Wangara Waste Transfer Station

Environmental Noise Assessment

Prepared for City of Wanneroo

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Executive Summary

The City of Wanneroo are proposing to repurpose the Wangara Material Recovery Facility site at 86 Motivation Dr, Wangara WA 6065 into a temporary Waste Transfer Station which will operate for approximately 5 years.

This report summarises an environmental noise assessment undertaken for the Wangara Waste Transfer Station (WWTS).

Aim

The aim of the study is to determine if the proposed WWTS operations are compliant with the Environmental Protection (Noise) Regulations at the surrounding noise sensitive receivers, and where applicable, provide high-level noise control advice to comply with the Environmental Protection (Noise) Regulations 1997 (the Regulations).

Noise Modelling

Noise modelling was undertaken to represent WWTS operations during day time and night-time (times of day as defined by the Regulations). The modelling included all proposed operations occurring simultaneously including vehicles, trucks, waste collection trucks and waste transfer shed operations.

The model was run under worst case weather conditions, and compared against the assigned levels.

Noise Model Results

Based on the outcomes of the noise modelling and analysis, the proposed WWTS complies with the assigned noise levels at all noise sensitive receivers under worst case conditions.

The model predicts that the WWTS operations exceed the industry boundary assigned levels.

Noise Control

It is recommended that a 2.4m high colorbond fence be installed (defined by blue lines in Figure 6-2). With the fence installed, the industry boundary assigned levels are achieved.

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1 Introduction

The City of Wanneroo are proposing to repurpose the Wangara Material Recovery Facility site at 86 Motivation Dr, Wangara WA 6065 into a temporary Waste Transfer Station which will operate for approximately 5 years.

This report summarises an environmental noise assessment undertaken for the Wangara Waste Transfer Station (WWTS).

1.1 Aim

The aim of the study is to determine if the proposed WWTS operations are compliant with the Environmental Protection (Noise) Regulations at the surrounding noise sensitive receivers, and where applicable, provide high-level noise control advice to comply with the Environmental Protection (Noise) Regulations 1997.

1.2 Scope

This report will assess noise emissions associated with WWTS operations, in accordance with the Environmental Protection (Noise) Regulations 1997. It includes operational noise emissions from site noise emissions including the transfer station shed, extraction system, mobile equipment and heavy vehicles. It excludes noise emissions from road traffic along gazetted roads outside of the facility.

1.3 Applicable Documents

[1] *Environmental Protection Act 1986*.

[2] Environmental Protection (Noise) Regulations 1997.

[3] DWER Draft Guideline “Assessment of environmental noise emissions”, May 2021.

2 Facility Overview

The proposed WWTS facility will manage approximately 20,000 tonnes per annum (tpa) recyclable waste and 80,000 tpa residual waste from Wanneroo. The proposed facility location is shown in Figure 2-1.

The facility layout, shown in Figure 2-2, will comprise designated drop-off areas for a variety of waste and recyclable materials that are accessed by haulage vehicles via a one-way internal loop road and two site exits. The facility incorporates the following key components:

- WTS Building:
  - Loading lane.
  - Fan extraction system.
  - Ventilation louvres.
  - Recycling drop-off area.
  - Residual waste drop-off area.
  - Front end loader operational area.
- Supporting infrastructure including entry, exit, access roads and service areas.
- Vehicle access roads.

2.1 Hours of Operation

The WWTS will be operational during the following hours:

- Monday to Friday, 6:00 AM - 6:00 PM
- Saturday, 6:00 AM - 6:00 PM (as required)
- Sunday, closed.
- Public holidays 6:00 AM to 6:00 PM (Excluding Christmas Day, Good Friday and New Years Day)

Table 2-1 provides a summary of estimated daily traffic volumes and peak usage times, provided by the City of Wanneroo. As the operations and traffic will occur during both the day-time and night-time periods according to the noise Regulations [2], the traffic volumes associated with the corresponding times have been considered in the noise model inputs (see section 0).

Table 2-1: Traffic Types and Volumes

Traffic Movement	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning Peak (9am-10am Monday to Saturday and 9am-10am Sundays/Public Holidays)	Waste Collection Vehicle - Kerbside collection trucks (x24 per hour) Haulage Vehicle - PM S 19M (x2 per hour)						
Afternoon Peak (12pm-1pm all days)	Waste Collection Vehicle - Kerbside collection trucks (x24 per hour) Haulage Vehicle - PM S 19M (x2 per hour)						

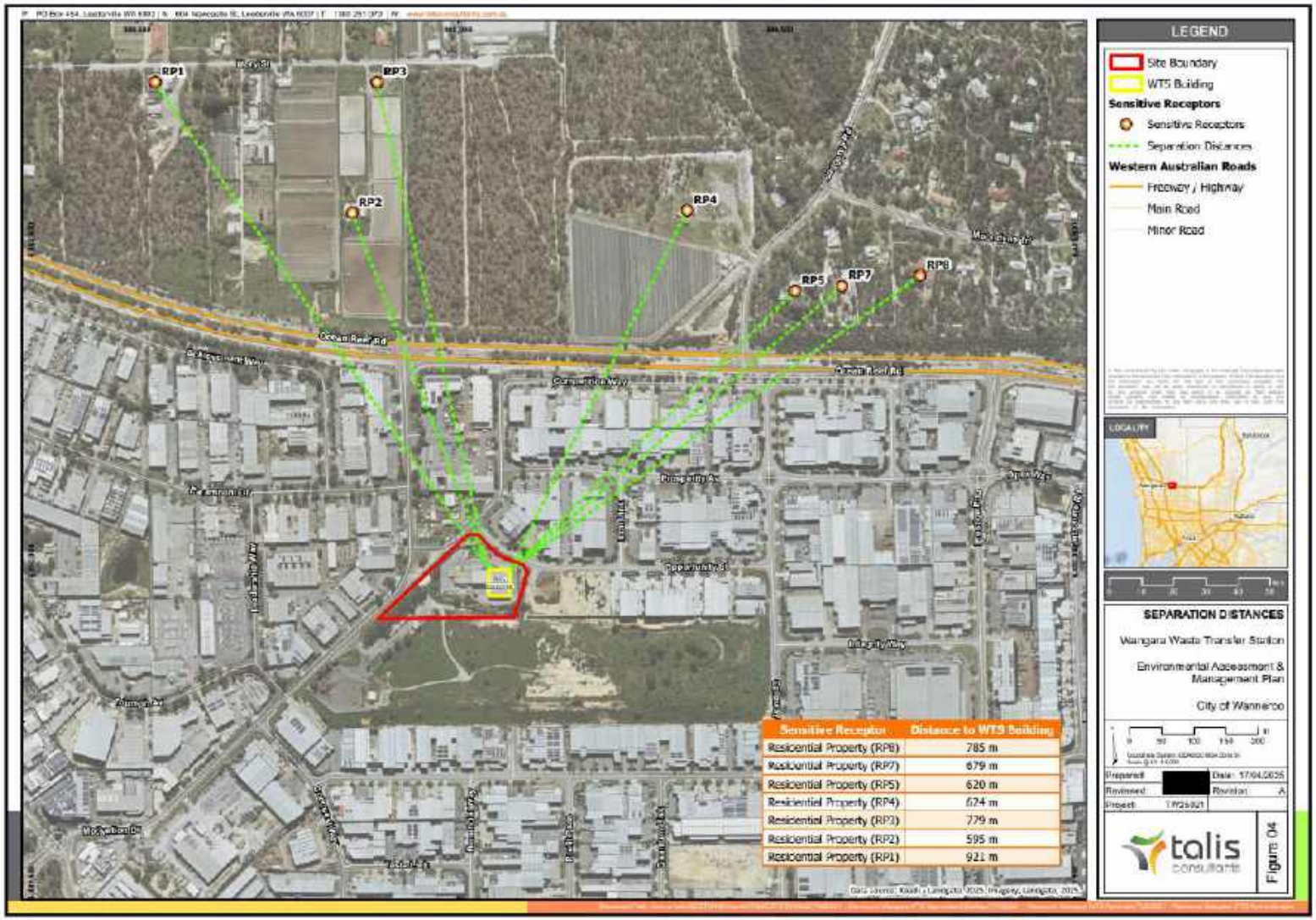

Figure 2-1: Project Location and noise sensitive receivers

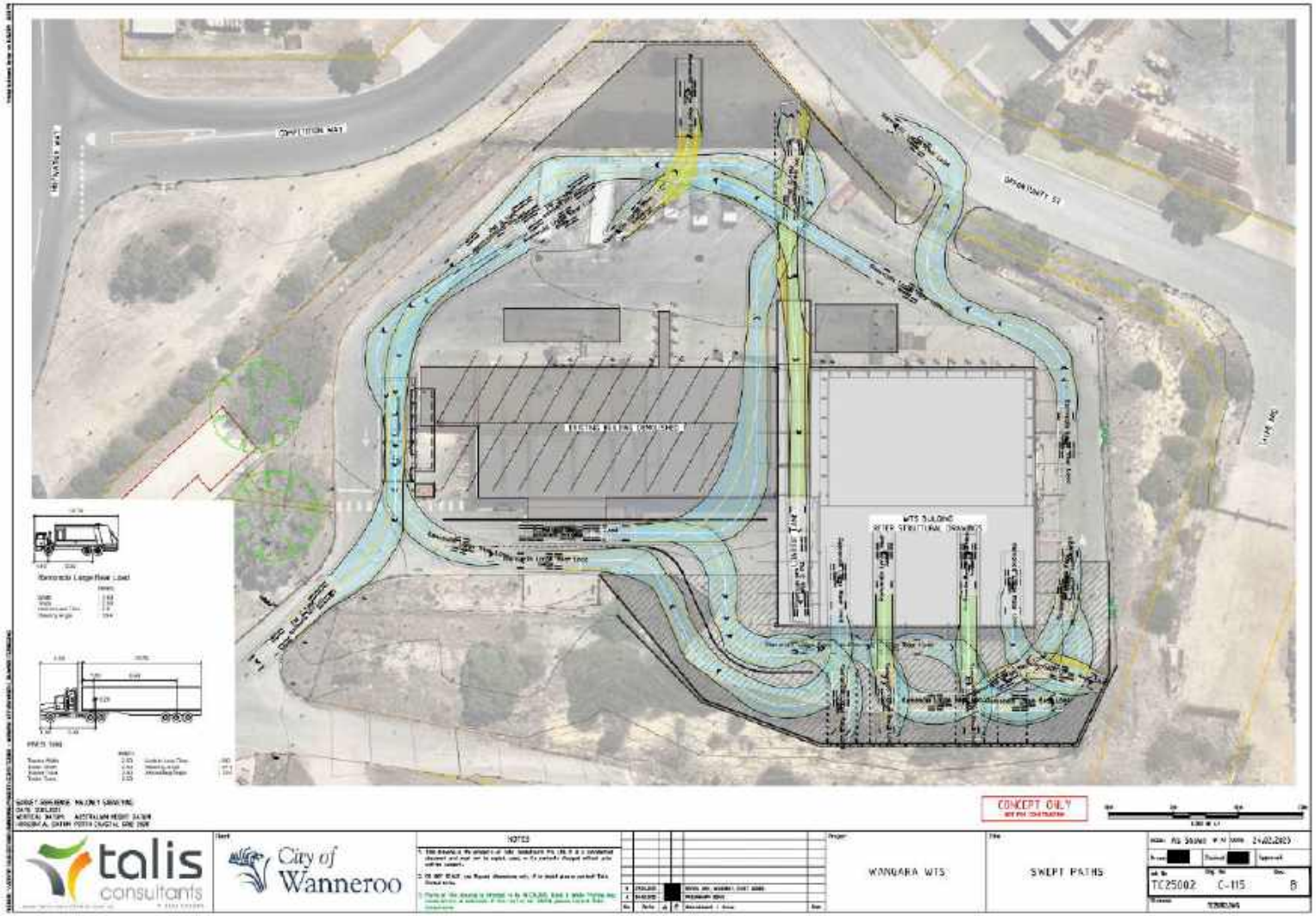

Figure 2-2: Site Layout

2.2 Noise Generating Activities

The WWTS operations will comprise the following noise generating activities:

- Transfer shed – front end loader
- Transfer shed – extraction fans.
- Commercial truck movements (waste trucks and haulage vehicles).

2.3 Noise Sensitive Receivers

An aerial review of the study area has been undertaken to determine the closest noise sensitive premises to the facility.

Based on this review, eight noise sensitive receivers have been included in the model to represent the nearest residential receivers in the surrounding communities. Table 2-2 and Figure 2-1 present the modelled receiver locations.

Table 2-2: GPS Coordinates of Modelled Noise Sensitive Receivers

Receiver Reference	Description	UTM, Zone 50J	
		Easting	Northing
RP1	Residential Property #1	389520	6482726
RP2	Residential Property #2	389833	6482537
RP3	Residential Property #3	389870	6482730
RP4	Residential Property #4	390349	6482533
RP5	Residential Property #5	390525	6482421
RP7	Residential Property #7	390603	6482424
RP8	Residential Property #8	390712	6482442

3 Assessment Criteria

3.1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented via the Environmental Protection (Noise) Regulations 1997 (the Regulations), which are made under the Environmental Protection Act 1986.

The Regulations define assigned levels, which apply to noise received at noise sensitive premises, such as residential areas. The assigned levels are determined by a combination of a base noise level plus an Influencing Factor (IF).

The assigned noise levels include L_{AS1}, L_{AS10} and L_{ASMAX} noise parameters, defined as:

- L_{ASMAX} means an assigned level which, measured as an $L_{A\ Slow}$ value, is not to be exceeded at any time.
- L_{AS1} means an assigned level which, measured as an $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.
- L_{AS10} means an assigned level which, measured as an $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period[1].

A representative assessment period of 1 hour has been assessed to align with the frequency of vehicle movements (see Table 4-1).

For noise sensitive premises, the time of day also affects the assigned noise levels. As the WWTS operates 06:00 to 18:00 hours and 06:00 to 18:00 on Public Holidays (see section 2.1), the noise emissions have been assessed against both the day and night assigned levels (see Table 3-1).

The type of noise sources being proposed includes low speed traffic and ventilation fans (which are homogenous). Therefore, the L_{A10} is the most stringent criteria which has been the focus of this assessment.

3.2 Assigned Noise Levels

The base assigned noise levels defined in the Regulations are given in Table 3-1.

Table 3-1: Environmental Protection (Noise) Regulations - Assigned Noise Levels

Sensitive Receiver	Time of day	Assigned Levels (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive Premises	**DAY** 0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	DAY (Sundays and public holidays) 0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor

[1] ***Representative assessment period*** means a period of time of not less than 15 minutes, and not exceeding 4 hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Sensitive Receiver	Time of day	Assigned Levels (dB)		
		L_{A10}	L_{A1}	L_{Amax}
	EVENING 1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	NIGHT 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
Industry Boundary	all times	65	80	90

3.2.1 Influencing Factors

The Influencing Factor (IF) is based on the surrounding land use adjacent to each of the noise sensitive receivers, including the amount (%) of industrial and commercial premises as well as the number and proximity of major and secondary roads.

The following steps were taken to calculate IF for each receiver assessed:

1. Two circles of radius 100m and 450m centred on each of the identified receivers were drawn.
2. The circles were used to determine and calculate the area of industrial and commercial premises and the presence major/secondary roads within the circles.

The WWTS is situated between two major roads (Ocean Reef Road and Gnangara Road), as well as adjacent to secondary roads and pockets of industrial/commercial land.

As a result, both a transport factor and industrial/commercial premises factor is applicable to most receivers. Table 3-2 summarises the influencing factors calculated for each receiver.

Table 3-2: Influencing Factors

Receiver	Transport Factor	% land used for industrial and utility premises		Total IF
		% in inner circle	% in outer circle	
RP1	2	0	5	2
RP2	2	0	18	4
RP3	2	0	0	2
RP4	2	0	16	4
RP5	6	0	31	9
RP7	6	0	29	9
RP8	2	0	26	5

3.2.2 Adjustments for intrusive or dominant characteristics

The Regulations require that "noise emitted from any premises when received at other premises – must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind and must free of tonality, impulsiveness, and modulation.".

Section 9 of the Regulations sets out objective tests to assess whether the received noise is free of these characteristics. Adjustments for characteristic noise is shown in Table 3-3, and are cumulative up to a maximum of 15 dB.

Table 3-3: Adjustments for intrusive and dominant characteristics

Tonality	Modulation	Impulsiveness
+ 5dB	+5 dB	+10 dB

3.2.3 Non-Significant Contributor

The Regulations require that *"noise emitted from any premises when received at other premises must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind".*

A noise emission is taken to significantly contribute to a level of noise if the noise emission exceeds a value which is **5 dB below the assigned level** at the point of reception.

Given the WWTS location, there are many other nearby industrial premises potentially contributing to noise received at the receivers. Therefore, received noise from the WWTS must not exceed a level which is 5 dB below the assigned level (i.e. must not significantly contribute to an exceedance).

As a result, a 5 dB non-significant contributor penalty has been applied to the assigned levels. As the 5 dB penalty has been applied, no adjustments have been applied to the predicted received levels to account for characteristic noise (e.g. tonality).

3.2.4 Applicable Noise Criteria

Table 3-4 presents the applicable assigned noise levels, for both day and night-time, including IF's and adjustments.

Table 3-4: Applicable assigned noise levels

Ref	Receiver	Daytime			Night-time		
		LA10	LA1	LAMax	LA10	LA1	LAMax
RP1	Residential Property #1	42	52	62	32	42	52
RP2	Residential Property #2	44	54	64	34	44	54
RP3	Residential Property #3	42	52	62	32	42	52
RP4	Residential Property #4	44	54	64	34	44	54
RP5	Residential Property #5	49	59	69	39	49	59
RP7	Residential Property #7	49	59	69	39	49	59
RP8	Residential Property #8	45	55	65	35	45	55

4 Noise Modelling Overview

4.1 Modelling Software

A desktop environmental noise model was created to simulate the WWTS operations using the SoundPlan v9 software program. This software package calculates sound pressure levels at nominated receiver locations and produces noise contours over a defined area of interest. SoundPlan can be used to model industrial noise, traffic noise and aircraft noise.

The inputs required by the SoundPlan modelling software are noise sources, ground topographical and absorption data, meteorological data and sensitive receiver point locations. For this study the ISO9613[2] and the CONCAWE[3,4] prediction algorithm were utilised. ISO9613 has been applied for the absorption of sound by the atmosphere.

The model has been used to predict received noise levels at noise sensitive receiver locations and to generate noise contour maps for the surrounding area.

4.2 Model Inputs

4.2.1 Noise Sources

Noise source Sound Power Levels (SWLs) have been calculated and allocated to the model using a combination of equipment lists provided which contain the type, make, model and quantities, as well as allocating SWLs from previous noise measurements of similar equipment from waste facilities and other operations.

The WWTS noise emissions are associated with vehicle movements (waste and haulage trucks), front end loader operating inside the transfer building, building ventilation system, and vehicles doing waste drop-off and pick up activities.

For heavy vehicles on-site, the total acoustic energy of traffic during peak times (see Table 2-1) with traffic travelling at slow speeds (10km/hr speed limit) has been distributed evenly across the site roads as a line source (Figure 2-2). This approach has the effect of distributing the vehicle noise emissions across site during the peak traffic volumes periods (i.e. worst case for day and night-time periods).

The transfer building activities (front end loader operations and ventilation system) will be operational during both day and night, and have therefore been assumed in the model to be operating at all times.

A summary of SWL's used in the modelling is provided in Table 4-1 and spectral data for each source can be found in Appendix A.

The facility layout, including the modelled source positions, is shown in Figure 4-1.

[2] ISO9613 is used for calculating the absorption of sound during propagation.

[3] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

[4] The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981.

Table 4-1: SWL's used in modelling

Equipment	Operating time	SWL per item, dBA	Quantity	Location
Shed ventilation fan	All hours	81	6	Shed roof
Shed front end loader	All hours	105	1	Shed
Haulage Vehicle - PM S 19M	All hours	97	2/hr	Facility roads
Waste Collection Vehicle - Kerbside collection trucks	Day time	94	24/hr	Facility roads
	Night-time	94	2/hr	Facility roads

4.2.2 Noise Sensitive Receivers

The noise sensitive receivers used in the model are presented in Table 2-2.

4.2.3 Buildings

The proposed facility is located adjacent to an industrial area. Building outlines for the industrial area have been provided Talis GIS team, and included in the model. The building heights have been set to a constant 7.0m for the industrial area.

No building have been included for the residential areas.

4.2.4 Topography and Ground Absorption

Topographical information was imported into the noise model to create a Digital Ground Map (DGM). The acoustic properties of the ground surface influence the propagation of noise. Flat non-porous surfaces such as concrete, asphalt and water are more reflective whereas soft, porous surfaces such as foliage and grass are more absorptive. A ground factor of 0.7 was applied to the model.

4.2.5 Meteorological Conditions

The CONCAWE algorithm has been used to calculate noise levels for user defined meteorological conditions. Table 4-2 defines the worst-case meteorological conditions applied to the model for the day time and night-time scenarios, which are defined in the Department of Water and Environment Regulation (DWER) "Draft Guideline on Environmental Noise for Prescribed Premises" [3].

Table 4-2: Weather conditions applied to the model

Scenario	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Pasquil Stability Class (PSC)
Day time	20	50	4	Worst case (source to receiver)	D
Night-time	15	50	3		F

4.3 Noise Modelling Scenarios

Two model scenarios have been developed to predict day and night-time WWTS operations, including the following operations:

- Daytime Scenario – all Table 4-1 items (incl. day-time waste truck quantities).
- Nighttime Scenario – all Table 4-1 items (incl. night-time waste truck quantities).

The location of the noise sources are shown in Figure 4-1. The model assumes all equipment is operating simultaneously.

All modelling has been run under worst case weather conditions defined in Table 4-2.

Figure 4-1: Model Layout

5 Noise Modelling Results

Table 5-1 provides a summary of the noise model results and a comparison with the assigned levels. Noise contour maps are provided in Figure 5-1 (day-time operations), Figure 5-2 (night-time operations) and Figure 5-3 (zoomed in noise contour map showing the industry boundary noise levels during day-time operations).

From the results, the following has been found:

- The WWTS operations comply with the assigned levels for both day and nighttime operations at all assessed noise sensitive receivers.
- The operations are higher than the industry boundary assigned level.

Based on the results, some noise control will be required to comply at the industry boundary.

Table 5-1: Model Results

Ref	Receiver	Daytime		Nighttime	
		Assigned LA10	Predicted LA10	Assigned LA10	Predicted LA10
RP1	Residential Property #1	42	31	32	28
RP2	Residential Property #2	44	34	34	32
RP3	Residential Property #3	42	33	32	31
RP4	Residential Property #4	44	33	34	31
RP5	Residential Property #5	49	34	39	32
RP7	Residential Property #7	49	34	39	31
RP8	Residential Property #8	45	32	35	30
IB	Industry Boundary	65	62-69	65	61-64

Figure 5-1: Noise Contour Map LA10 – Daytime

Figure 5-2: Noise Contour Map LA10 – Nighttime

Figure 5-3: Noise Contour Map LA10 – Industry Boundary

6 Noise Control

The noise modelling results identified that noise from the facility is predicted to exceed the industry boundary assigned level.

The top contributing noise sources at boundary are the waste truck movements.

To reduce the industry boundary noise level, a standard colorbond fence of height 2.4m has been placed along the fenceline, as shown in Figure 6-1.

Figure 6-1: Proposed Colorbond Fence (blue)

6.1 Noise Control Outcomes

With the fence installed, the facility complies with the industry boundary assigned level at all times of day, and also reduces the received levels at sensitive receivers (which were already compliant).

Noise contour maps for the L_{A10} assessment industry boundary, day and night time scenarios are provided in Figure 6-2.

Figure 6-2: Noise Control Noise Contour Map LA10 – Industry Boundary

7 Conclusions

Based on the outcomes of the noise modelling and analysis, the proposed WWTS complies with the assigned noise levels at all noise sensitive receivers under worst case conditions.

The model predicts that the WWTS operations exceed the industry boundary assigned levels. It is recommended that a 2.4m high colorbond fence be installed (defined by blue lines in Figure 6-1 and Figure 6-2). With the fence installed, the industry boundary assigned levels are achieved.

APPENDIX A
Noise Source Levels

Noise source	Octave Band Levels, dBA									O/A
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8KHz	
Haulage Vehicle - PM S 19M	58	77	84	85	91	93	91	86	79	97
Waste Collection Vehicle – Kerbside collection vehicle	55	74	81	82	88	90	88	83	76	94
Front end loader	47	68	88	103	92	95	94	89	83	105
Vent Fans		38	59	73	77	69	74	69	60	81

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