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APPENDIX G ADDENDUM NOISE AND VIBRATION IMPACT ASSESSMENT

Minto Resource Recovery Facility Response to Submissions

15 DECEMBER 2017

Incorporating Hyder

4 December 2017

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Skylife Properties Pty Ltd
Minto Resource Recovery Facility
13 Pembury Road Minto

Attention: Shivesh Singh

Dear Shivesh

Minto Resource Recovery Facility - Redesign Addendum Noise and Vibration Impact Assessment 13 Pembury Road Minto

1 Introduction

Approval is sought to increase the processing capacity of the existing Minto Resource Recovery Facility, located at 13 Pembury Road, Minto (the Proposal site), from 30,000 tonnes per annum (tpa) to 220,000 tpa. An approval will supersede previous approvals issued over the Proposal site and provide a new suite of operating requirements and mitigation measures commensurate to the increased processing capacity. The facility would continue to process general solid waste (non-putrescible), as described in the Waste Classification Guidelines, 2014, prepared by the NSW Environment Protection Authority (EPA). The facility is defined as a resource recovery facility under Part 3, Division 23 of *State Environmental Planning Policy (Infrastructure), 2007* (SEPP).

SLR prepared a Noise and Vibration Impact Assessment for the proposed resource recovery facility (RRF) at 13 Pembury Road, Minto on 23 March 2017 which has been documented in the Environmental Impact Statement (EIS) dated May 2017.

Amendments are now proposed to the Proposal based on submissions provided by government agencies and the community, as part of design progression, and to provide additional clarity where relevant. This addendum noise and vibration impact assessment has been prepared by SLR to quantify recent changes at the RRF and to assess the facility under its current operational conditions (the Amended Proposal).

The purpose of this addendum noise and vibration impact assessment is to assess the changes proposed in the Amended Proposal and quantify any change in impacts compared to those identified in the EIS.

1.1 Amended Proposal description

The key components of the Amended Proposal include:

- Construction of a shed and roof structure to enclose the existing waste processing and handling area

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- Demolition of minor wall and cladding extents within Shed A and Shed C to accommodate the proposed shed extension
- Minor vegetation and landscape clearing, and planting of new landscaping
- Provision of 16 on-site car parking spaces and one accessible car space
- Relocation of a site office and amenities buildings
- Provision of two vehicle access points at the eastern entrance and a single exit point at the western exit.
- Removal of the existing above-ground wheel wash
- Installation of a new 20 metre (m) long weighbridge and in-ground wheel wash at the vehicle egress point
- Relocation of the 30,000 litre self-bunded fuel tank closer to the rear of Shed A
- Extension of the dust suppression and sprinkler system across the new shed and its openings
- Provision of ancillary infrastructure and internal structures
- Provision of an electrical substation

The key operational components of the Amended Proposal would include:

- Increasing operational (including processing and waste delivery and collection) hours 6 am to 10 pm, Monday to Saturday (no works on Sundays or public holidays would be undertaken)
- Processing of up to 220,000 tpa of non-putrescible waste
- Waste storage of up to 10,000 tonnes of non-putrescible waste at any given time.

1.2 Proposal amendments

Section 0 above describes the Amended Proposal for which approval is sought. The purpose of this assessment is to assess the above changes and quantify any change in impacts compared to those identified in the EIS. The key changes to the Proposal made since the EIS, and the subject of this assessment include:

- Construction of a roof structure to enclose the waste processing and handling area
- Minor removal of walls and cladding
- Adjustments to the location of the proposed site office
- Alterations to landscaping
- Extension of a dust suppression and sprinkler system
- Minor changes to internal infrastructure
- Provision of additional car parking spaces.

An assessment of the overall Amended Proposal (described in section 0 and including these amendments) is also provided.

1.2.1 Construction

The EIS Proposal previously identified minor construction works only. To support the Amended Proposal a four month construction pause is now proposed.

The construction period of the Proposal would be approximately four months, and is anticipated to commence in early 2018. Construction of the Proposal would be undertaken in three key phases:

Stage 1 – Site preparation, demolition and installation of hardstand

Stage 2 – Construction of the enclosed processing shed, site office, amenity building and ancillary facilities

Stage 3 – Commissioning and demobilisation.

Operation of resource recovery activities would cease during the construction period.

A glossary of acoustic terminology used throughout this report is included as **Appendix A**.

2 Project Specific Noise and Vibration Criteria

The Project Specific Noise and Vibration Criteria for the proposed Minto Resource Recovery Facility has been outlined in the previous SLR's noise assessment dated 23 March 2017 and will remain unchanged and shown below.

2.1 Construction Noise Management Levels

The construction Noise Management Levels are presented in **Table 1**.

Table 1 Construction Noise Criteria

Receiver	Measured Ambient Noise Levels			Noise Management Levels - NMLs (dBA)					
	Daytime[1]	Evening[1]	Night-time[1]	Standard Hours Daytime	Highly Noise Affected	Out of Hours Daytime	Out of Hours Evening	Out of Hours Night-time	Sleep Disturbance Screening Criterion
Residential Receivers	53	51	44	63	75	58	56	49	59

Note 1: Standard hours are 7.00 am to 6.00 pm Monday to Friday, 8.00 am to 1.00 pm on Saturdays with no work on Sundays or Public Holidays. Evening is 6.00 pm to 10.00 pm. Night-time is 10.00 pm to 7.00 am Sundays to Saturday and 10.00 pm to 8.00 am on Sunday.

2.2 Operational Noise Criteria

The intrusive and amenity criteria for nearby residential premises and industrial boundaries are presented in **Table 2**.

Table 2 Operational Noise Criteria for at Nearest Residential Receivers

Receiver	Time of Day	ANL[1] LAeq(period)	Criteria for New Sources		
			Intrusive LAeq(15minute)	Amenity[2] LAeq(period)	Sleep Disturbance LAmax Screening Criteria
Residential	Morning Shoulder[5] Period (6am-7am)	-	57	55	INP 67 RNP 60-65[3] and 75-80[4]
	Day	60	58	60	-
	Evening	50	56	56	-
	Night	45	49	51	INP 59 RNP 60-65[3] and 75-80[4]
Commercial	When in use	Acceptable 65 Maximum 70	-	65-70	-
Industrial	When in use	Acceptable 70 Maximum 75	-	70-75	-

Note 1: ANL = "Acceptable Noise Level" for residences in Suburban areas, and acceptable and maximum noise level for industrial receivers in accordance with INP.

Note 2: Assuming existing noise levels are unlikely to decrease in the future.

Note 3: Unlikely to awaken people.

Note 4: One or two noise events per night are not likely to affect health and wellbeing significantly.

Note 5: Shoulder period defined as per Section 3.3 of the INP ie 6.00 am to 7.00 am.

2.3 Traffic Noise Criteria

The NSW Road Noise Policy's (RNP's) assessment criteria for residences potentially affected by additional traffic generated by land use developments on local roads are summarised in **Table 3**.

Table 3 NSW RNP Road Traffic Noise Assessment Criteria for Residences

Road category	Type of project/land use	Assessment criteria[1]	
		Day (7:00 am to 10:00 pm)	Night (10:00 pm to 7:00 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 dBA	LAeq(9hour) 55 dBA
Local Roads	Existing residences affected by **additional traffic** on existing local roads generated by land use developments	LAeq(1hour) 55 dBA	LAeq(1hour) 50 dBA

Note 1: The criteria are for assessment against façade-corrected noise levels when measured at 1 m in front of a building facade.

In relation to the noise criteria in **Table 3**, the RNP notes that an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. Where existing residences and other sensitive land uses are potentially affected by additional traffic on existing roads due to land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding 'no build option'.

2.4 Vibration - Human Comfort

The NSW EPA's *Assessing Vibration: a technical guideline* provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the daytime or night-time period.

The recommended VDVs for vibration of an intermittent nature (eg construction works where more than three distinct vibration events occur) are presented in **Figure 1**.

Figure 1 Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$) (EPA *Assessing Vibration: a technical guideline)*

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

3 Noise Assessment

3.1 Noise Model

In order to predict noise levels associated with the Amended Proposal at noise sensitive receivers, a SoundPLAN computer model was developed for the facility. SoundPLAN is a software package which enables compilation of a sophisticated computer model comprising a digitised ground map (containing ground contours and significant structures, where appropriate), the location and acoustic power levels of significant noise sources, and the location of sensitive receptors.

3.2 Construction Noise

3.2.1 Construction Plant and Equipment

The comparison of the original and revised construction plants for the proposed Minto Resource Recovery Facility is presented in **Table 4** below. The sound power level for each individual construction plant and the combined sound power level for each construction scenario are also presented in **Table 4**.

Table 4 Construction Scenarios and Equipment Sound Power Levels Comparison

Scenario	Plant/Equipment Item	Number of items per 15 minute period		Maximum Sound Power Level (L_{Aeq})		
				Individual Item	Maximum for Scenario[1]	
		EIS Proposal	Amended Proposal		EIS Proposal	Amended Proposal
S1 General Construction	Elevated Working Platform	1	1	97	118	118
	Hand Tools	1	1	96		
	Grinder	1	1	98		
	Circular Saw	1	1	104		
	Truck (10 tonne)	1	1	98		
	Dozer	1	1	110		
	Bobcat	1	1	104		
	Excavator (20 tonne)	1	1	99		
	Front End Loader (FEL) 962	2	2	112		
	Tipper Truck	4	4	97		
	Franna Crane	2	2	99		
	Concrete Truck / Agitator	1	1	106		
	Water Tanker (8000 litre)	2	2	98		
	Boom Lift	-	2	92		
	Scissor Lift	-	2	92		
S2 Noise Intensive Works	Excavator (Breaker)[2]	1	1	121	121	121

Note 1: Maximum activity assumes all plant and equipment per scenario operating concurrently.

Note 2: Denotes “annoying” items of equipment as defined in the ICNG, and as such includes a +5dB penalty to the predictions.

3.2.2 Predicted Construction Noise Levels

The EIS Proposal and Amended Proposal predicted construction noise at each of the surrounding residential areas is presented in **Table 5**.

Table 5 Predicted Construction Noise Levels

Scenario	Receiver ID	Receiver Type	Worst Case Predicted		Daytime NML	Daytime Exceedance	
			EIS Proposal	Amended Proposal		Original Design	Redesign
S1 General Construction	R1	Residential	32	32	63	-	-
	R2	Residential	36	36	63	-	-
	R3	Residential	32	32	63	-	-
	R4	Residential	25	25	63	-	-
	R5	Residential	27	27	63	-	-
	R6	Residential	43	43	63	-	-
	R7	Residential	49	49	63	-	-
	R8	Residential	49	49	63	-	-
	R9	Residential	44	44	63	-	-
	R10	Residential	38	38	63	-	-
	R11	Residential	36	36	63	-	-
	R12	Residential	37	37	63	-	-
	R13	Residential	35	35	63	-	-
	R14	Residential	36	36	63	-	-
	R15	Residential	35	35	63	-	-
	R16	Residential	37	37	63	-	-
	R17	Residential	33	33	63	-	-
	I1	Industrial	59[2]	59[2]	75[3]	-	-
	I2	Industrial	67[2]	67[2]	75[3]	-	-
	I3	Industrial	66[2]	66[2]	75[3]	-	-
	I4	Industrial	51[2]	51[2]	75[3]	-	-
	I5	Industrial	59[2]	59[2]	75[3]	-	-
	C1	Community	27[2]	27[2]	70[3]	-	-
	C2	Community	39[2]	39[2]	70[3]	-	-
	C3	Community	31[2]	31[2]	70[3]	-	-
	C4	Community	32[2]	32[2]	70[3]	-	-
	C5	Community	30[2]	30[2]	70[3]	-	-
	C6	Community	28[2]	28	70[3]	-	-
S2 Noise Intensive Works	R1	Residential	35	35	63	-	-
	R2	Residential	39	39	63	-	-
	R3	Residential	35	35	63	-	-
	R4	Residential	28	28	63	-	-
	R5	Residential	30	30	63	-	-
	R6	Residential	46	46	63	-	-
	R7	Residential	52	52	63	-	-
	R8	Residential	52	52	63	-	-
	R9	Residential	47	47	63	-	-
	R10	Residential	41	41	63	-	-
	R11	Residential	39	39	63	-	-
	R12	Residential	40	40	63	-	-

Scenario	Receiver ID	Receiver Type	Worst Case Predicted		Daytime NML	Daytime Exceedance	
			EIS Proposal	Amended Proposal		Original Design	Redesign
S2 Noise Intensive Works	R13	Residential	38	38	63	-	-
	R14	Residential	39	39	63	-	-
	R15	Residential	38	38	63	-	-
	R16	Residential	40	40	63	-	-
	R17	Residential	36	36	63	-	-
	I1	Industrial	62[2]	62[2]	75[3]	-	-
	I2	Industrial	70[2]	70[2]	75[3]	-	-
	I3	Industrial	69[2]	69[2]	75[3]	-	-
	I4	Industrial	54[2]	54[2]	75[3]	-	-
	I5	Industrial	62[2]	62[2]	75[3]	-	-
	C1	Community	30[2]	30[2]	70[3]	-	-
	C2	Community	42[2]	42[2]	70[3]	-	-
	C3	Community	34[2]	34[2]	70[3]	-	-
	C4	Community	35[2]	35[2]	70[3]	-	-
	C5	Community	33[2]	33[2]	70[3]	-	-
	C6	Community	31[2]	31[2]	70[3]	-	-

Note 1: Noise predictions obtained from SLR's report "*610.14692.00120 Resource Recovery Facility – Minto, 13 Pembury Road, Minto, Noise and Vibration Assessment* dated 23 March 2017".

Note 2: Predicted amenity noise levels for Industrial and Community Receptors.

Note 3: Amenity noise criteria - LAeq(period).

Additional Boom Lifts and Scissor Lifts would be required for the construction scenarios compared with the EIS Proposal. However, the predicted overall construction noise levels at the surrounding noise affected receivers remain unchanged. The predicted construction noise levels presented in **Table 5** do not trigger the daytime NML for residential premises at the nearest residential receivers and other land uses.

3.3 Operational Noise

3.3.1 Operational Scenarios

The proposed operation hours and scenarios remain unchanged from the EIS Proposal and shown below:

The proposed hours of operations are:

- Monday to Saturday: 6:00am to 10:00pm
- Sunday and Public Holidays: No operation

The operational scenarios incorporated into the noise model to reflect the above operations are discussed in **Table 6**.

Table 6 Operational Scenarios

INP Assessment Time Period	Operational Characteristics
Morning Shoulder (6:00 am to 7:00 am)	Waste processing vehicles fully operational (equivalent to 2000 tonnes/day) sorting waste and loading trucks Trucks dropping off / picking up waste (9 Trucks idling, up to 8 trucks arriving and leaving during any 15 minute period at a speed of 10km/h)
Daytime (7:00 am to 6:00 pm)	Waste processing vehicles fully operational (equivalent to 2000 tonnes/day) sorting waste and loading trucks Trucks dropping off / picking up waste (9 Trucks idling, up to 8 trucks arriving and leaving during any 15 minute period at a speed of 10km/h)
Evening (6:00 pm to 10:00 pm)	Waste processing vehicles fully operational (equivalent to 2000 tonnes/day) sorting waste and loading trucks Trucks dropping off / picking up waste (9 Trucks idling, up to 8 trucks arriving and leaving during any 15 minute period at a speed of 10km/h)

3.3.2 Operational Noise Predictions

A summary of the predicted operational noise levels for the original design and redesign of the Minto Resource Recovery Facility is shown in **Table 7**.

Table 7 Predicted Operational Noise Levels

Receiver	EIS Predicted Noise Levels				Amended Predicted Noise Levels				Difference between EIS Proposal and Amended Proposal				Project Specific Noise Criteria	
	Period				Period				Period					
	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Evening	Morning Shoulder (Sleep Disturbance)
	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAmax
Residential Receptor														
R1	30	30	30	39	27	27	27	36	-3	-3	-3	-3	57/58/56	67
R2	33	33	33	40	30	30	30	37	-3	-3	-3	-3	57/58/56	67
R3	29	29	29	37	26	26	26	34	-3	-3	-3	-3	57/58/56	67
R4	22	22	22	30	21	21	21	29	-1	-1	-1	-1	57/58/56	67
R5	28	28	28	37	28	28	28	37	0	0	0	0	57/58/56	67
R6	39	39	39	45	41	41	41	47	2	2	2	2	57/58/56	67
R7	46	46	46	52	44	44	44	50	-2	-2	-2	-2	57/58/56	67
R8	45	45	45	49	44	44	44	48	-1	-1	-1	-1	57/58/56	67
R9	39	39	39	43	38	38	38	42	-1	-1	-1	-1	57/58/56	67
R10	34	34	34	39	34	34	34	39	0	0	0	0	57/58/56	67
R11	29	29	29	35	30	30	30	36	1	1	1	1	57/58/56	67
R12	34	34	34	38	32	32	32	36	-2	-2	-2	-2	57/58/56	67
R13	33	33	33	41	27	27	27	35	-6	-6	-6	-6	57/58/56	67
R14	33	33	33	41	28	28	28	36	-5	-5	-5	-5	57/58/56	67
R15	35	35	35	43	29	29	29	37	-6	-6	-6	-6	57/58/56	67
R16	34	34	34	42	30	30	30	38	-4	-4	-4	-4	57/58/56	67
R17	29	29	29	41	29	29	29	41	0	0	0	0	57/58/56	67

Receiver	EIS Predicted Noise Levels				Amended Predicted Noise Levels				Difference between EIS Proposal and Amended Proposal				Project Specific Noise Criteria	
	Period				Period				Period					
	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Morning Shoulder	Day	Evening	Morning Shoulder (Sleep Disturbance)	Evening	Morning Shoulder (Sleep Disturbance)
	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LAmax	LAeq (15minute)	LAmax
Industrial Receptor														
I1	59[1]	59[1]	59[1]	n/a	55[1]	55[1]	55[1]	n/a	-4	-4	-4	n/a	75[2]	n/a
I2	63[1]	63[1]	63[1]	n/a	63[1]	63[1]	63[1]	n/a	0	0	0	n/a	75[2]	n/a
I3	64[1]	64[1]	64[1]	n/a	66[1]	66[1]	66[1]	n/a	2	2	2	n/a	75[2]	n/a
I4	60[1]	60[1]	60[1]	n/a	58[1]	58[1]	58[1]	n/a	-2	-2	-2	n/a	75[2]	n/a
I5	58[1]	58[1]	58[1]	n/a	47[1]	47[1]	47[1]	n/a	-11	-11	-11	n/a	75[2]	n/a
Community Receptor														
C1	28[1]	28[1]	28[1]	n/a	34[1]	34[1]	34[1]	n/a	6	6	6	n/a	75[2]	n/a
C2	37[1]	37[1]	37[1]	n/a	37[1]	37[1]	37[1]	n/a	0	0	0	n/a	75[2]	n/a
C3	27[1]	27[1]	27[1]	n/a	28[1]	28[1]	28[1]	n/a	1	1	1	n/a	75[2]	n/a
C4	29[1]	29[1]	29[1]	n/a	27[1]	27[1]	27[1]	n/a	-2	-2	-2	n/a	75[2]	n/a
C5	33[1]	33[1]	33[1]	n/a	33[1]	33[1]	33[1]	n/a	0	0	0	n/a	75[2]	n/a
C6	30[1]	30[1]	30[1]	n/a	31[1]	31[1]	31[1]	n/a	1	1	1	n/a	75[2]	n/a

Note 1: Predicted amenity noise levels for Industrial and Community Receptors.

Note 2: Amenity noise criteria - $L_{Aeq(period)}$.

According to the noise predictions presented in **Table 7**, the operational noise levels have been reduced at most of the assessment locations due to the enclosure of the site. Noise increases were also found at six assessment locations due to the noise from the opening areas and the roof of the enclosure. The predicted noise levels from the proposed operation would comply with the project specific noise criteria presented in **Table 2** at all residential receivers and other land uses.

3.4 Off-site Traffic Noise

Campbelltown Road and Pembroke Road have been identified as "Sub-arterial Road". According to the NSW Road Noise Policy (RNP), the relevant assessment criteria for residences potentially affected by additional traffic generated by land use developments on sub-arterial road are 60 dBA $L_{Aeq(15hour)}$ and 55 dBA $L_{Aeq(9hour)}$.

Vehicles would access the site via three (3) routes depending upon their direction. **Figure 2** and **Figure 3** depict the routes that vehicles would take to access the Proposal site.

Figure 2 Inbound Haul Route

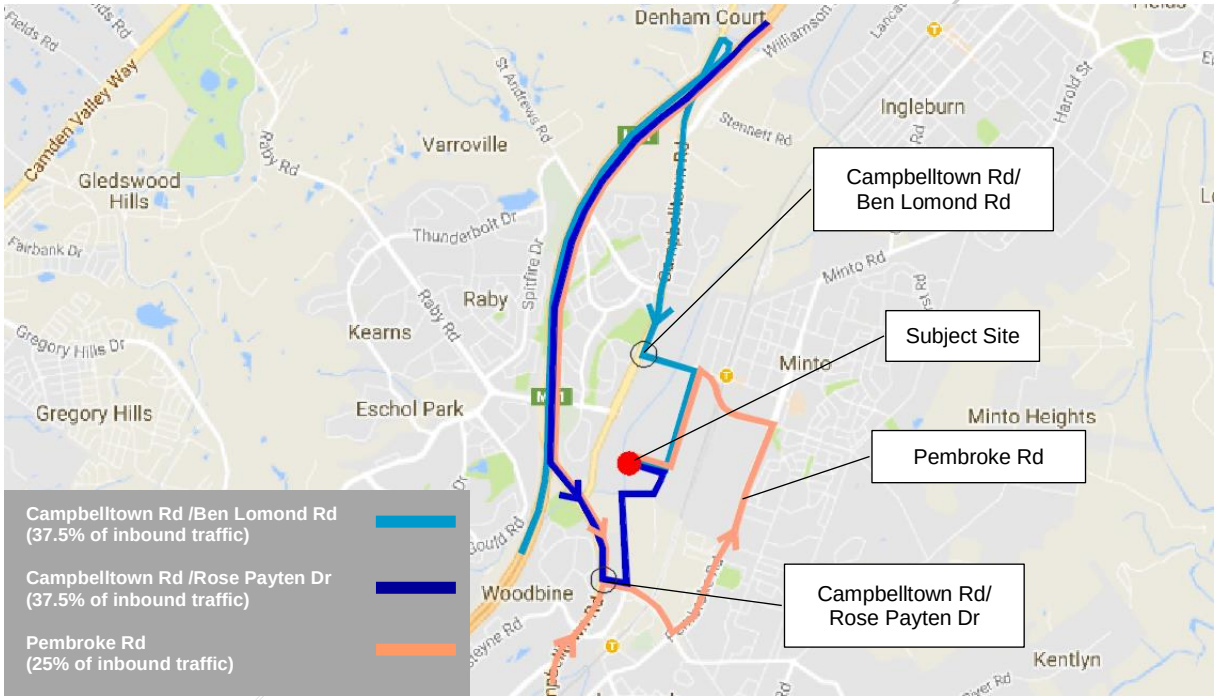
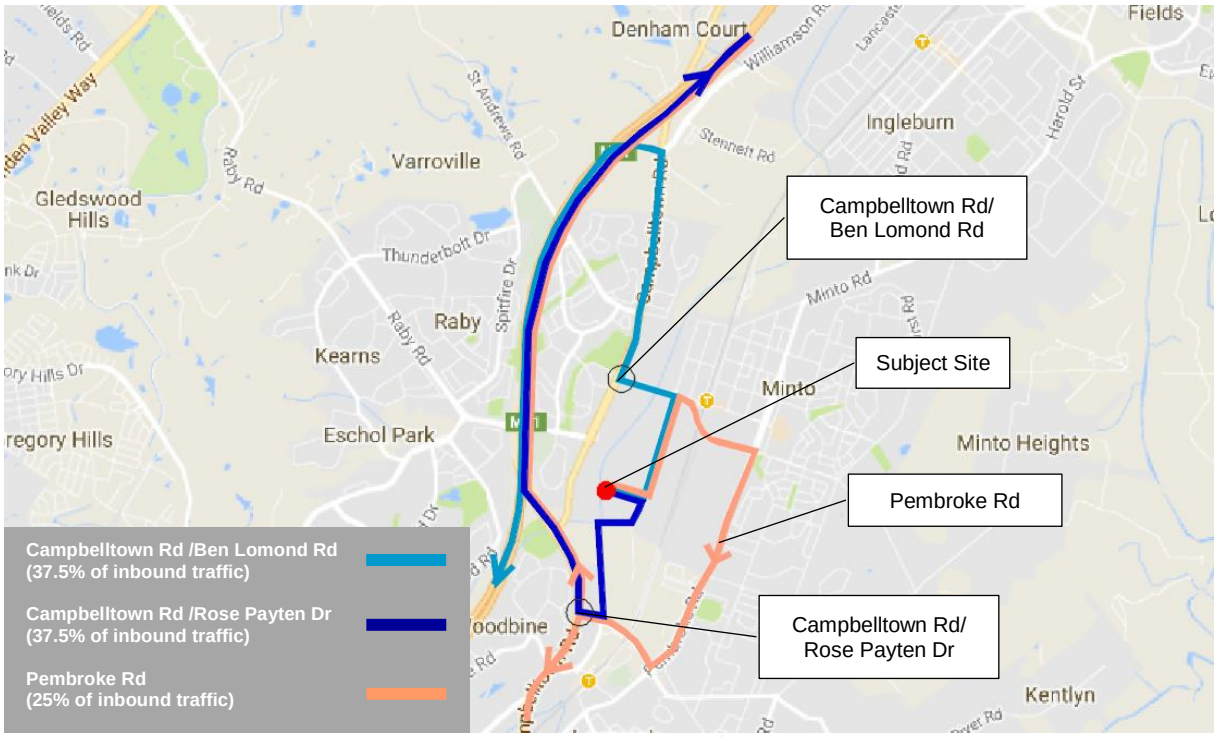


Figure 3 Outbound Haul Route



The existing traffic flows on Campbelltown Road and Pembroke Road for day and night-time periods are presented in **Table 8**. The predicted traffic noise levels for the existing environment in accordance with Calculation of Road Traffic Noise (CORTN) methodology at the most noise affected receivers along Campbelltown Road and Pembroke Road are also presented in **Table 8**.

Table 8 Average Daily Traffic Flow on Campbelltown Road and Pembroke Road[1,5]

Road	Period	Existing (including existing project-related)[2]			Predicted Noise Levels LAeq(period) - dBA
		LV	HV	Total	
Campbelltown Road	Daytime[3]	32,922	2,896	35,818	$L_{Aeq(15\ hour)}$[6] = 67.8
	Night-time[4]	6,750	740	7,490	$L_{Aeq(9\ hour)}$[7] = 63.8
Pembroke Road	Daytime[3]	17,074	956	18,030	$L_{Aeq(15\ hour)}$[6] = 67.7
	Night-time[4]	2,176	215	2,391	$L_{Aeq(9\ hour)}$[7] = 62.3

Note 1: Traffic flows are for two way traffic movements.

Note 2: Existing traffic flow on Campbelltown Road is based hourly annual average traffic flows from RMS's published AADT Traffic Volume Viewer database for Station 83011 for the period 20 March 2017 to 26 March 2017 (RMS AADT); Existing traffic flow on Pembroke Road is based traffic count survey conducted between 19 and 25 September 2017 by TTPP.

Note 3: Daytime period (7:00 am to 10:00pm).

Note 4: Night-time period (10:00 pm to 7:00am).

Note 5: LV – number of light vehicles. HV – Number of heavy vehicles.

Note 6: $L_{Aeq(15hour)}$ refers to the daytime period between 7:00 am and 10:00 pm.

Note 7: $L_{Aeq(9hour)}$ refers to the night-time period between 10:00 pm and 7:00 am.

The results in **Table 9** show that the predicted traffic noise levels for the existing environment at the most noise affected receivers along Campbelltown Road and Pembroke Road exceed the NSW RNP criteria of 60 dBA $L_{Aeq(15hour)}$ and 55 dBA $L_{Aeq(9hour)}$. The NSW RNP 2 dBA 'allowance' criterion therefore applies for the amended Proposal.

The comparison of the existing and the additional project-generated traffic flows are presented in **Table 9**. For the purposes of this noise impact assessment, the weekly average traffic flows for daytime (7:00 am to 10:00 pm) and morning shoulder (6:00 am to 7:00 am) are shown, together with the relative percentage increase associated with the Amended Proposal traffic.

Table 9 Average Daily Traffic Flow on Campbelltown Road and Pembroke Road[1,6]

Road	Period	Existing (including existing project-related)[2]			Additional project-generated[3]			Cumulative			Increase due to Project		
		LV	HV	Total	LV	HV	Total	LV	HV	Total	LV	HV	Total
Campbelltown Road	Daytime[4]	32,922	2,896	35,818	31	44	75	32,953	2,940	35,893	0.1%	1.5%	0.2%
	Morning Shoulder[5]	2,224	212	2,436	2	14	15	2,226	225	2,451	0.1%	6.4%	0.6%
Pembroke Road	Daytime[4]	17,074	956	18,030	10	15	25	17,084	971	18,055	0.1%	1.5%	0.1%
	Morning Shoulder[5]	699	63	762	1	5	5	699	68	767	0.1%	7.1%	0.7%

Note 1: Traffic flows are for two way traffic movements.

Note 2: Existing traffic flow on Campbelltown Road is based hourly annual average traffic flows from RMS's published AADT Traffic Volume Viewer database for Station 83011 for the period 20 March 2017 to 26 March 2017 (RMS AADT); Existing traffic flow on Pembroke Road is based traffic count survey conducted between 19 and 25 September 2017 by TTPP.

Note 3: Proposed additional traffic flows based on traffic count survey conducted between 19 and 25 September 2017 by TTPP. TTPP has also estimated that approximately 25% of the project-generated vehicles will use Pembroke Road and approximately 75% of the project-generated vehicles will use Campbelltown Road.

Note 4: Daytime period (7am to 10pm).

Note 5: Morning Shoulder period (6pm to 7am).

Note 6: LV – number of light vehicles. HV – Number of heavy vehicles.

Traffic noise levels at the most noise affected receivers along Campbelltown Road and Pembroke Road have been predicted in accordance with Calculation of Road Traffic Noise (CORTN) methodology and the latest traffic count presented in **Table 9**. The summary of predicted traffic noise levels for the existing and proposed environment are shown in **Table 10** below.

Table 10 Predicted Traffic Noise Levels

Road	Period	Existing (Including existing project-related)	Proposed (Including additional project-generated)	Noise Increase
Campbelltown Road	$L_{Aeq(15hour)}$[1], dBA	67.8	67.9	0.1
	$L_{Aeq(1hour)}$[2], dBA	68.1	68.3	0.2
Pembroke Road	$L_{Aeq(15hour)}$[1], dBA	67.7	67.8	0.1
	$L_{Aeq(1hour)}$[3], dBA	66.7	66.9	0.2

Note 1: $L_{Aeq(15hour)}$ refers to the 7:00 am to 10:00 pm daytime period.

Note 2: $L_{Aeq(1hour)}$ refers to the 6:00 am to 7:00 am night-time period.

Table 10 also shows that the maximum 0.2% and 0.1% increase in total traffic flows, respectively, due to the additional project-generated vehicles on Campbelltown Road and Pembroke Road would result in less than a 2 dBA increase in the existing traffic noise levels. Specifically, the traffic noise levels would increase by 0.1 dBA and 0.2 dBA during the daytime and morning shoulder periods on Campbelltown Road and Pembroke Road. Accordingly, the residents along both Campbelltown Road and Pembroke Road comply with the RNP's 2 dBA noise increase allowance criterion. According to EPA's Road Noise Policy, the noise increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average. Further, the EPA's Road Noise Policy goes on to say, where existing residences and other sensitive land uses are potentially affected by additional traffic on existing roads due to land use developments, any increase in the total traffic noise level should be limited to 2 dB above the corresponding 'no build option'.

Therefore, the residents along Campbelltown Road and Pembroke Road comply with the RNP's 2 dBA noise increase allowance criterion.

3.5 Operational Vibration

The existing mechanical plant operating at the Proposal site is not anticipated to change; however, the plant would be maintained and monitored on an ongoing basis. As assessed in SLR's previous assessment, no potentially vibration sensitive receivers have been identified in close proximity to the Proposal site at this stage.

4 Conclusion

The Minto Resource Recovery Facility upgrade proposal has been changed after initial feedback had been received from the relevant parties. This report updates the noise and vibration impact to the most noise and vibration sensitive receivers due to the redesign of the Minto Resource Recovery Facility upgrade project.

This assessment has been carried out in accordance with NSW regulatory requirements and will accompany Response to Submissions (RtS) report to be submitted to the Department of Planning and Environment for the proposed upgrades.

The assessment has demonstrated that the Proposal site would be able to operate at a rate of 220,000 tonnes per annum in an acoustically compliant manner.

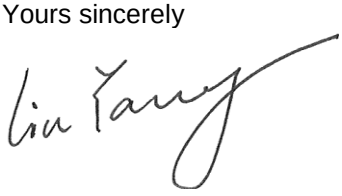
Construction noise emission would remain unchanged to the most noise affected receivers compared with the original assessment prepared by SLR on 23 March 2017. The predicted construction noise levels do not trigger the daytime NML for at all surrounding receivers. No additional construction mitigation measures are required for the amended Minto Resource Recovery Facility.

Noise reductions have been achieved at most of the residential receivers and other land uses. Operational noise emissions are predicted to comply with the site specific operational intrusive and amenity noise criteria at the most noise affected residential receivers and other land uses. No additional noise management or mitigation measures are required to achieve compliance with the project specific noise limits at all surrounding receivers.

Vibration emissions would remain unchanged as the existing mechanical plants operating at the Proposal site are not anticipated to change. The predicted vibration levels comply with the relevant criteria at all surrounding receivers, provided that heavy objects are not dropped from height and that they are handled through the use of appropriate plant to minimise vibration.

Traffic noise assessment has found that the existing traffic noise levels on both Campbelltown Road and Pembroke Road have exceeded the NSW RNP's base criteria of 60 dBA $L_{Aeq(15hour)}$ and 55 dBA $L_{Aeq(9hour)}$. The 2 dBA 'allowance' criterion is therefore applicable for this project. The traffic noise prediction has shown the increase in the existing traffic noise levels at surrounding residential receivers would be negligible and the Amended Proposal would be in compliance with the traffic noise criteria.

Yours sincerely



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Associate

Checked/
Authorised by: DG

GLOSSARY OF ACOUSTIC TERMINOLOGY

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

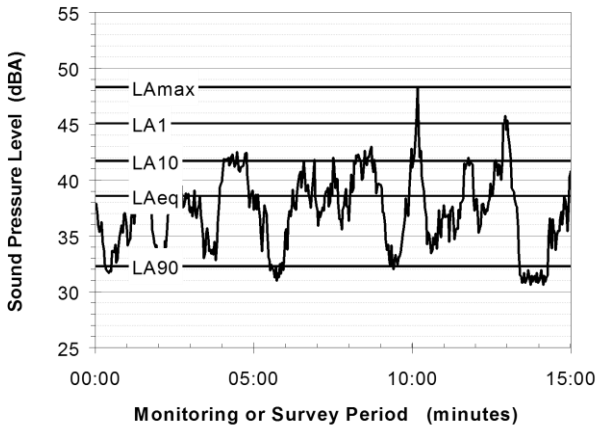
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_W, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' L_{A90} noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (L_{Aeq}, L_{A10}, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

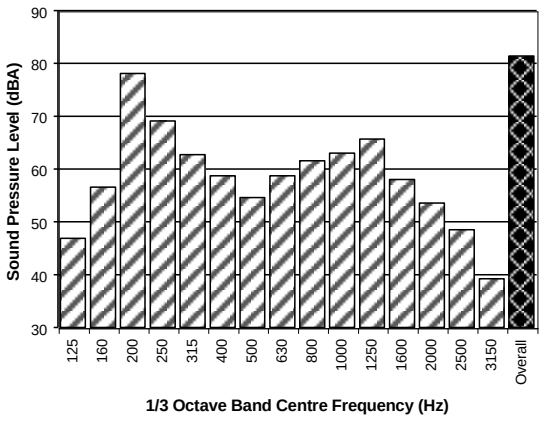
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/V_0), where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

10 Over-Pressure

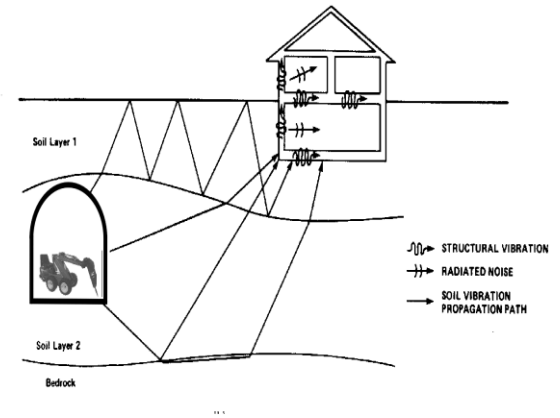
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise