40	40	40
2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	47	46	45	41	41	37	37	36

Table 2-2 : Assigned Levels at Hamel

Time of Day	Noise Limit – L_{A10} dB(A)
	Hamel
0700 to 1900 hours Monday to Saturday	45
0900 to 1900 hours Sunday and public holidays	40
1900 to 2200 hours all days	40
2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35

Figure 2-1 : Selected Locations Surrounding Wagerup Refinery

2.2 Legislation Relating to Constructions Noise

Regulation 13 of The *Environmental Protection (Noise) Regulations 1997* addresses noise from constructions sites and states that for construction work carried out between 7am and 7pm on any day, which is not a Sunday or public holiday the assigned noise levels do not apply provided that:

- The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*"; and
- The equipment used for the construction is the quietest reasonably available.

The Chief Executive Officer (CEO) [of the EPA] may request that a noise management plan be submitted for the construction work at any time.

For construction work done outside daytime hours or on Sundays and public holidays, if noise emissions are likely to exceed the Assigned Levels then:

- The contractor must advise all nearby occupants or other sensitive receptors who are likely to receive noise levels which fail to comply with the standard under Regulation 7, of the work to be done at least 24 hours before it commences;
- The contractor must show that it was reasonably necessary for the work to be done out of hours; and
- The contractor must submit to the CEO a Noise Management Plan at least seven days before the work starts, and the plan must be approved by the CEO. The plan must include details of:
    - Need for the work to be done out of hours;
    - Types of activities which could be noisy;
    - Predictions of the noise levels;
    - Control measures for noise and vibration;
    - Procedures to be adopted for monitoring noise emissions; and
    - Complaint response procedures to be adopted.

3 ASSESSMENT METHODOLOGY

3.1 Assessment of Operational Noise

The noise impacts associated with the RSA10 project have been assessed using the Wagerup Refinery Noise Model. The model was created in Oct 2021 and is described in Wood report no. 1401217-4-600 (*Wagerup Refinery Noise Model Design and Verification*).

Before assessing the impact of the RSA10 project, the base model was further updated to include sources within the residue area which are relevant to the project but which had not previously been included in the refinery noise model because of their very low sound power levels[4].

The sound power levels of the relevant sources were determined during a site visit undertaken in January 2022. The measured sound power levels were applied to the relevant existing equipment in the noise model and to similar equipment proposed for the RSA10 project.

The equipment added to the base model includes:

- Sand booster pumps 11 – 14; and
- Southern perimeter drain pumping station.

Sound power levels for the existing DP2 sprinkler pumps, which were originally included in the refinery model, were also updated based on new measurements recorded during the site survey.

The updated base model was used to predict noise levels at the eight approved locations and Hamel.

A second modelling scenario was then developed to represent the changes in the residue area associated with the RSA10 project as described in section 1.1. The predictions were compared to the base model to determine the noise impact of the project. The contribution of the new and relocated equipment to received noise levels was also determined and used to assess the likelihood of intrusive characteristics affecting the receiving locations.

3.1.1 RSA10 Noise Sources

Table 3-1 summarises the overall sound power levels and co-ordinates of the noise sources included in the model. One-third octave band sound power levels are provided in APPENDIX C.

[4] The net effect of these additions was 0.0 dB to the predicted noise levels at the assessment locations.

Table 3-1 : RSA10 Source Coordinates and Sound Power Levels

Noise Source	Ground RL (m)	Easting (mE)	Northing (mN)	Sound Power Level (dBA)
New submersible decant pump	15.0	394,173	6,358,070	85.2
New submersible underdrain pump	13.5	393,835	6,357,390	88.2
New DP2 sprinkler pump	30.0	396,201	6,359,358	96.7
New #15 sand booster pump	50.8	395,091	6,358,255	95.1
Relocated #14 sand booster pump	49.7	395,122	6,358,979	95.1
Relocated submersible southern perimeter drain pump	13.0	394,559	6,357,364	87.3
6inch temporary pump	0.5	394,367	6360,006	80.6
4inch temporary pump	0.5	395,152	6359,907	97
20kW Pump	0.5	393,433	6358,906	102
20kW Pump	0.5	393,394	6358,903	102
20kW Pump	0.5	393,373	6358,980	102
20kW Pump	0.5	393,731	6359,173	102

3.2 Assessment of Construction Noise

The DWER draft guideline "*Assessment of environmental noise emissions*" requires that noise level predictions are undertaken for construction activities.

Noise from construction activities was modelled in isolation using the same modelling platform, with operational refinery and residue sources excluded.

Two scenarios were investigated representing day and night-time construction activities as described in section 1.2.

3.2.1 Construction Noise Sources

Details of construction noise sources, including sound power level data, was provided by Alcoa in a report prepared by Herring Storer Acoustics: Report Reference 13292-1-11029-4-01, *RSA9 Wagerup Construction Noise Assessment*.

Table 3-2 provides the sound power levels of the constructions noise sources and the number of sources operating during daytime and night-time construction activities. One-third octave band sound power levels are provided in APPENDIX C.

The locations of construction noise sources for daytime and night-time activities are shown in Figure 1-3.

Table 3-2 : Construction Noise Source Sound Power Levels

Construction Noise Source	Number of Sources During Daytime Hours	Number of Sources During Night-time Hours	Sound Power Level (dBA)
Water Cart	2	2	106
CAT 825 Compactor	2	-	116
CAT 16G Grader	4	-	112
CAT 777 Haul Truck	19	-	119
CAT D10 Dozer	3	-	112
PC 1250 Excavator	2	-	111
PC 1100 Excavator	1	-	111

3.3 Assumed Meteorological Conditions

All noise level predictions were undertaken for worst-case weather conditions as defined in the Department of Water and Environmental Regulation (DWER) guidance: *Assessment of Environmental Noise Emissions*. These conditions are summarised in Table 3-3 below.

Table 3-3 : Worst-Case Weather Conditions Assumed for Noise Modelling

Parameter	'Day' 0700 - 1900	'Night' 1900 - 0700
Wind speed	4 m/s	3 m/s
Pasquill stability	E	F
Temperature	20 °C	15 °C
Relative humidity	50 %	50 %

4 NOISE MODELLING RESULTS

4.1 Operational Noise Predictions

Table 4-1 presents noise level predictions before and after implementation of the RSA10 project as well as the resultant change and the contribution of the new / relocated sources.

Table 4-1 : Noise Level Predictions for Operational Equipment

Receiving Location	Baseline Noise Level dB(A)	Noise Level Including RSA10 dB(A)	Change dB	Contribution of New/Relocated RSA10 Sources dB(A)
L1	45.1	45.1	0.0	21.0
L2	46.3	46.3	0.0	14.2
L3	43.2	43.2	0.0	15.8
L4	41.4	41.4	0.0	4.2
L5	41.5	41.6	0.0	6.2
L6	35	34.9	0.0	7.0
L7	37.5	37.5	0.0	5.4
L8	35.7	35.8	0.0	5.1
Hamel	52.6	52.6	0.0	14.2

4.2 Construction Noise Predictions

Table 4-2 presents noise level predictions for daytime and night-time construction activities.

Table 4-2 : Noise Level Predictions for Construction Equipment

Receiving Location	Daytime Construction Noise Level - dB(A)	Night-Time Construction Noise Level - dB(A)
L1	62.1	21.2
L2	37.4	21.2
L3	56.0	18.4
L4	18.2	16.3
L5	30.7	16.6
L6	29.8	16.6
L7	28.9	16.2

Receiving Location	Daytime Construction Noise Level - dB(A)	Night-Time Construction Noise Level - dB(A)
L8	38.2	16.1
Hamel	49.7	18.4

5 DISCUSSION OF RESULTS

5.1 Discussion of Operational Noise Results

The results presented in Table 4-1 demonstrate that the contributions of new and relocated noise sources associated with the RSA10 project are between 25 dB and 40 dB below existing refinery emissions. Consequently, the RSA10 project results in 0 dB increase in predicted overall noise levels at all selected receiving locations.

The contribution of operational noise from the RSA10 project is also so low compared to ambient levels that it is unfeasible that any intrusive characteristics (such as tonality, impulsiveness or modulation) associated with the project would be evident in received noise at the selected receiving locations.

5.2 Discussion of Construction Noise Results

The results presented in Table 4-2 for night-time construction show that noise level predictions are insignificant both compared to existing refinery noise at Hamel and typical ambient levels.

The Approval does not address construction noise and under Regulation 13 of the *Environmental Protection (Noise) Regulations 1997,* there are no restrictions to the proposed daytime construction activities provided that:

- The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*"; and
- The equipment used for the construction is the quietest reasonably available.

6 CONCLUSIONS

The following conclusions can be drawn from this assessment of noise associated with construction and operation of the proposed RSA10 project:

- Predicted noise levels for new and relocated equipment associated with the RSA10 project are between 25 dB and 40 dB below ambient levels at the assessed receiving locations;
- When operational, the RSA10 project will result in no change (0.0 dB) to refinery noise emissions at the assessed receiving locations;
- Intrusive noise characteristics (i.e. tonality, impulsiveness and modulation) associated with RSA10 project equipment will not be evident at the assessed receiving locations.
- Daytime and night-time construction activities will comply with the *Environmental Protection (Noise) Regulations 1997* under regulation 13 provided that:
    - The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*"; and
    - The equipment used for the construction is the quietest reasonably available.

APPENDIX A SUMMARY OF APPLICABLE LEGISLATION

A.1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented through the *Environmental Protection (Noise) Regulations 1997* (the Regulations) which operate under the *Environmental Protection Act 1986*. The Regulations specify maximum noise levels (assigned levels) which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises.

Assigned levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, e.g. residences, an "influencing factor" is incorporated into the assigned noise levels. The influencing factor depends on land use zonings within circles of 100 m and 450 m radius from the noise receiver, including:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major or secondary roads.

For noise sensitive residences, the time of day also affects the assigned levels.

The regulations define three types of assigned noise level:

- L_{Amax} assigned level means a noise level which is not to be exceeded at any time;
- L_{A1} assigned level which is not to be exceeded for more than 1% of the time; and
- L_{A10} assigned level which is not to be exceeded for more than 10% of the time.

The assigned levels prescribed by the Regulations are shown in Table A-1.

Table A-1 : Assigned Levels Prescribed by The Regulations

Type of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + Influencing factor	55 + Influencing factor	65 + Influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + Influencing factor	50 + Influencing factor	65 + Influencing factor
	1900 to 2200 hours all days	40 + Influencing factor	50 + Influencing factor	55 + Influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + Influencing factor	45 + Influencing factor	55 + Influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial premises	All hours	65	80	90

A.2 Adjustments for Intrusive Characteristics

Received noise levels associated with refinery operations must be adjusted if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive (e.g. banging), tonal (e.g. whining noise having a defined pitch) or modulating (e.g. noise which varies cyclically in either pitch or amplitude). Table A-2 presents the adjustments required when intrusive or dominant characteristics cannot be reasonably and practicably removed. The adjusted noise levels must now comply with the assigned noise levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics.

Table A-2 : Adjustments for Intrusive or Dominant Noise Characteristics

Adjustment where noise emission is not music - these adjustments are cumulative to a maximum of 15 dB		
Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB

A.3 Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012

In 2002 Alcoa applied for a variation to the assigned noise levels specified in the *Environmental Protection (Noise) Regulations 1997*. In June 2012, the *Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012* was gazetted. This allows Alcoa to exceed the standard prescribed under Regulation 7(1)(a), provided that Alcoa complies with the conditions of the approval. The approval was subsequently appealed.

The appeal determination process was finalised on 10 December 2013 when the *Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Amendment Approval 2013* was gazetted.

A subsequent amendment was issued in October 2014 to correct an error in the coordinates for noise monitoring locations in the appeal decision (the *Environmental Protection [Wagerup Alumina Refinery Noise Emissions] Amendment Approval 2014*).

When read together, the following documents outline the approval for the Wagerup Alumina Refinery to exceed the Noise Regulation assigned noise levels:

- Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012;
- Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Amendment Approval 2013; and
- Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Amendment Approval 2014.

In this document the term 'The Approval' refers to the documents list above, which are to be read together.

The Approval defines L_{A10} & L_{A1} noise limits at eight locations surrounding the refinery, with L_{Amax} limits unchanged from the Noise Regulations.

APPENDIX B APPROVAL LOCATIONS

The following locations are specified in the Environmental Protection (Wagerup Alumina Refinery Noise Emissions) Approval 2012:

Location 1 means any place at or adjacent to the north-eastern corner of Lot 16 on Plan 202652, near the intersection of Willowdale Road and South Western Highway, Wagerup;

Location 2 means any place at or adjacent to the south-eastern corner of Lot 145 on Plan 232779, near the intersection of Bancell Road and South Western Highway, Wagerup;

Location 3 means any place at or adjacent to the western boundary of Lot 1 on Diagram 51826, near South Western Highway, Wagerup;

Location 4 means any place at or adjacent to the south-western corner of Lot 500 on Plan 22014, near the water treatment plant on Boundary Road, Wagerup;

Location 5 means any place at or adjacent to the south-eastern corner of Lot 2606 on Plan 249779, near Boundary Road, Wagerup;

Location 6 means any place at or adjacent to the north-western corner of the intersection of Millar Street and Aitken Street, Wagerup;

Location 7 means any place at or adjacent to the intersection of Chapter Road and Aitken Street, Wagerup;

Location 8 means any place at or adjacent to the south-western corner of Lot 102 on Diagram 85596, near Waterous Road, Wagerup.

APPENDIX C NOISE SOURCE SOUND POWER LEVELS (SWL)

A.4 Operational Noise Source Sound Power Levels

Noise Source	Overall SWL dB(A)	A-Weighted 1/3 Octave Bound Sound Power Levels – dB(A)																								
		25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1	1.25	1.6	2	2.5	3.15	4	5	6.3	8	10
		Hz																kHz										
Existing Sprinkler Pumps	99.7	53.2	43.1	45.8	53.5	57.6	64.1	69.0	74.1	80.1	84.7	86.1	85.4	87.1	87.8	89.6	88.3	86.2	90.6	91.6	81.9	84.1	84.5	91.5	84.6	81.2	72.1	68.5
New Sprinkler Pump	96.7	50.2	40.0	42.8	50.5	54.6	61.1	66.0	71.1	77.1	81.7	83.1	82.4	84.1	84.8	86.5	85.3	83.2	87.6	88.5	78.9	81.1	81.5	88.5	81.6	78.2	69.1	65.5
New RSA10 Decant Pump	85.2	23.0	27.6	36.3	53.5	50.7	45.7	53.0	51.0	59.4	58.3	66.8	71.5	72.3	72.3	71.6	77.3	74.2	73.0	76.0	74.1	75.3	72.5	72.3	71.1	69.9	66.2	62.7
Sand Booster Pumps	95.1	35.3	40.3	44.5	53.5	75.4	71.4	70.0	77.2	79.8	83.0	80.2	78.5	78.0	81.1	81.4	84.1	83.2	89.3	86.6	82.2	82.4	79.2	77.6	75.0	75.1	68.4	62.3
New RSA10 Underdrain Pump	88.2	30.2	34.0	36.8	39.4	44.3	56.8	56.0	48.2	57.0	60.3	63.3	66.9	67.6	71.2	74.1	76.9	79.0	76.5	75.9	77.3	78.2	78.0	78.0	77.4	76.3	74.9	72.4

Noise Source	Overall SWL dB(A)	A-Weighted 1/3 Octave Bound Sound Power Levels – dB(A)																									
		25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1	1.25	1.6	2	2.5	3.15	4	5	6.3	8	10
		Hz																kHz										
S-Perimeter Drain P-Station	87.3	30.5	32.1	35.6	44.9	43.6	49.8	56.0	55.1	59.3	69.5	71.6	74.3	74.6	73.9	81.2	80.7	75.5	75.8	73.8	72.9	72.6	70.2	66.6	67.4	71.6	66.8	58.9
6in Top Soil Diesel Pump	81		70			71			72			74			74			77			74			70			64	
4in H-Road Diesel Pump	97		87			88			89			91			91			94			91			87			81	
20kW Pump	102		92			93			94			96			96			99			96			92			86	

A.5 Construction Noise Sources

Noise Source	Overall SWL dB(A)	Linear 1/3 Octave Bound Sound Power Levels – dB(L)																									
		25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1	1.25	1.6	2	2.5	3.15	4	5	6.3	8	10
		Hz																kHz										
Water Cart	106	100	105	102	116	103	112	106	113	110	101	93	92	96	93	100	97	94	95	92	92	88	88	86	84	80	79	76
CAT 825 Compactor	116	88	95	94	99	98	99	110	106	107	109	104	106	107	109	106	109	107	107	105	104	101	99	98	96	94	91	90
CAT 16G Grader	112	88	92	96	88	93	105	101	102	102	97	96	97	107	103	101	104	104	104	102	98	97	95	95	94	89	86	86

Noise Source	Overall SWL dB(A)	Linear 1/3 Octave Bound Sound Power Levels – dB(L)																									
		25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1	1.25	1.6	2	2.5	3.15	4	5	6.3	8	10
		Hz																kHz										
CAT 777 Haul Truck	119	110	113	110	110	108	108	108	113	111	110	111	109	114	112	111	110	109	109	108	106	106	103	102	101	97	95	93
CAT D10 Dozer	112	85	88	88	101	102	100	108	106	107	102	103	107	110	103	102	103	100	100	100	98	96	94	92	92	87	85	84
PC 1250 Excavator	111	98	105	103	105	106	110	116	105	105	107	106	104	109	106	103	101	100	100	98	96	94	92	89	86	83	80	76
PC 1100 Excavator	111	98	105	103	105	106	110	116	105	105	107	106	104	109	106	103	101	100	100	98	96	94	92	89	86	83	80	76