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25 February 2020

The General Manager
Penrith City Council
PO Box 60
PENRITH NSW 2571

Dear Sir/Madam,

DA19/0470 - Response to EPA request for additional information - air quality and noise

I refer to DA19/0470 and the request for additional information by the NSW Environment Protection Authority (EPA) dated 6 December 2019. This letter provides a response to each of the issues outlined in the EPA's request. Specifically, this includes further modelling and assessment undertaken for air quality impacts (Attachment 1 of this letter) and noise impacts (Attachment 2 of this letter). The outcome of these assessments comprehensively demonstrates the compliance of the proposed development with relevant assessment methodologies and, importantly, relevant amenity thresholds.

We trust this information is satisfactory to both the EPA and Council. Should however either party require clarification please contact the undersigned.

Yours faithfully

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Attachment 1: Supplementary air quality impact assessment
Attachment 2: Supplementary noise impact assessment

Attachment 1: Supplementary air quality impact assessment

Prepared by AECOM

25 February 2020

Introduction

SUEZ Recycling & Recovery Pty Ltd (SUEZ) submitted an Air Quality Impact Technical Report (AQITR) as part of a Development Application (No. DA19/0470) to Penrith City Council (Council) pertaining to expansion of the Elizabeth Drive Landfill, Kemps Creek NSW (the Project). The New South Wales Environment Protection Authority (EPA) provided comments to Council on the AQITR and requested clarification and additional information on several items. SUEZ responded to these comments in October 2019 in a letter report (the Response).

A new set of comments from EPA was received in December 2019 requesting further clarification on the Response and AQITR. SUEZ' responses to the EPA's December 2019 (i.e. second round) comments on the AQITR and Response are provided in this letter.

Seven issues were outlined by EPA in the October 2019 round of comments. As part of the December round of comments the EPA indicated that the following issues have been adequately addressed:

- Issue 1
- Issue 2
- Issue 4
- Issue 6
- Issue 8.

According to EPA, the remaining three issues were not adequately addressed by the previous response and are therefore addressed again in this letter. The three issues are:

- Issue 3: Insufficient information provided to recalculate the emission inventory
- Issue 5: Excavation emissions not included in emissions inventory and air quality assessment
- Issue 7: Missing cumulative impacts at all receptors.

The following sections of this report present responses to these three outstanding issues.

Issue 3: Insufficient information provided to recalculate the emission inventory

EPA comment

The EPA advised SUEZ that information was required on:

1. *Vehicle Kilometres Travelled (VKT);*
2. *Emissions and modelling on unsealed haul road;*
3. *How and when variable emission rates for wind erosion and operating hours were applied;*
4. *Which emission rates were varied by hour and day; and*
5. *The methodology used to calculate wind erosion.*

Of the itemised issues above, the Response has adequately addressed points 1, 2, 4 and 5. However the EPA notes that point 3 has not been adequately addressed.

The Response has incorrectly applied the emission factor or wind erosion form the NPI Emission Estimation Technique Manual for Mining (NPI Manual). The NPI Manual provides a default value for wind erosion of 0.4 kg/ha/hr (3504 kg/ha/year) as well as an equation when more information is available (Equation 22):

$EF_{TSP} = 1.9 * (s/1.5) * 365 * (365-p/235) * (f/15)$

Where f is the percentage of time that wind speed is greater than 5.4 m/s, s is the silt content (%) and p is the number of days/year with rainfall >0.25mm.

The NPI manual does not indicate how to vary these annual emission rates by hourly variable emission due to wind speed and only provides emission actors on an annual basis. The AQITR Table 5.6 and Table 18 of the Response has given the emission factor for wind erosion as the default value (0.4 kg/ha/hr) which does not have a wind speed factor and should be applied to calculate total annual emissions.

Using the default factor, the EPA calculates annual TSP emissions from controlled (40%) intermediate areas (240,000 m^2) and uncontrolled areas (55,000 m^2) at 69,730 kg/yr.

The AQITR and the Response states a variable emission rate was active for wind erosion and was applied based on a wind speed threshold. Neither the AQITR, nor the Response transparently describe and justify how this was done. Assessment documentation provided does not include sufficient information to verify the methods used to calculate and model wind erosion emissions, including:

i. Total number of house used in the wind erosion emission calculation;

ii. Total calculated emission from wind erosion (annual basis);

iii. Number of hours the dispersion model activated wind erosion as an emission source;

iv. Methodology used for apportioning total wind erosion emission to an hourly basis in the dispersion model (such as wind speed threshold and cubic relationship between emission and wind speed); and

v. All meteorological data and other applicable calculation input variables.

Based on the limited information provided to date, it appears that an annualised average emission factor (the default factor) was used but only applied for a limited subset of assessment hours. By applying the default annual emission factor only specific hours or days of the model, SUEZ has likely significantly underestimated total annual emissions and, more importantly peak intensity emissions from wind erosion.

The EPA advises that varying wind erosion by wind speed is acceptable, providing a suitable threshold is applied, the total annual emissions are correctly calculated and provided, a clear methodology of distributing those annual emissions on an hourly basis in the model is given, and clear meteorological information is provided.

The EPA recommends that SUEZ reassess their emission rates for wind erosion and carefully consider the application of emission factors, fully stepping out the methodology and justifying the application of any wind speed factors and including information on fraction of time wind threshold was applied to. The EPA also recommends that as there are significant differences in the average and maximum wind speeds and fraction of calms between the BoM meteorological data and model generated meteorological data, SUEZ consider a conservative approach to the use of a wind speed factor.

SUEZ response

Wind erosion from the site is not expected to be a major source of dust emissions due to the relatively small area of continuously disturbed surfaces (i.e. the general waste cell and excavation area etc.) and the crusting of non-disturbed surfaces (see more discussion on this below). Based on this the application of the default NPI emission factor only to wind speeds above a threshold was considered appropriate for the site at the time of writing the original AQITR. However, it is acknowledged that the use of the default NPI wind speed emission factor is potentially not the most accurate method for estimating wind erosion from site and may slightly underestimate wind erosion emissions. Following the comments from EPA, the NPI Manual (NPI Emission Estimation Technique Manual for Mining, Version 3.1) wind erosion calculation (Equation 22) was adopted to recalculate the wind erosion emissions from site. Recalculated wind erosion emission rates based on Equation 22 were re-entered into the model and air impacts reassessed. A description of the new methodology for wind erosion emission calculation is provided below.

The NPI Equation 22 was used to estimate wind erosion emissions as follows:

- EF_{TSP} = 1.9 * (s/1.5) * 365 * (365-p/235) * (f/15)

Where:

- f is the percentage of time that wind speed is greater than 5.4 m/s
- s is the silt content (%)
- p is the number of days/year with rainfall >0.25mm.

It was noted by EPA that the CALMET winds were slightly lower than the winds measured at Badgerys Creek. As this has the potential to result in a slight underestimation of dust emissions this frequency difference needed to be addressed. As recommended by EPA, as slightly lower wind speed threshold than 5.4 m/s was used due to the lower wind speeds predicted by CALMET. To provide a conservative estimate of a lower threshold, the frequency of wind speeds was compared with those in the BoM Badgerys Creek 2015 data. In the Badgerys Creek data, 6.9% of winds were above 5.4 m/s. In the CALMET data, 6.5 % of winds were above 4.4 m/s and 7.1% of winds were above 4.3 m/s. The lower 4.3 m/s was chosen as a suitably conservative threshold due to a slightly higher frequency.

Parameters used in the NPI equation and estimation of the wind emission are presented in **Table 1**. A total of 624 hours in the CALMET data had winds greater than 4.3 m/s. The annualised emission rate of 1,456 kg/ha/year was applied only to those hours, resulting in an emission factor of 2.3 kg/ha/hour for hours with wind speeds above the 4.3 m/s threshold.

Table 1 Parameter used in calculating wind erosion emissions – NPI equation 22

Wind Erosion Parameter	Value	Units	Comment/reference
Silt Content (s)	6.4	%	Municipal landfills AP42 table 13.2.2-1
Days rainfall (p)	120.7	Number	Average of long-term BoM Horsley Park, Badgerys Creek, and Penrith
Percentage of winds > 5.4 m/s	6.9	%	BoM Badgerys Creek (2013-2017)
Percentage of winds > 4.3 m/s	7.1	%	CALMET
Unmitigated wind erosion factor (TSP)	1,456	kg/ha/year	Based on NPI Equation 22
Active hours per year	624	hours	Hours per year
Unmitigated wind erosion factor (per active hour) (TSP)	2.3	kg/ha/hr	Calculated
PM_{10} to TSP ratio	0.5	-	From NPI
$PM_{2.5}$ to PM_{10} ratio	0.15	-	From Cowherd et. al. (as used in AQITR)

As well as revising the method to estimate emissions, the area of each wind erosion source and the control applied to each source was also revised following further clarification of active areas by SUEZ. The sources available to wind erosion were identified and are summarised below. These are presented graphically in **Figure 1**.

- Active landfilling areas – there are only three active areas at any one time, the general waste cell, the restricted waste cell, and the excavation area:
    - General waste cell:
        - 10,000 m^2 total
        - 3,500 m^2 active area (trucks and machinery physically disturbing the landfill surface)
        - Shale is used at night to cover the active 3,500 m^2 area

        - Tarps cover batters at night time
        - The non-active area of the general waste cell (about 7,000 m^2) is covered in shale.
    - Restricted waste cell:
        - 3,000 m^2 total
        - 300 m^2 active area (trucks and machinery physically disturbing the landfill surface);
        - non-active area (2,700 m^2) is covered in shale
        - No tarps used.
    - Excavation area:
        - Approximately 14,300 m^2
        - All this area is actively bulldozed or excavated
- Disused shale stockpiles:
    - Wind erosion mitigated using chemical stabiliser which provides about six months of effectiveness.
- Other non-active surfaces – i.e. all areas of the landfill that are not grassed or active cells:
    - Approx. 325,000 m^2 (including disused shale stockpiles)
    - Covered in shale/clay material that is derived from the onsite excavations
    - The shale/clay mix forms a crust when wet for the first time
    - No wind driven dust emissions unless re-disturbed.

Figure 1 Approximate layout of wind erosion sources

A summary of the wind erosion sources and the control factors applied in the model to each source are presented in **Table 2**. For the inactive parts of the general and restricted waste cells, the shale covering used on-site at present provides a stabilised surface that inhibits wind erosion (through the formation of a crust). Wind-driven dust is only visible on these surfaces during the strongest winds. A control efficiency of 30% was utilised in the model for these surfaces which is equivalent to the control factor specified in the NPI Mining Manual for "primary rehab". This is only an estimate however it is considered conservative as the shale covering likely provides a much higher degree of control.

Other areas of the landfill are covered in a shale/clay mix that forms a crust when it gets wet for the first time. This crust covers the majority of the landfill surface area (anywhere that is not active or already grassed) and no wind-driven dust is visible (even under strong winds). These areas are not physically disturbed and remain inert from a dust emission perspective. Although wind erosion emissions from these areas are expected to be close to zero, as a conservative estimate, a 90 % control factor has been applied to these areas. It is feasible that over time, even without physical disturbance, the crust may degrade slightly which could potentially result in minor wind erosion, however this is not expected to result in a significant additional source of dust on the site.

A chemical stabiliser is used on the disused shale stockpiles. The chemical stabiliser binds the surface and inhibits wind erosion for up to six months without reapplication. The effectiveness of the stabiliser is monitored visually and if any visible dust emissions become apparent the stabiliser is reapplied. Due to the potential for mild degradation of the stabiliser over time, emissions can't be realistically considered to be zero. However, the freshly applied stabiliser is very effective and provides close to 100% control. A conservative control factor of 90% has been used in the modelling, assuming that as the stabiliser degrades, and that mild wind erosion may occur before the stabiliser can be reapplied.

Table 2 Wind erosion sources and control factors applied in the model

Source	Mitigation	Control Factor	Reference
General waste/ restricted waste cell (active parts)	None	0%	No mitigation – subject to full wind erosion emissions
General Waste and Restricted Waste Cell (non-active)	Shale covering	30%	Control factor equivalent to "primary rehab" factor provided in NPI Mining Manual
Other non-active areas and old shale stockpiles	Shale and clay cover/ chemical stabiliser	90%	Control factor equivalent to "revegetated" factor provided in NPI Mining Manual
Excavation area	None	0%	No mitigation – subject to full wind erosion emissions
Central Stockpile	None	0 %	No mitigation – subject to full wind erosion emissions

A summary of annualised emission rates based on the NPI equation, surface area and mitigation controls for each wind erosion source in the model is presented in **Table 3**. The area available for wind erosion for each source was revised based on the detail provided above.

Table 3 Summary of annualised emissions for each modelled wind erosion source

Source	Area (m^2)	Control Factor	Total Emissions (kg/year)		
			TSP	PM_{10}	$PM_{2.5}$
General Waste Cell and Restricted Waste Cell (active)	3,800	0%	553	277	41

Source	Area (m^2)	Control Factor	Total Emissions (kg/year)		
			TSP	PM_{10}	$PM_{2.5}$
General Waste and Restricted Waste Cell (non-active)	9,200	30%	804	402	60
Other non-active areas and disused shale stockpiles	326,000	90%	5,488	2,744	412
Excavation area	14,300	0%	2,082	1,041	156
Central stockpile	8,000	0%	1,165	582	87
Total			**9,061**	**4,530**	**680**

The annualised emission rates for each source were applied only to the active hours in the model, i.e. hours with wind speeds above the threshold of 4.3 m/s (which equates to 624 hours per year based on the 2015 Badgerys Creek data). A summary of modelled emission rates for the active hours is presented in **Table 4**. Note that the general waste and restricted waste areas were combined into a single operating area along the boundary nearest to the receptors on the eastern side of the site. Modelling these areas together is a conservative representation of wind erosion emissions due to the proximity to Receptor 1 approximately 130 m to the east. In reality, the restricted waste cell is located further north and wind erosion from the restricted waste cell would result in a lower dust impact on receptors than the outcome presented by the modelled scenario.

Table 4 Summary of emission rates for active hours for each modelled wind erosion source

Source	Emission Rate (g/hr)			Emission Rate (g/s)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
General Waste Cell plus restricted Waste Cell (active)	887	444	67	0.25	0.12	0.02
General Waste and Restricted Waste Cell (non-active)	1,289	644	97	0.36	0.18	0.027
Other non-active areas - shale and clay cover	8,800	4,400	660	2.44	1.22	0.18
Excavation area	3,338	1,669	250	0.93	0.46	0.07
Central stockpile	1,867	934	140	0.52	0.26	0.04

Updated modelling results based on the revised wind erosion emission rates discussed in this section are presented below in the response to Issue 7.

Issue 5: Excavation emissions not included in emissions inventory and air quality assessment

EPA comment

The Response states excavation is expected to continue until the end of 2021 and therefore has included additional modelling to assess the impacts of particulates for simultaneous excavation and landfilling activities. The Response has included emission rates (g/s) for extractive activities and presented new dispersion modelling in Section 3.0. Tables 25-27 present new incremental and cumulative maximum impacts at sensitive receptors. Significant increases in PM_{10} incremental concentrations (26%) are predicted to occur as a result of simultaneous extractive and landfilling activities compared to those predicted in the AQITR. Importantly, the simultaneous extractive and

landfilling activities are predicted to cause an exceedance at receptor 1 with a significant proportion of the PM_{10} concentration (13.9 µg/m³, 27.8 %) resulting from site activities.

In the case of exceedances at a receptor, additional mitigation measures and emission controls that reduce emissions to a greater extent should be considered and the impact assessment revised. No additional mitigation and/or control measures have been proposed on the basis that the modelled scenario is unlikely to occur.

The EPA advises that SUEZ must consider additional mitigation and control measures and/or other options to reduce particulate emissions from the site and exceedances at receptors.

The EPA recommends that any revised air quality assessment should include a final emissions inventory with all sources clearly presented and specify emissions in g/s and kg/yr. In additional, the revised assessment should address the outstanding issues identified; Issues 3 and 7.

SUEZ response

In response to the EPA's recommendation for further dust mitigation, SUEZ has explored several additional mitigation strategies to assist in minimising dust emissions from the Project. The following mitigation strategies were identified and would be committed to for the Project:

- Sealing of waste delivery haul routes almost to the tipping face. Sealed road will be progressively laid moving from the eastern boundary onto the landfill towards the tipping face. Only the final 50 m of haul/turnaround area would remain unsealed. Emission rates have been updated to reflect this change. Note that as of February 2020 the majority of this sealing has already been undertaken.
- Twice daily cleaning of sealed haul roads. All sealed haul roads are currently cleaned twice daily using the high-pressure water spray on the onsite water carts, keeping them dust-free. This practice would continue throughout the life of the Project and would include the SAWT road, as well as the waste delivery haul routes discussed above. On this basis, all sealed road sections were removed from the model as these can no longer be considered dust sources with this mitigation in place.
- Continue to place shale cover on non-active areas of the general and restricted waste cells (discussed above in wind erosion section).
- Use of tarps at night on the general waste cell batters. This accounts for only a small area (around 600 m^2) and conservatively was not included in the revised model – i.e. when winds were above 4.3 m/s, emissions were modelled for the 600 m^2 batters. This is an existing mitigation strategy that would continue for the life of the Project.
- Continue to place shale and clay cover on non-active surfaces (discussed above in wind erosion section).
- Continue to use chemical stabilisers on disused shale stockpiles (discussed above in wind erosion section).

Based on the first two mitigation strategies, haul road distances, and hence emission rates, were significantly reduced. The model was updated to reflect these changes and new predictions made for the facility. A summary of revised haul road parameters for modelled haul sources is presented in **Table 5**. This is a revised version of Table 2 in the previous response.

Table 5 Revised haul road parameters for modelled sources

Vehicle type	Weekday trucks	Saturday trucks	Dump truck
Empty Weight (tonnes)	9	11	24
Load Capacity (tonnes)	12.7	14.9	27

Vehicle type	Weekday trucks	Saturday trucks	Dump truck
Assumed Duty	Waste Delivery	Waste Delivery	Intermediate Cover
Total Daily Trips	280	74	5
Annual Vehicles	70,553	3,826	1,556
Annual Throughput (t)	893,000	57,000	42,000
Unsealed haul road length (km)	0.050	0.050	0.300
Unsealed haul VKT - one way (km)	3,528	191	467
Unsealed haul VKT - total (km)	7,055	383	933

Table note:

- Shading indicates value that has changed based on new mitigation strategy compared with the AQITR and the Response
- SAWT trucks and sections of sealed road are no longer included in model due to effective dust mitigation strategies

In addition to the changes to the unsealed haul roads and the omission of the sealed haul roads, changes were made to the excavation haul scenario that was previous modelled. Previously, as shown in **Figure 2**, 20% of excavated material from the Cell A9 excavation was hauled to Cell A5B, which is the cell to the north of Cell A9. From April 2020, this haul route will cease to be used and 100% of hauled material will be hauled to the Central Stockpile. The adjacent cell haul route and dumping emissions were therefore removed from the model as these will not occur simultaneously with the Project and the emission rates for haul and handling of material to the Central Stockpile adjusted upwards accordingly.

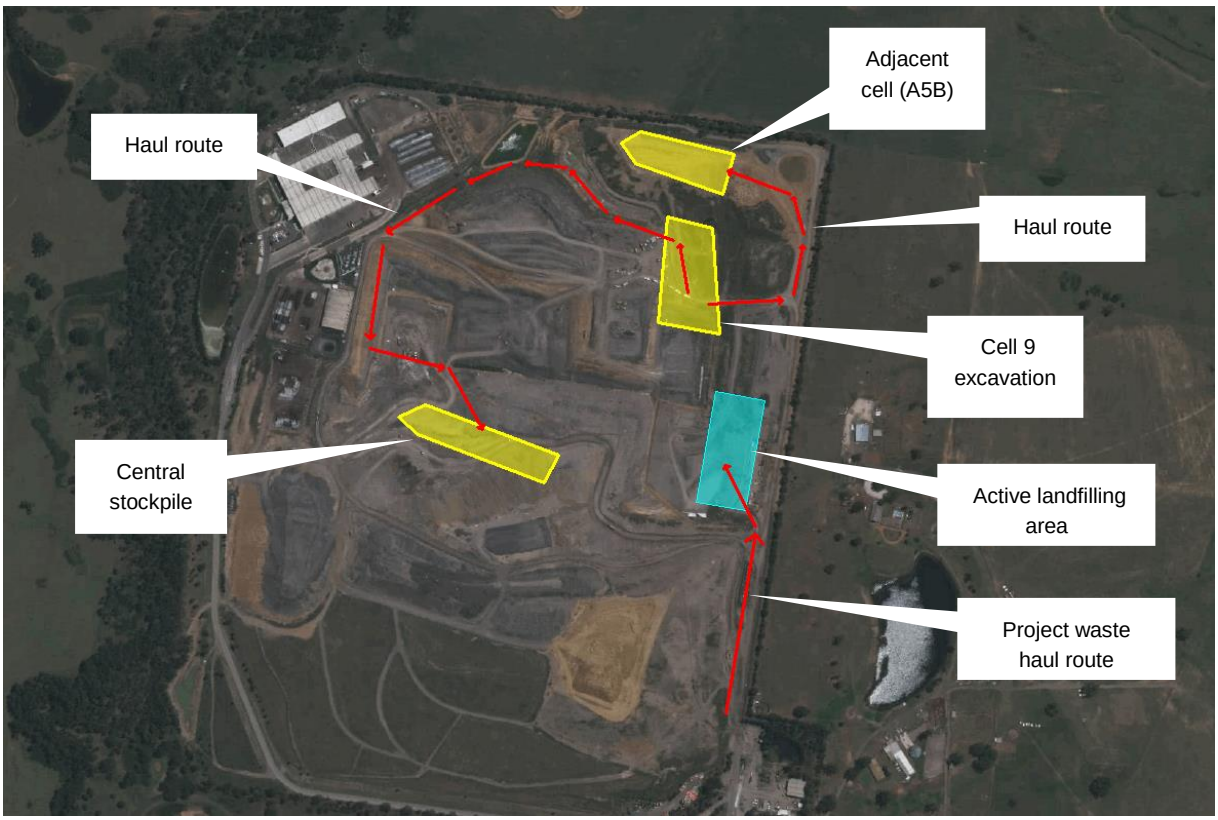

Figure 2 Graphical representation of previous excavation haul scenario

A summary of revised haul road parameters for the excavation activities is presented in **Table 6**. The throughput for the Central Stockpile haul has increased to 100% of excavated material for the year 2020 (660,000 tonnes) and the number of annual trips and total VKT have increased commensurately.

Table 6 Summary of revised excavation haul road parameters

Vehicle Type	Dump Truck to Central Stockpile	Dump Trucks to Adjacent Cell
Average loaded weight (tonnes)	51	Not modelled – activity to cease in April 2020
Empty weight (tonnes)	24	
Load capacity (tonnes)	27	
Annual throughput (t)	660,000	
Annual trips	24,445	
Round trip haul distance (km)	1.764	
Annual vehicle kilometres travelled (km)	43,121	

Table note: Shading indicates value that has changed compared with AQITR and the Response

The EPA requested that emission rates for all sources in the model be included in a final emission inventory with emission rates clearly specified in both kilograms per year and grams per second. The final emission inventory is presented in **Table 7**.

The revised assessment now addresses both Issue 3 and 7 (see SUEZ responses to these issues in this letter above for details).

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Table 7 Final emission inventory of all modelled sources

Activity/ Source	Active Hours Annually	Emission Rates (kg/year)			Emission Rates (g/s)		
		TSP	PM10	PM2.5	TSP	PM10	PM2.5
Landfilling Activities							
Unsealed haul road (weekdays)	3000	3195	863	86	0.296	0.080	0.008
Unsealed haul road (Saturdays)	364	189	51	5	0.144	0.039	0.001
Dozer on active face/ stockpiles	3364	1229	177	18	0.101	0.015	0.001
Excavator removing waste from trucks	3364	338	160	24	0.028	0.013	0.002
Handling of intermediate cover (includes excavator/ scraper and dump truck)	3364	651	179	41	0.054	0.015	0.003
Excavation Activities							
Excavators (x2)	3364	327	155	23	0.027	0.013	0.002
Excavation haul to central stockpile	3364	29378	7931	793	2.426	0.655	0.065
Dumping onto central stockpile	3364	163	77	12	0.013	0.006	0.001
Dozers at Cell A9 (x3)	3364	13001	2468	247	1.074	0.204	0.020
Dozer at central stockpile	3364	302	57	6	0.025	0.005	0.0005
Wind Erosion							
General Waste Cell plus restricted Waste Cell (active)	624	553	277	41	0.25	0.12	0.02
General Waste and Restricted Waste Cell (non-active)	624	938	469	70	0.42	0.21	0.03
Non-active areas - Shale and clay cover	624	4746	2373	356	2.11	1.06	0.16
Active excavation area	624	2082	1041	156	0.93	0.46	0.07
Central stockpile	624	1165	582	87	0.52	0.26	0.04

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Issue 7: Missing cumulative impacts at all receptors

EPA comment

The Response has provided project (incremental) and cumulative particulate impacts at all receptors in Table 13 (PM_{10}) and 14 ($PM_{2.5}$).

*The EPA cannot reconcile the data in Table 13 of the Response to Submissions with Section 4.4 and Figure 6.1 of the AQITR. Considering the background air quality data used in the AQITR (Bringelly 2015 PM_{10}) the maximum cumulative impacts do not equate to incremental + background. For example at receptor 2, the cumulative (contemporaneous) 24-hour PM_{10}*concentration in Table 13 is 59.8 *$\mu g/m^3$ with a project concentration of 9.5 $\mu g/m^3$, giving a background concentration of 50.3 $\mu g/m^3$. The background data of PM_{10} at Bringelly in 2015 (Figure 6.1 of the AQITR) does not include a data point at 50.3 $\mu g/m^3$. The maximum 24-hour PM_{10}*concentration in 2015 at Bringelly is 57.0 *$\mu g/m^3$ (Table 4.3 Of AQITR), the next highest monitoring concentration is below 37.4 $\mu g/m^3$ (Figure 6.1 of the AQITR and verified via online monitoring data).*

The issue is apparent at all receptors in Table 13 of the Response to Submissions as well as Table 25 and Figure 15.

The EPA advises that SUEZ must provide segregated results of the cumulative assessment for the short and long-term averaging period. In additional, SUEZ must provide a refined assessment for the most impacted receptor which includes the highest backgrounds and the highest increments for 24-hour PM_{10} and $PM_{2.5}$ concentrations in accordance with Table 11.3 of the Approved Methods which includes as a minimum:

- *Time/date*
- *Project (only) increment*
- *Adopted background*
- *Cumulative (total) impact.*

The EPA recommends that SUEZ undertake this for the dispersion modelling inclusive of extractive activities.

SUEZ response

As discussed in SUEZ' responses above for Issue 3 and Issue 5, the wind erosion emissions estimation methodology has been revised and additional mitigation strategies have been adopted for the Project. The impact assessment and results presented in the AQITR and the Response are therefore no longer current. Remodelling was undertaken for the landfilling and excavation scenario using the emission rates that are presented above in **Table 7**. Revised impact assessment results which include the new wind erosion emissions and mitigation strategies are presented here. The results have been presented as recommended by EPA.

Annual average PM_{10} and $PM_{2.5}$ results for the revised scenario are presented in **Table 8**. The results show that there is now no exceedance of the annual average PM_{10} criteria predicted at any of the receptors (compared with a small exceedance at 25.8 $\mu g/m^3$ in the Response). The additional mitigation has reduced the annual average PM_{10} Project contribution by 50% at Receptor 1 compared with that predicted previously in the Response. Annual average $PM_{2.5}$ was predicted to exceed the criteria, however this is due to a high adopted background concentration which is already above the criteria. The highest Project increment at a receptor was 0.5 $\mu g/m^3$ (also a 50% reduction compared with predictions in the Response), which is only about 6% of the criteria. This is an acceptable incremental increase in annual average $PM_{2.5}$ concentration.

Table 8 Revised annual average PM_{10} and $PM_{2.5}$ results

Receptor	PM_{10} annual (µg/m³)		$PM_{2.5}$ annual (µg/m³)	
	Project	Cumulative[1]	Project	Cumulative
1	3.0	22.8	0.5	9.2
2	1.1	20.9	0.2	8.9
3	0.5	20.3	0.1	8.8
4	0.4	20.2	0.1	8.8
5	0.1	19.9	0.02	8.7
6	0.3	20.1	0.04	8.7
7	0.2	20.0	0.03	8.7
8	0.3	20.1	0.04	8.7
9	0.3	20.1	0.05	8.7
10	0.4	20.2	0.1	8.8
11	0.4	20.2	0.1	8.8
12	0.3	20.1	0.1	8.8
13	0.3	20.1	0.04	8.7
14	0.5	20.3	0.1	8.8
15	0.3	20.1	0.05	8.7
16	0.3	20.1	0.05	8.7
17	0.3	20.1	0.05	8.7
18	0.1	19.9	0.01	8.7
Criteria	**-**	**25**	**-**	**8**

Annual average TSP and deposited dust results are presented in **Table 9**. Results are well below criteria at all receptors and are lower than the results predicted in the Response.

Table 9 Revised TSP and deposited dust results

Receptor	Annual TSP (ug/m³)		Annual Deposited Dust (g/m²/month)
	Project	Cumulative	Project
1	2.5	42.1	0.9
2	0.5	40.1	0.2
3	0.2	39.8	0.1
4	0.2	39.8	0.1
5	0.1	39.7	0.03
6	0.3	39.9	0.1
7	0.2	39.8	0.1
8	0.3	39.9	0.1
9	0.3	39.9	0.1
10	0.1	39.7	0.05
11	0.1	39.7	0.04

Receptor	Annual TSP (ug/m^3)		Annual Deposited Dust (g/m^2/month)
	Project	Cumulative	Project
12	0.1	39.7	0.03
13	0.1	39.7	0.02
14	0.1	39.7	0.04
15	0.1	39.7	0.05
16	0.1	39.7	0.04
17	0.1	39.7	0.04
18	0.04	39.6	0.02
Criteria	**-**	**90**	**2**

Due to elevated background concentrations of PM_{10} and $PM_{2.5}$, cumulative 24-hour concentrations of particulate matter were assessed contemporaneously using 2015 24-hour averages from the OEH Bringelly monitoring station (as per the AQITR and the Response).

The top ten cumulative 24-hour PM_{10} results at each receptor are presented in **Table 10**. Each receptor has a maximum concentration above 57.0 µg/m^3, which is the highest concentration in the Bringelly background data. The data clearly show that no additional exceedances are predicted at any of the receptors, with the second highest concentration of 48.6 µg/m^3 predicted at Receptor 1. The second highest concentration predicted at all other receptors is below 40 µg/m^3.

The contemporaneous assessment for 24-hour PM_{10} at Receptor 1 is also presented graphically in **Figure** 3. The chart shows a single exceedance of the criteria. The maximum cumulative concentration of 59.8 µg/m^3 (compared with 68.9 µg/m^3 modelled previously in the Response) occurred in May and was largely attributed to an elevated background concentration of 57.0 µg/m^3, which was above the criterion. There were no additional cumulative exceedances predicted as a result of the Project. Concentrations measured at other receptors were generally lower than those predicted at Receptor 1 and therefore this chart is considered the worst case for any receptor.

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Table 10 Top 10 highest cumulative 24-hour PM_{10} concentrations predicted at each receptor

Receptor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ten Highest Cumulative 24-hour PM_{10} concentrations At each receptor ($\mu g/m^3$)	**59.8**	**57.1**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**57.0**	**58.8**	**57.0**	**57.0**	**57.0**
	48.6	39.9	38.3	38.6	37.5	37.7	38.5	38.7	38.9	38.0	37.8	37.8	37.8	37.8	38.3	38.0	38.0	37.7
	45.9	39.1	37.8	37.5	37.4	37.6	37.6	37.6	37.5	37.7	37.7	37.7	37.6	37.8	37.7	37.6	37.6	37.4
	43.0	38.5	37.2	37.1	37.4	37.4	37.0	37.0	37.2	37.1	37.1	37.1	37.1	37.4	37.5	37.0	37.0	37.0
	41.9	37.6	37.1	37.1	36.8	36.8	36.9	37.0	37.0	37.0	37.0	37.0	37.0	37.1	37.2	37.0	37.0	36.8
	40.0	36.1	34.9	34.9	34.9	36.3	36.2	36.4	36.4	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9
	39.0	35.0	33.3	33.1	33.6	34.9	33.2	33.3	33.3	33.1	33.1	33.1	33.1	33.4	33.1	33.1	33.1	33.1
	38.5	34.9	33.2	32.7	32.3	33.2	32.3	32.3	32.3	32.9	33.0	33.1	33.0	33.1	32.3	32.8	32.8	32.3
	36.8	34.4	33.1	32.6	31.8	32.3	31.6	31.6	31.6	32.8	32.9	32.9	32.8	33.1	31.6	32.7	32.6	31.7
	35.6	33.5	31.9	31.4	31.4	32.2	31.6	31.6	31.6	31.5	31.7	31.9	31.8	32.7	31.4	31.4	31.4	31.4

*Shaded cell denotes exceedance of 50 $\mu g/m^3$ criteria

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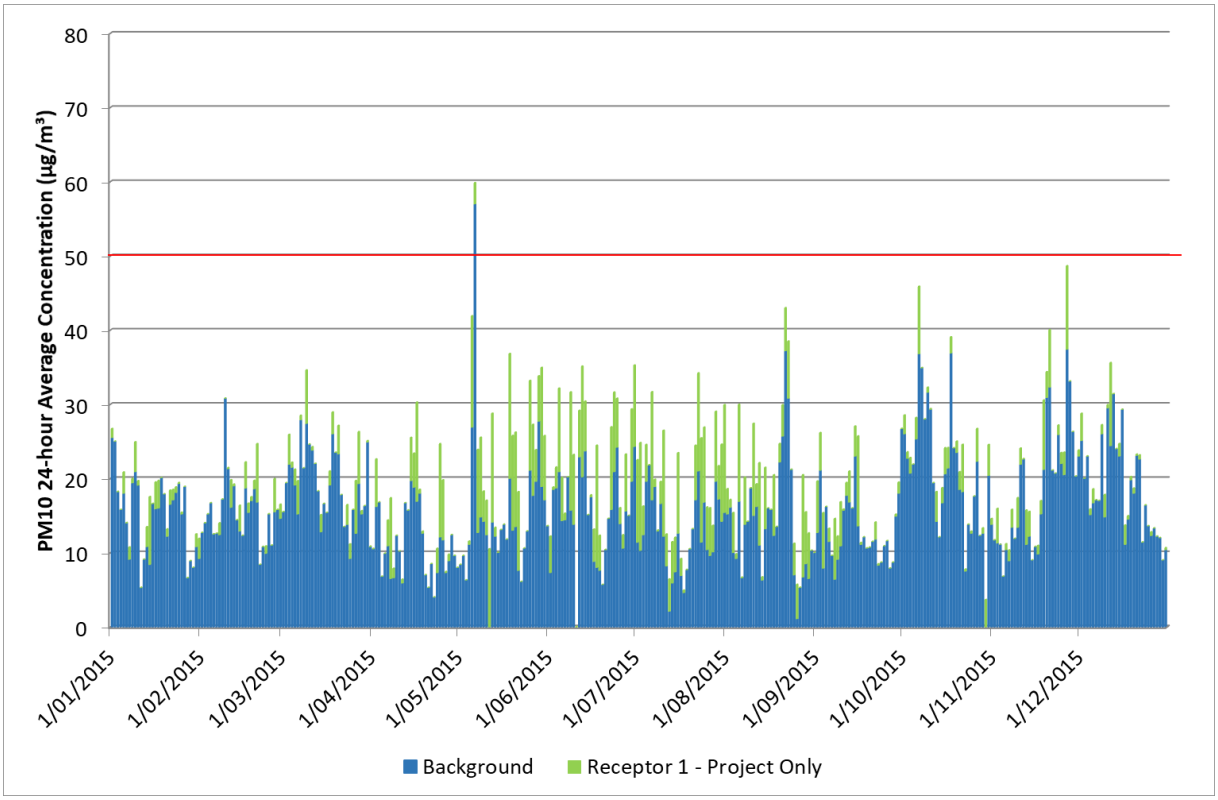

Figure 3 24-hour PM_{10} contemporaneous assessment at receptor 1

A refined assessment of the top ten 24-hour PM_{10} results at the most affected receptor (Receptor 1) is presented in

Table 11. These data reflect Figure 3 and show that no additional exceedances are predicted at this receptor due to the Project. There are three instances of zero Project increment predicted for the top ten highest background days. The winds on these days were not blowing from the west (which would lead to impacts on Receptor 1 to the east):

- Wednesday 7 October 2015 – wind blowing from the south-south east during landfill operational hours – i.e. not towards receptor 1
- Friday 27 November 2015 – wind blowing from the east-north east during landfill operational hours – i.e. not towards receptor 1.
- Saturday 12 December 2015 – wind blowing from the east during landfill operational hours – i.e. not towards receptor 1.

Table 11 Contemporaneous 24-hour PM_{10} assessment – Receptor 1 – criteria 50 µg/m³

Date	24-hour PM_{10} Concentration (µg/m³)			Date	24-hour PM_{10} Concentration (µg/m³)		
	Highest Background	Project	Total		Highest Project Increment	Background	Total
6/05/2015	**57.0**	2.8	**59.8**	18/05/2015	16.8	20.0	36.8
26/11/2015	37.4	11.2	48.6	17/06/2015	16.4	8.0	24.4
21/08/2015	37.2	5.8	43.0	29/05/2015	16.0	18.9	34.9
17/10/2015	36.9	2.1	39.0	8/06/2015	15.9	15.7	31.6

Date	24-hour PM_{10} Concentration ($\mu g/m^3$)			Date	24-hour PM_{10} Concentration ($\mu g/m^3$)		
	Highest Background	Project	Total		Highest Project Increment	Background	Total
6/10/2015	36.8	9.1	45.9	5/05/2015	15.0	26.9	41.9
7/10/2015	34.9	0.0	34.9	12/06/2015	14.9	20.2	35.1
27/11/2015	33.1	0.0	33.1	12/05/2015	14.6	14.1	28.7
20/11/2015	32.3	7.7	40.0	6/07/2015	14.5	17.1	31.6
9/10/2015	31.6	0.7	32.3	31/07/2015	14.5	15.4	29.9
12/12/2015	31.4	0.0	31.4	2/07/2015	14.5	10.3	24.8

The top ten cumulative 24-hour $PM_{2.5}$ results at each receptor are presented in **Table 12**. Each receptor has a maximum concentration of 29.6 $\mu g/m^3$, which is the highest concentration in the Bringelly background data. The data clearly shows that no additional exceedances are predicted at any of the receptors, with the second highest concentration of 24.9 $\mu g/m^3$ predicted at Receptor 1. The third highest concentration predicted at all other receptors is at or below 22.3 $\mu g/m^3$.

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Table 12 Top 10 highest cumulative 24-hour $PM_{2.5}$ concentrations predicted at each receptor

Receptor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ten Highest Cumulative 24-hour $PM_{2.5}$ concentrations At each receptor ($\mu g/m^3$)	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**	**29.6**
	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
	22.3	21.7	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.6	21.5	21.5	21.5
	22.1	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2	21.2
	21.4	20.8	20.7	20.7	20.5	20.6	20.7	20.7	20.7	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	21.2	20.7	20.4	20.4	20.1	20.1	20.1	20.2	20.2	20.3	20.3	20.3	20.2	20.3	20.4	20.3	20.3	20.2
	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
	18.9	18.5	18.5	18.7	18.4	18.4	18.4	18.4	18.4	18.5	18.4	18.4	18.4	18.4	18.5	18.5	18.5	18.5
	18.7	17.9	17.2	17.1	17.1	17.2	17.3	17.3	17.3	17.1	17.1	17.1	17.1	17.4	17.2	17.1	17.1	17.1
	18.4	17.5	17.2	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.2	17.1	17.1	17.1	17.1

*Shaded cell denotes exceedance of 25 $\mu g/m^3$ criteria

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The contemporaneous assessment for 24-hour $PM_{2.5}$ at Receptor 1 is presented in **Figure 4**. The chart shows a single exceedance of the criteria due to an elevated background concentration. There were no additional exceedances of criteria predicted as a result of the project inclusive of excavation activities. Concentrations predicted at other receptors were generally lower than those predicted at Receptor 1 and therefore this chart is considered the worst case for any receptor. The highest background concentration was 29.6 µg/m³, which was on a Sunday when no Project operations were occurring. This is the reason why the maximum contemporaneous 24-hour $PM_{2.5}$ concentrations at each receptor is 29.6 µg/m³ in **Table 12**.

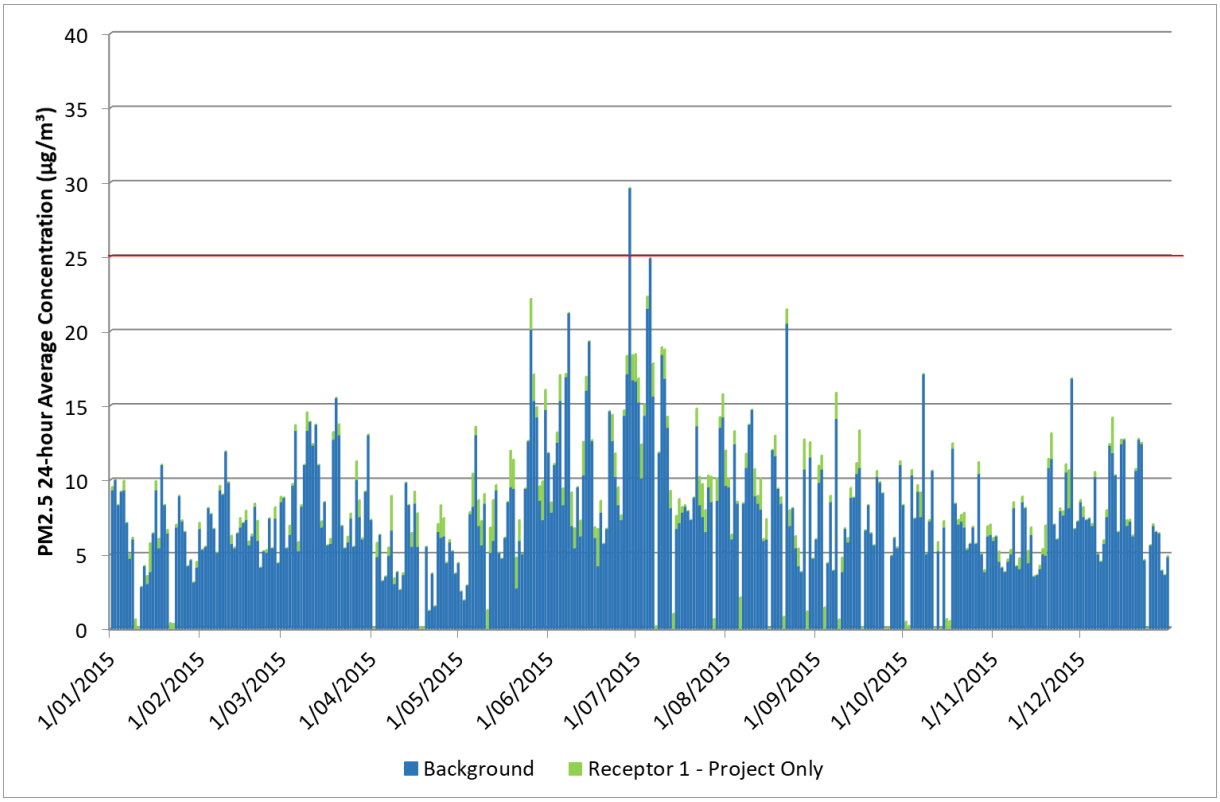


Figure 4 24-hour $PM_{2.5}$ contemporaneous assessment at receptor 1

A refined assessment of the top ten 24-hour $PM_{2.5}$ results at the most affected receptor (Receptor 1) is presented in **Table 13**. This data reflects the graph shown above and shows that no additional exceedances are predicted at this receptor due to the Project. There are four instances of zero Project increment predicted for the top ten highest background days. The reason for zero Project increment on these days is that these dates were all Sundays when the landfill operations were not operational and that winds were either not above the wind erosion threshold or not blowing towards Receptor 1.

Table 13 Contemporaneous 24-hour $PM_{2.5}$ assessment – Receptor 1 – criteria 25 µg/m³

Date	24-hour $PM_{2.5}$ Concentration (µg/m³)			Date	24-hour $PM_{2.5}$ Concentration (µg/m³)		
	Highest Background	Project	Total		Highest Project Increment	Background	Total
28/06/2015	**29.6**	0.0	**29.6**	12/05/2015	2.7	5.9	8.6
5/07/2015	24.9	0.0	24.9	29/05/2015	2.6	7.3	9.9
4/07/2015	21.5	0.8	22.3	26/11/2015	2.5	8.1	10.6
7/06/2015	21.2	0.0	21.2	15/09/2015	2.5	10.8	13.3
21/08/2015	20.5	0.9	21.4	17/06/2015	2.5	4.2	6.7
25/05/2015	20.1	2.0	22.1	18/05/2015	2.4	9.5	11.9

Date	24-hour $PM_{2.5}$ Concentration (µg/m³)			Date	24-hour $PM_{2.5}$ Concentration (µg/m³)		
	Highest Background	Project	Total		Highest Project Increment	Background	Total
14/06/2015	19.3	0.0	19.3	11/12/2015	2.4	11.8	14.2
9/07/2015	18.4	0.5	18.9	31/07/2015	2.4	9.6	12.0
27/06/2015	17.1	1.2	18.3	7/04/2015	2.3	6.6	8.9
27/06/2015	17.1	1.2	18.3	2/07/2015	2.3	10.1	12.4

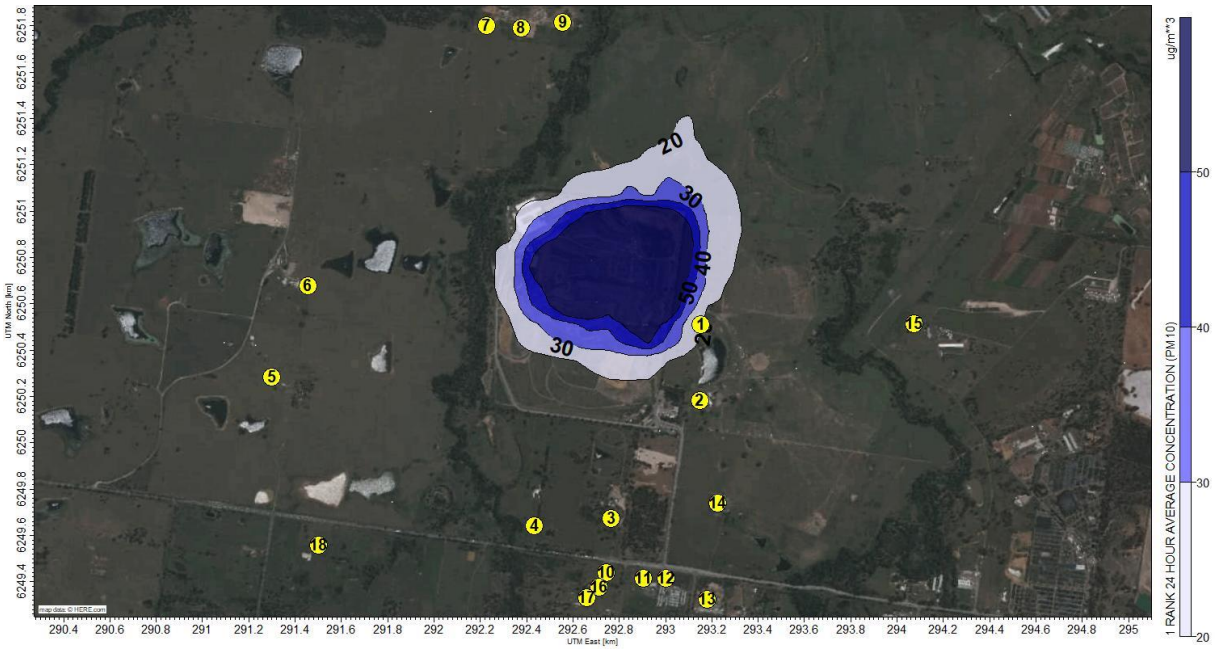


Figure 5 Maximum 24-hour PM_{10} – Project and Excavation Scenario contribution

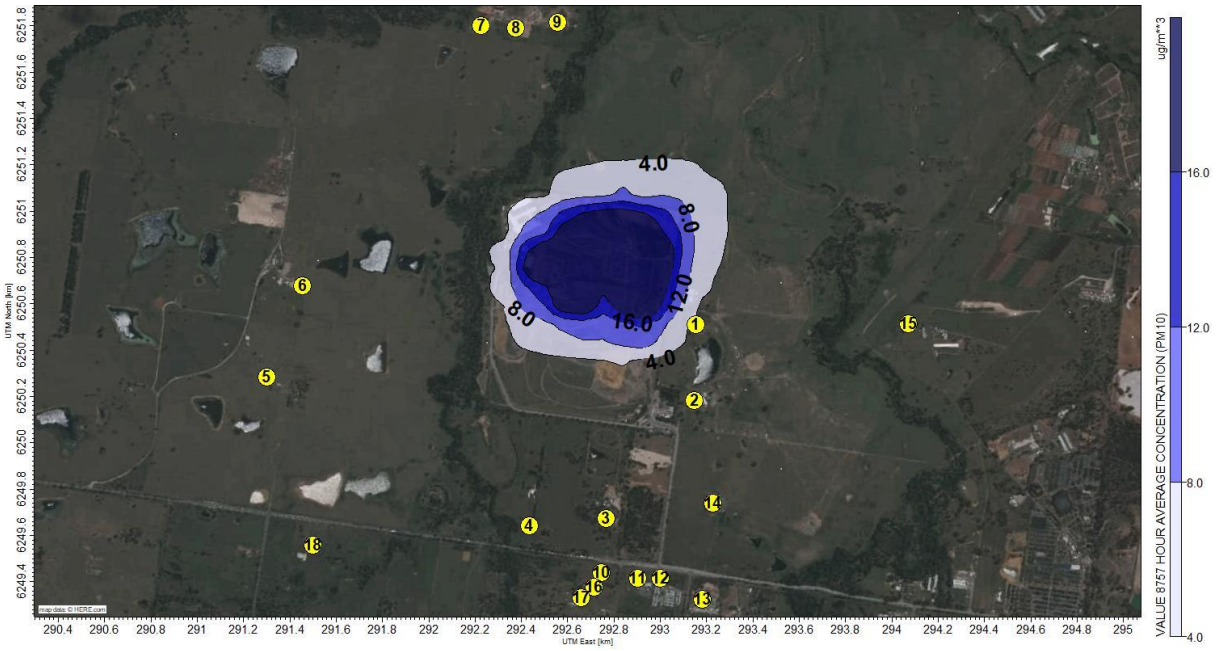


Figure 6 Annual average PM_{10} – Project and Excavation Scenario contribution

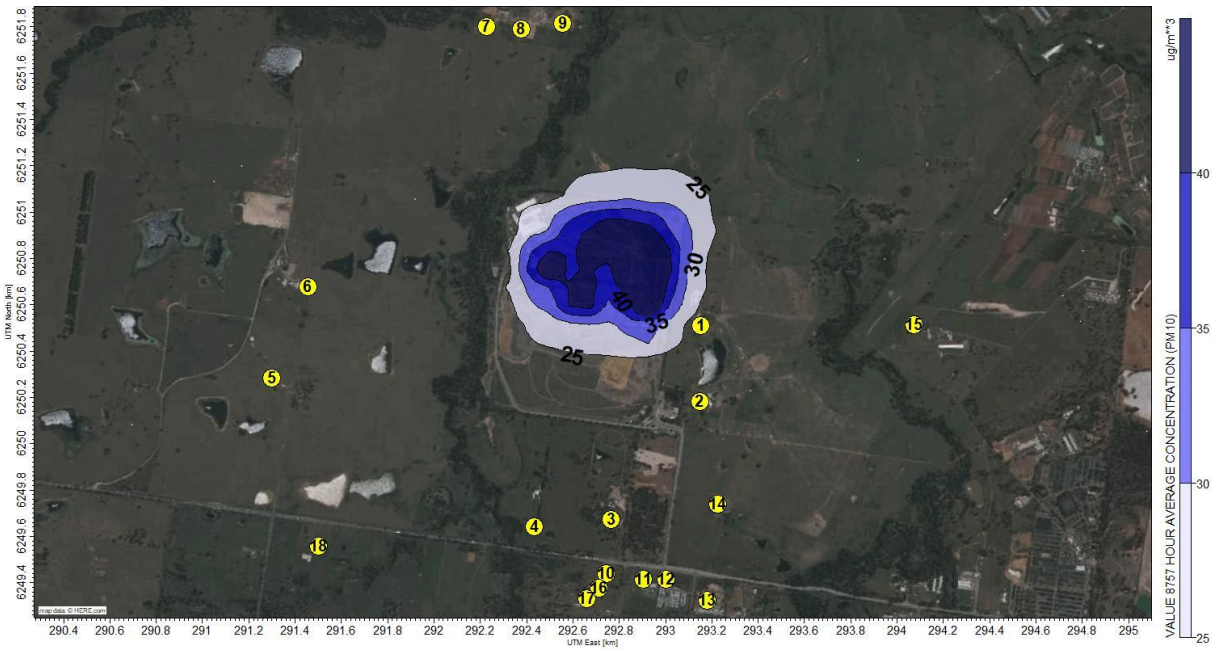


Figure 7 Annual average PM_{10} – cumulative[1] (Project plus Excavation Scenario plus background)

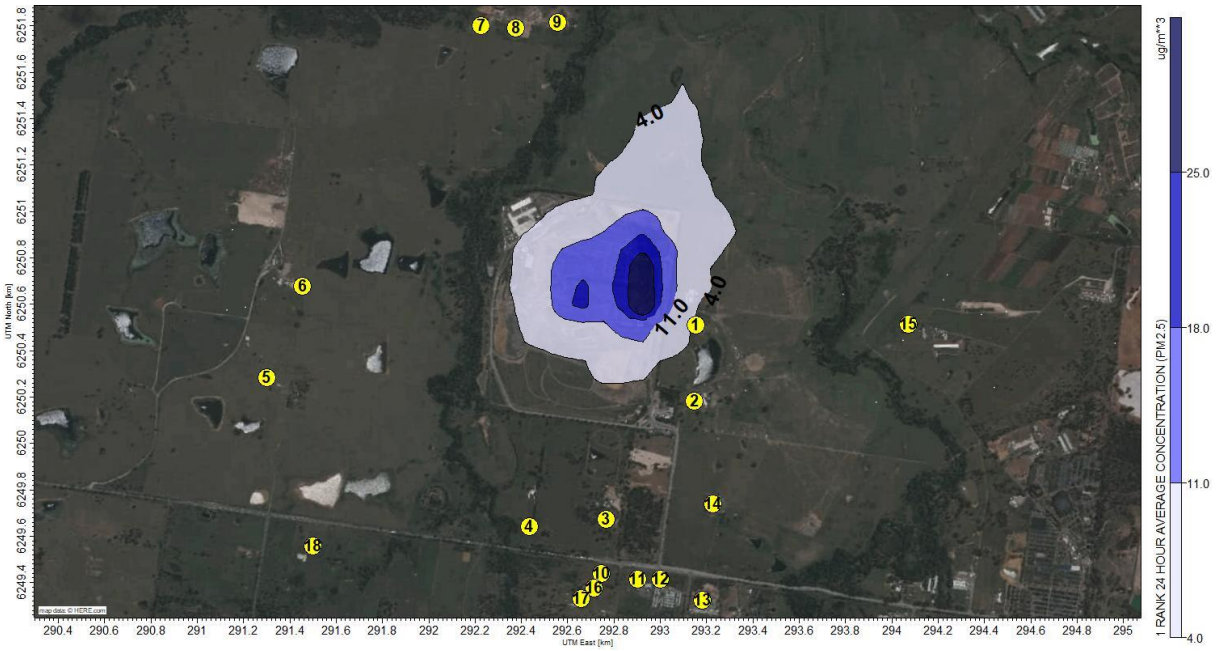


Figure 8 Maximum 24-hour $PM_{2.5}$ – Project and Excavation Scenario contribution

[1] [1] Criterion of 25 µg/m³ not shown as the lowest concentration across the whole domain is already above the criterion due to elevated background concentrations

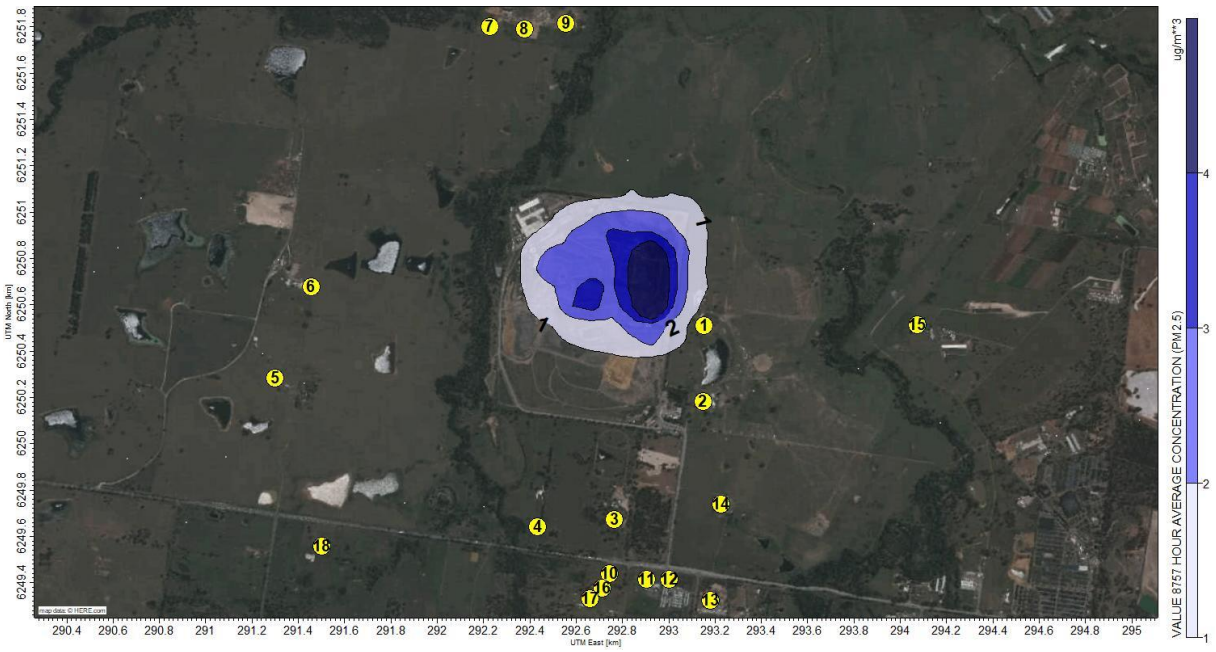


Figure 9 Annual average $PM_{2.5}$ – Project and Excavation Scenario contribution

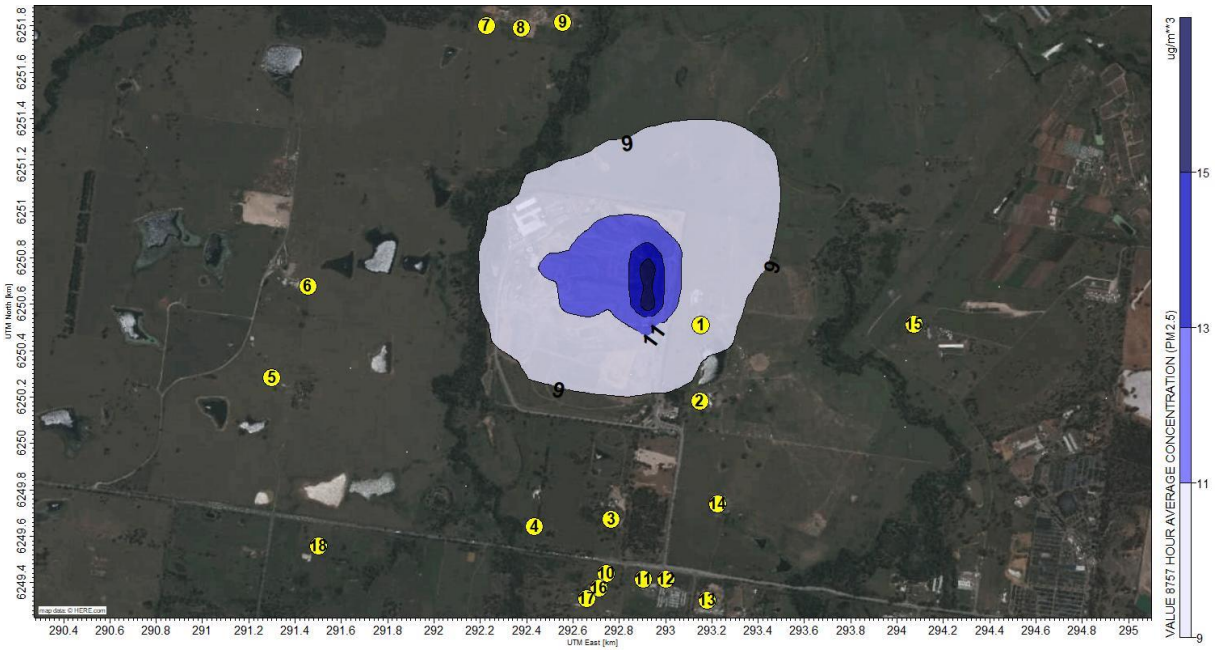


Figure 10 Annual average $PM_{2.5}$ – cumulative[2] (Project plus Excavation Scenario plus background)

[2] Criterion of 8 µg/m³ not shown as the lowest concentration across the whole domain is already above the criterion due to elevated background concentrationsExce

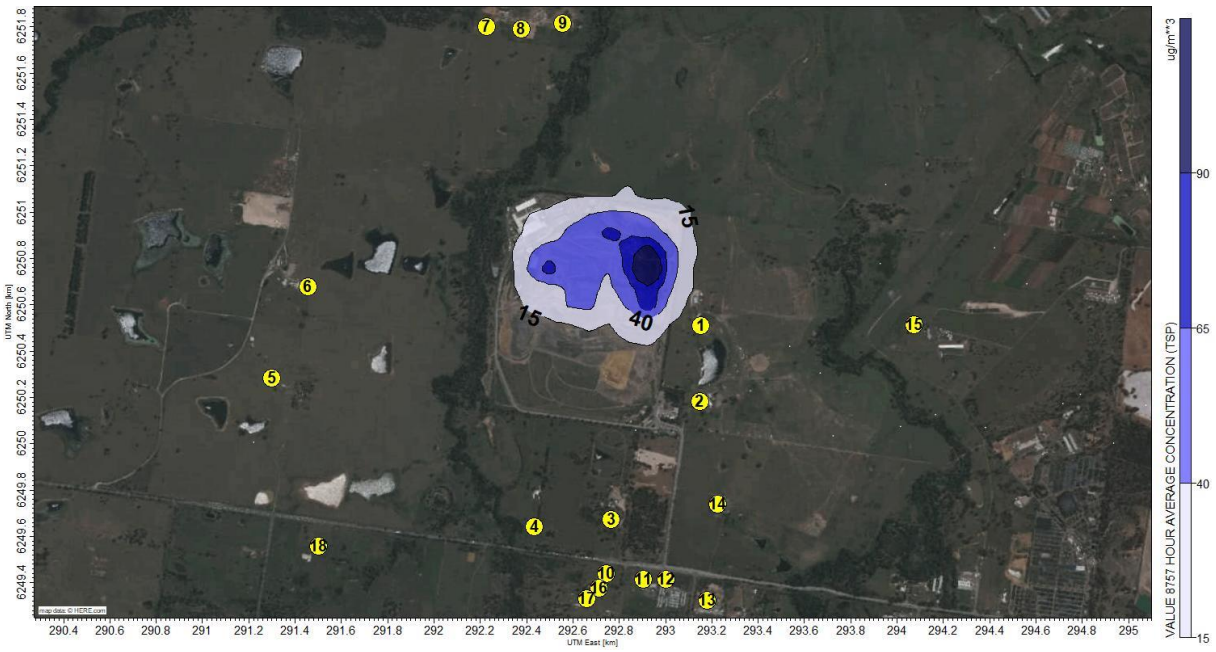


Figure 11 Annual average TSP – Project and Excavation Scenario contribution

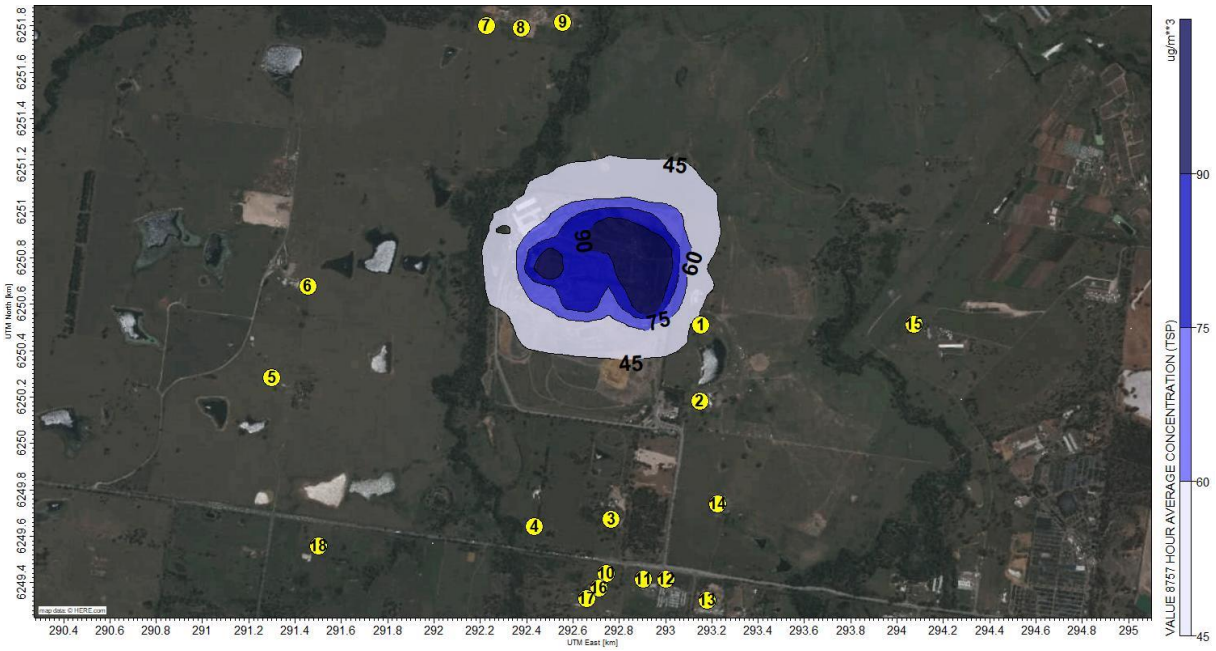


Figure 12 Annual average TSP – cumulative (Project plus Excavation Scenario plus background) – criterion 90 µg/m³

Discussion and conclusion

In response to the EPA's comments SUEZ have undertaken a revised air quality impact assessment of the Elizabeth Drive Landfill expansion project. The revised assessment included a newly adopted wind erosion emission estimation technique, as requested by EPA, and revised wind erosion emission source parameters such as active areas. A range of new mitigation measures were also adopted for the assessment which were aimed at reducing particulate emission due to the Project to an acceptable level. The revised assessment showed that with the new wind erosion emissions and mitigation strategies, overall emission rates were lower than previously estimated in both the AQITR and the previous Response to EPA. Modelling of the lower revised emission rates showed that no additional exceedances of any air quality criteria are predicted for the Project.

SUEZ would commit to the mitigation strategies (outlined in the response to Issue 5 above) for the duration of the Project. Based on this, the Project is viable from an air quality perspective.

Attachment 2: Supplementary noise impact assessment

Prepared by AECOM

25 February 2020

1.0 Introduction

SUEZ Recycling & Recovery Pty Ltd (SUEZ) submitted a Noise and Vibration Impact Assessment Technical Report (NIA) to Penrith City Council (Council) as part of Development Application DA19/0470. This development application pertains to the expansion of the Elizabeth Drive Landfill, Kemps Creek NSW (the Project). This letter addresses the comments made by the NSW Environment Protection Authority (EPA) in the letter titled: *Development Application No. DA19/0470 – Further request for additional information – Noise and Air,* document number 19/1054201, dated 6 December 2019.

The current Environmental Protection Licence 4068 (EPL 4068), version date 17 April 2014, Condition L6, Clause L6.2 allows for the delivery of waste items between 6.00am to 7.00am, Monday to Friday.

EPL 4068 Condition L6 is reproduced below:

L6 Hours of operation

L6.1 All quarrying and waste compaction activities at the premises must only be conducted between the following hours: 7.00am to 6.00pm Monday to Friday; 7.00am to 5.00pm Saturdays; and 8.00am to 5.00pm Sundays and Public Holidays.

L6.2 All waste receipt activities at the premises must only be conducted between the following hours: 6.00am to 6.00pm Monday to Friday; 7.00am to 5.00pm Saturdays; and 8.00am to 5.00pm Sundays and Public Holidays.

Considering the EPL 4068 hours of operation, the EPA has requested SUEZ to provide an additional assessment of noise from the development relating to activities during the 6.00am to 7.00am period.

2.0 Morning shoulder period noise trigger levels

The EPA's noise Policy for Industry (NPfI) provides guidance in Section 3A of Fact Sheet A ('*Dealing with 'shoulder' periods*') on how to deal with situations that call for different assessment periods, such as in this case for delivery of waste between 6.00am to 7.00am, Monday to Friday. Part 3A is also valid for this situation as noise monitoring has shown that existing background noise levels steadily rise in these early morning hours (refer to Appendix A for measured background noise graphs).

In addition, Part 3A provides guidance on how to derive shoulder period intrusiveness noise level based on a shoulder period rating background noise level (RBL).

As such, shoulder period RBLs and shoulder period noise trigger levels have been derived to assess noise impacts arising from the delivery of waste between 6.00am to 7.00am.

The shoulder period RBLs were derived based on:

the lowest 10th percentile of $L_{AF90,\ 15min}$ dB measurements for the equivalent of one week's worth of valid data taken over the shoulder period (i.e. 6.00am to 7.00am, Monday to Friday)

The shoulder period RBLs and shoulder period noise trigger levels for each noise catchment area (NCA) are presented in **Table 14**.

Table 14 Shoulder period noise trigger levels

Noise catchment area	Measured shoulder period RBL	Shoulder period intrusiveness noise levels	Shoulder period noise trigger levels
	$L_{A90,\ 15min}$	$L_{Aeq,\ 15min}$	$L_{Aeq,\ 15min}$
NCA1	41	46	46

Noise catchment area	Measured shoulder period RBL	Shoulder period intrusiveness noise levels	Shoulder period noise trigger levels
	$L_{A90, 15min}$	$L_{Aeq, 15min}$	$L_{Aeq, 15min}$
NCA2	36	41	41
NCA3	34	39	39
NCA4	40	45	45

Note:

1. Shoulder period is defined as 6.00am to 7.00am, Monday to Friday.

In addition to the above, the potential for sleep disturbance from maximum noise level events from the Project needs to be considered. Section 2.5 of the NPfI outlines that sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

The NPfI indicates that where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

a detailed maximum noise level event assessment should be undertaken.

The sleep disturbance noise trigger levels applicable to the Project are presented in **Table 15**.

Table 15 Shoulder period sleep disturbance noise trigger levels

Noise catchment area	Measured shoulder period RBL	Sleep disturbance noise trigger levels	
	$L_{A90, 15min}$	$L_{Aeq,15min}$	L_{AFmax}
NCA1	41	46	56
NCA2	36	41	52
NCA3	34	40	52
NCA4	40	45	55

3.0 Shoulder period operational noise assessment

As outlined in Section 2.0, the only activities that currently occur between 6.00am and 7.00am is the delivery of waste. As outlined in the EIS, the average number of trucks entering the site on a weekday during this period is 10, with no trucks on the weekend (refer EIS Chapter 12 – Traffic and Transport Assessment).

To take a conservative approach to the assessment, an estimation of 16 trucks was assessed entering the site in the 6.00am to 7.00am shoulder period for four landform scenarios which have previously been assessed for this Project, i.e.:

Final approved landform RL75

Interim proposed landform RL65

Final proposed landform RL90

Final proposed capped landform RL95.

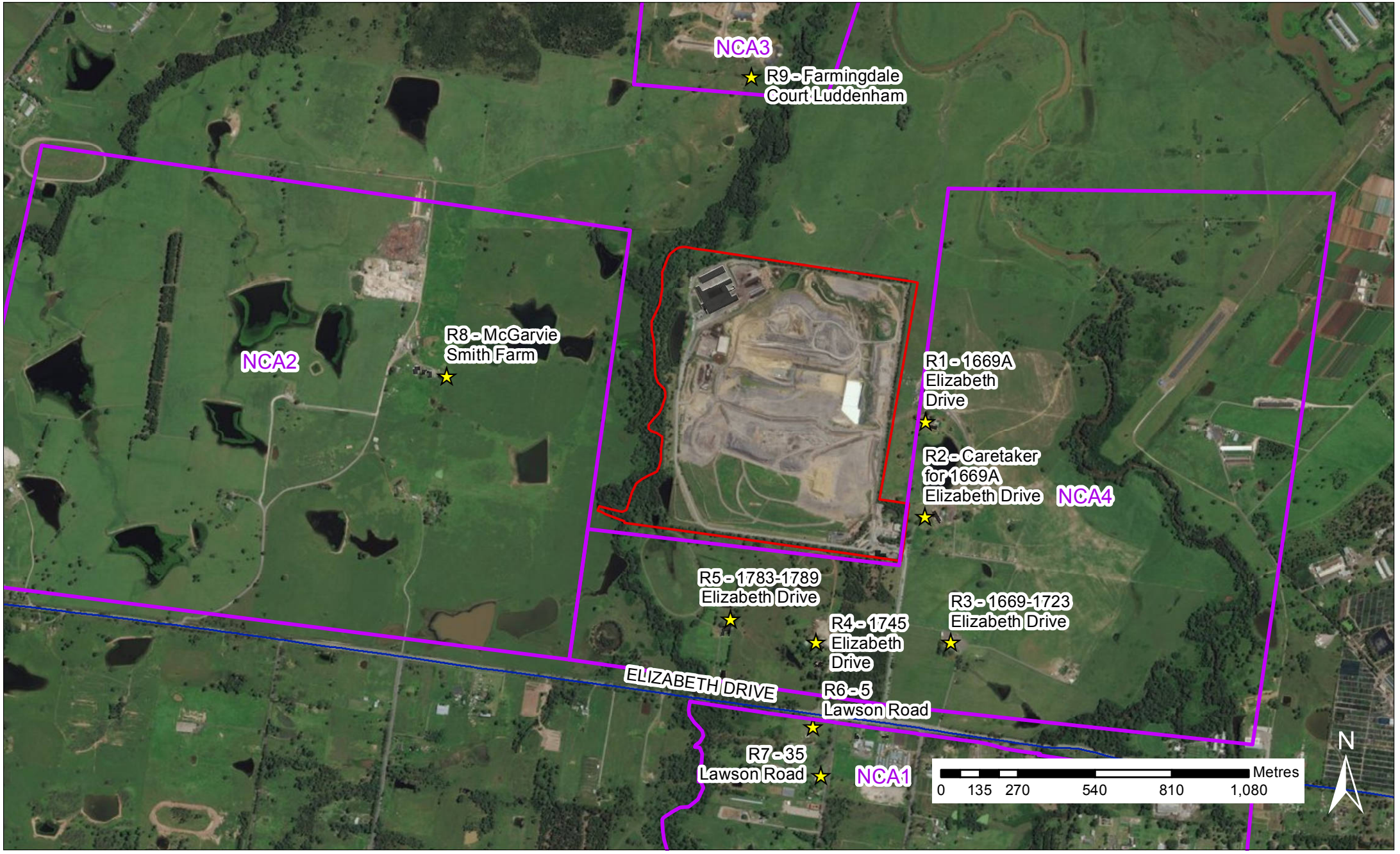
Only noise-enhancing meteorological conditions defined in Fact Sheet D of the NPfI were considered as part of this assessment. These were based on Pasquill-Gillford stability category D with source to receiver wind speed up to 3 m/s at 10 metres above ground level.

It should be noted that this assessment has been undertaken assuming all existing and committed noise mitigation measures outlined in the EIS are in place (e.g. existing and proposed noise bunds).

A map of noise sensitive receivers is provided in Figure 1.

4.0 Predicted operational noise impacts

The following section presents the predicted shoulder period noise levels associated with waste deliveries between 6:00am and 7:00am, as well as sleep disturbance noise levels.



NCA

Assessment location

Site Boundary

AECOM

suez

SUEZ ELIZABETH DRIVE LANDFILL

FIGURE 1: REPRESENTATIVE NOISE SENSITIVE RECEIVER MAP

DATE	13/11/2018
SCALE	1:17,000
PROJECT	60571292
DRAWN	PD

Table 16 Predicted shoulder period noise levels at all representative receiver locations under noise-enhancing meteorological conditions

Receiver ID	NCA	Receiver	Project noise trigger levels, $L_{Aeq,15min}$	Predicted noise levels, $L_{Aeq,15min}$, dB(A)				Exceedance, dB(A)			
				Approved	Proposed			Approved	Proposed		
				RL75	RL65	RL90	RL95	RL75	RL65	RL90	RL95
R1	NCA4	1669A Elizabeth Drive	45	39	41	40	40	-	-	-	-
R2	NCA4	Caretakers Residence 1669A Elizabeth Drive	45	37	38	38	38	-	-	-	-
R3	NCA4	1669-1723 Elizabeth Drive	45	32	33	33	33	-	-	-	-
R4	NCA1	1745 Elizabeth Drive	46	34	34	34	34	-	-	-	-
R5	NCA1	1783-1789 Elizabeth Drive	46	32	33	30	30	-	-	-	-
R6	NCA2	5 Lawson Road, Badgerys Creek	41	30	31	31	31	-	-	-	-
R7	NCA3	35 Lawson Road, Badgerys Creek	39	29	29	29	29	-	-	-	-
R8	NCA4	McGarvie Smith Farm	45	26	28	27	26	-	-	-	-
R9	NCA4	Farmingdale Court Luddenham	45	25	28	27	27	-	-	-	-

Table 17 Predicted shoulder period sleep disturbance noise levels at all representative receiver locations under noise-enhancing meteorological conditions

Receiver ID	NCA	Receiver	Sleep disturbance noise trigger levels	Predicted noise levels, dB(A)				Exceedance, dB(A)			
				Approved	Proposed			Approved	Proposed		
			$L_{Aeq,15min}$ / L_{Amax}	RL75	RL65	RL90	RL95	RL75	RL65	RL90	RL95
				$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}	$L_{Aeq,15min}$ / L_{Amax}
R1	NCA4	1669A Elizabeth Drive	45 / 55	39 / 57	41 / 55	40 / 55	40 / 55	- / 2	- / -	- / -	- / -
R2	NCA4	Caretakers Residence 1669A Elizabeth Drive	45 / 55	37 / 53	38 / 56	38 / 56	38 / 56	- /	- / 1	- / 1	- / 1
R3	NCA4	1669-1723 Elizabeth Drive	45 / 55	32 / 49	33 / 49	33 / 49	33 / 49	- / -	- / -	- / -	- / -
R4	NCA1	1745 Elizabeth Drive	46 / 56	34 / 50	34 / 50	34 / 50	34 / 50	- / -	- / -	- / -	- / -
R5	NCA1	1783-1789 Elizabeth Drive	46 / 56	32 / 51	33 / 51	30 / 51	30 / 51	- / -	- / -	- / -	- / -
R6	NCA2	5 Lawson Road, Badgerys Creek	41 / 52	30 / 45	31 / 45	31 / 45	31 / 45	- / -	- / -	- / -	- / -
R7	NCA3	35 Lawson Road, Badgerys Creek	40 / 52	29 / 43	29 / 43	29 / 43	29 / 43	- / -	- / -	- / -	- / -
R8	NCA4	McGarvie Smith Farm	45 / 55	26 / 44	28 / 44	27 / 44	26 / 44	- / -	- / -	- / -	- / -
R9	NCA4	Farmingdale Court Luddenham	45 / 55	25 / 41	28 / 43	27 / 43	27 / 43	- / -	- / -	- / -	- / -

5.0 Discussion of results

Shoulder period noise levels

The predicted shoulder period noise levels at nearby noise sensitive receivers, under noise-enhancing meteorological conditions, for all landforms comply with the shoulder period noise trigger levels.

Sleep disturbance noise levels

The predicted maximum noise levels at nearby noise sensitive receivers under noise-enhancing meteorological conditions, for all landforms, comply with the shoulder period sleep disturbance noise trigger levels, with the exception of two receivers. Receiver R1 has a maximum exceedance of 2 dB(A) for the current approved landform (i.e. RL75).

Receiver R2 has a maximum exceedance of 1 dB(A) of the sleep disturbance noise trigger levels for all proposed landforms and no exceedances for the current approved landform.

Although some receivers are exposed to maximum noise levels exceeding the sleep disturbance trigger levels, the exceedances are less than or equal to 2 dB and as such are considered 'negligible' in accordance with Table 4.1 of the NPfI. The NPfI outlines that for negligible exceedances "*the exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls*". Furthermore, as only noise enhancing meteorological conditions were used in the noise modelling, i.e. a conservative assessment, it can be expected that exceedances will occur only part of the time under noise-enhancing wind conditions (i.e. winds 3 m/s source to receiver).

6.0 Conclusion

We trust that the information provided in this letter, satisfies Council and the EPA with regard to SUEZ' commitment to appropriately manage noise impacts associated the proposed expansion of Elizabeth Drive Landfill.

Appendix A – Unattended Noise Monitoring Summaries

NL1 - 83 Lawson Street, Badgerys Creek - 25/07/18 - 03/08/18

Logger Setup

Logger Type: Rion NL52

Serial No : 164395

Address: 83 Lawson Road , Badgerys Creek

Location: Front Yard

Facade / Free Field: Free Field

Environment: Wind noise and leaves rustling dominant at location. Bird noise audible. Line of site to traffic on Elizabeth Drive, however it is inaudible.

Logger Setup Photo

INP Noise Level, dB(A)

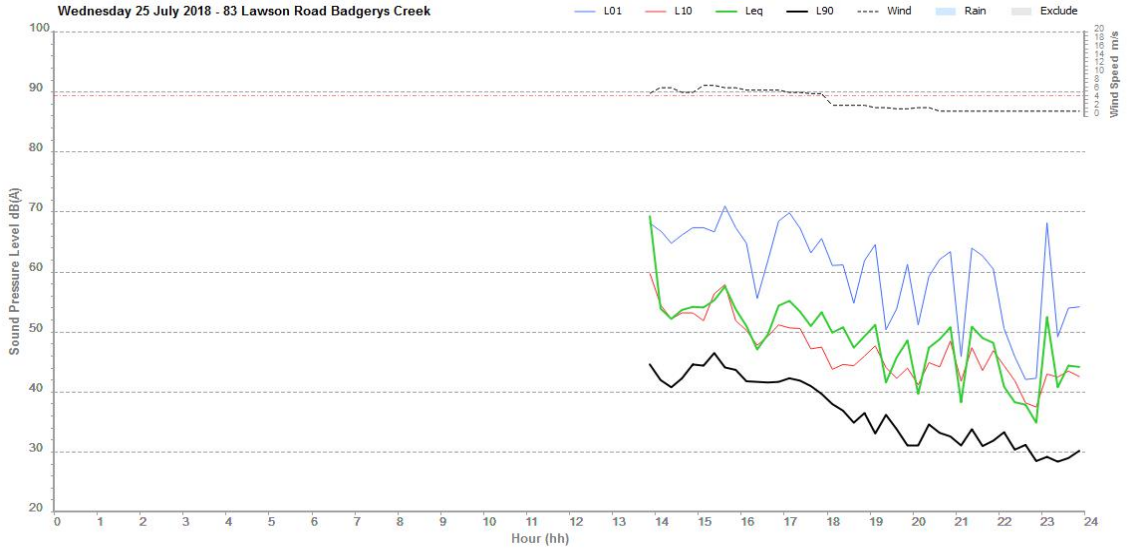
	Log Average	RBL
Day	54	36
Evening	49	34
Night	48	30

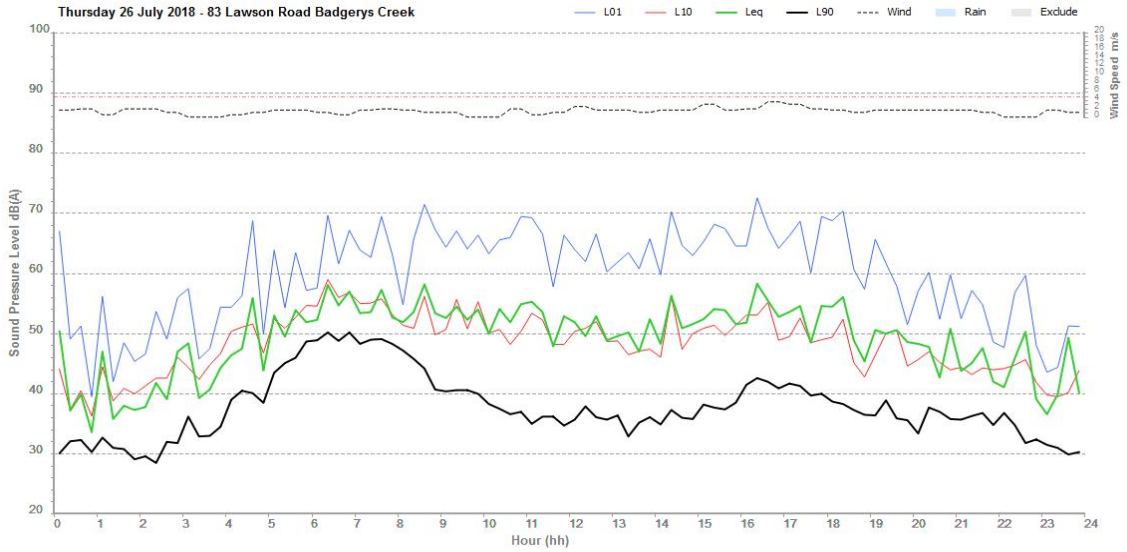
RNP Noise Level, dB(A)

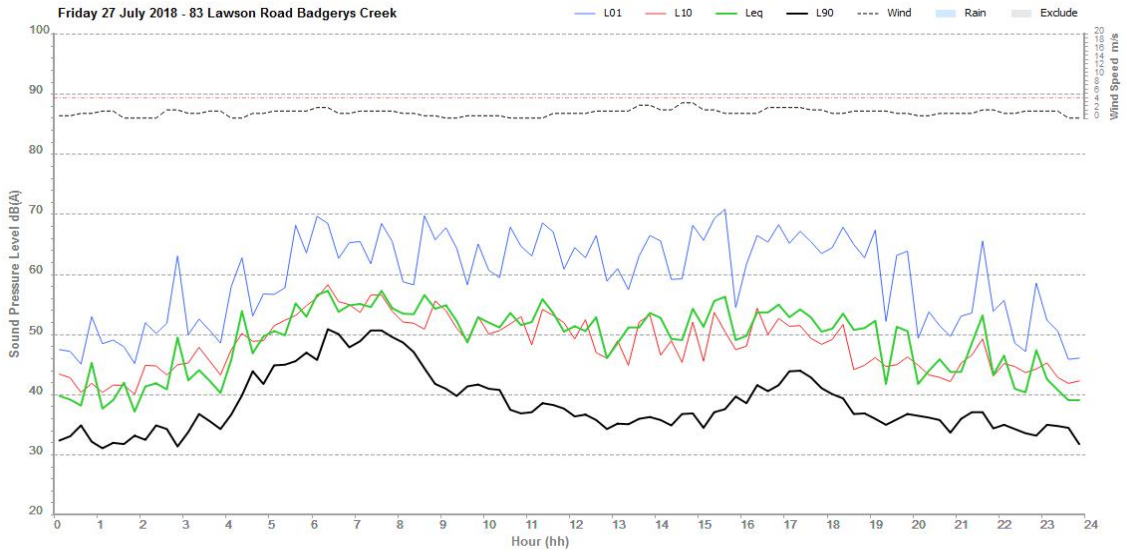
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map

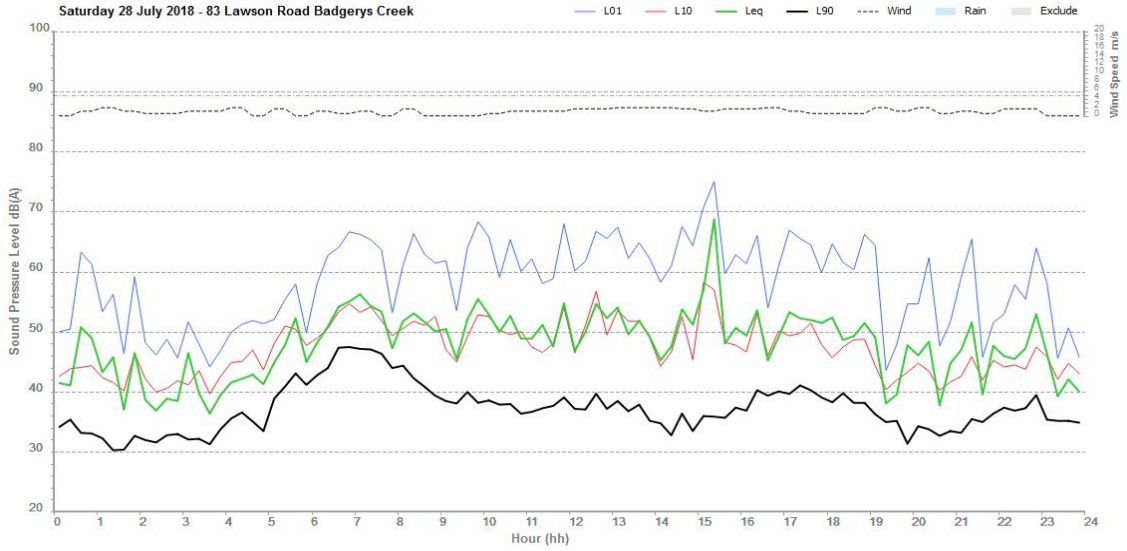
Logger Graphs

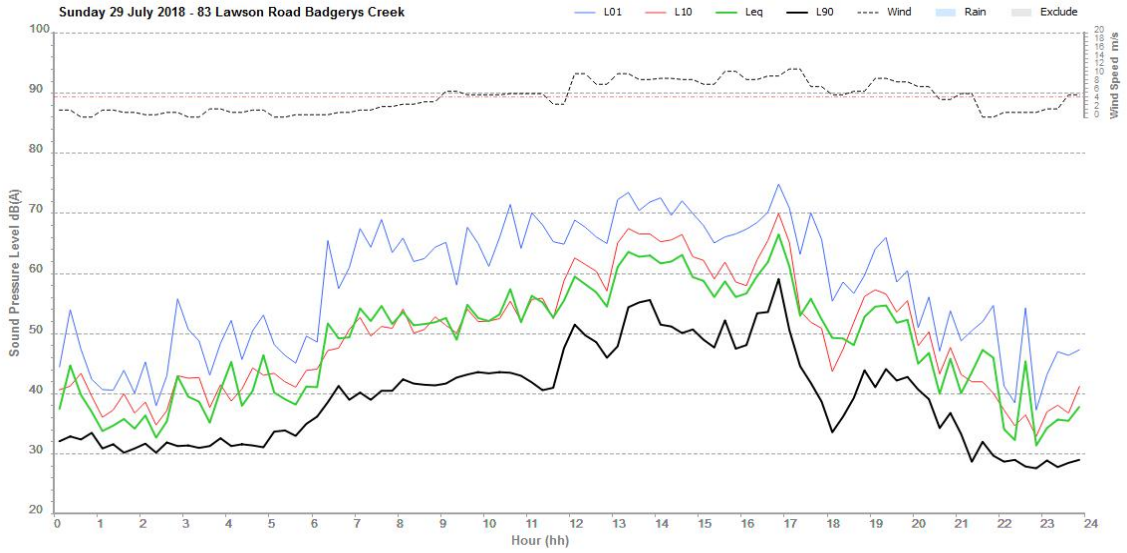


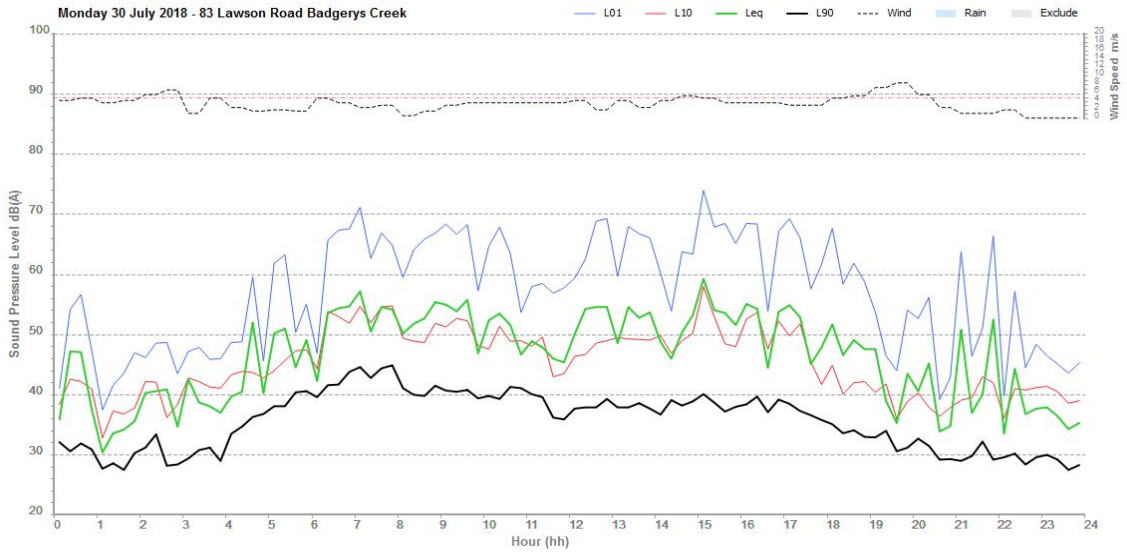




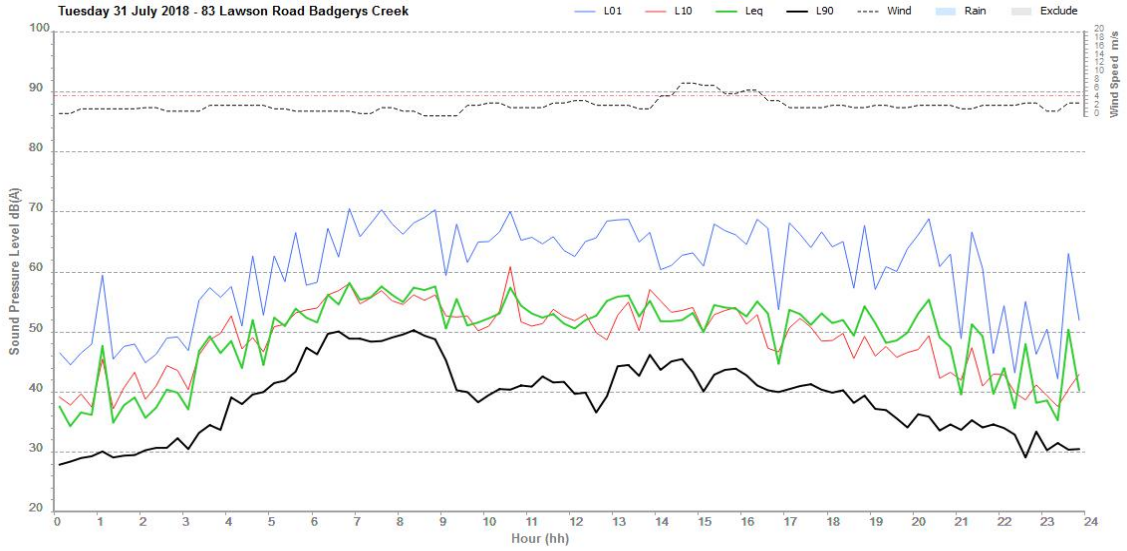
Logger Graphs

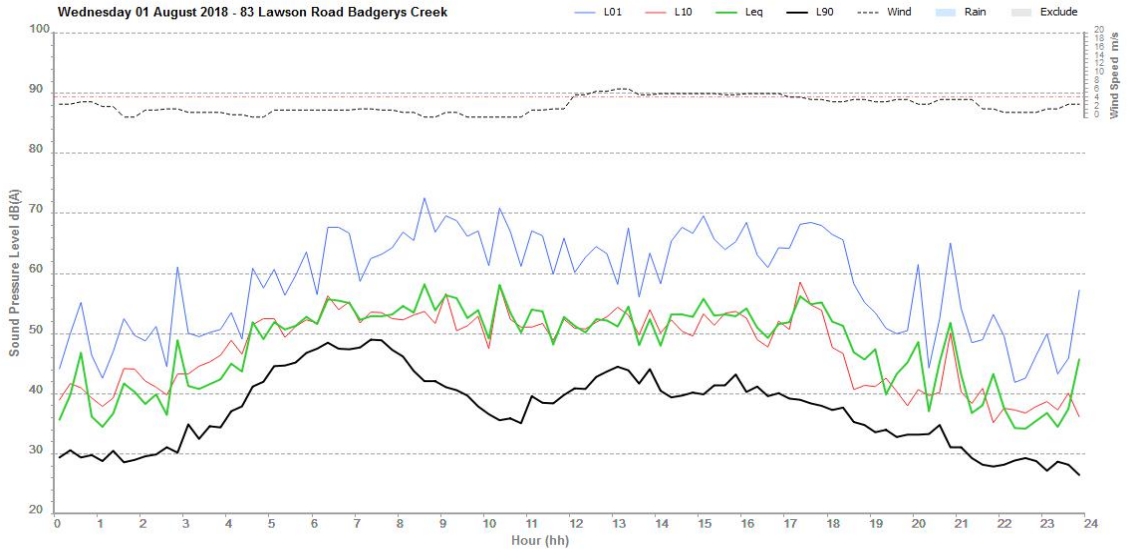


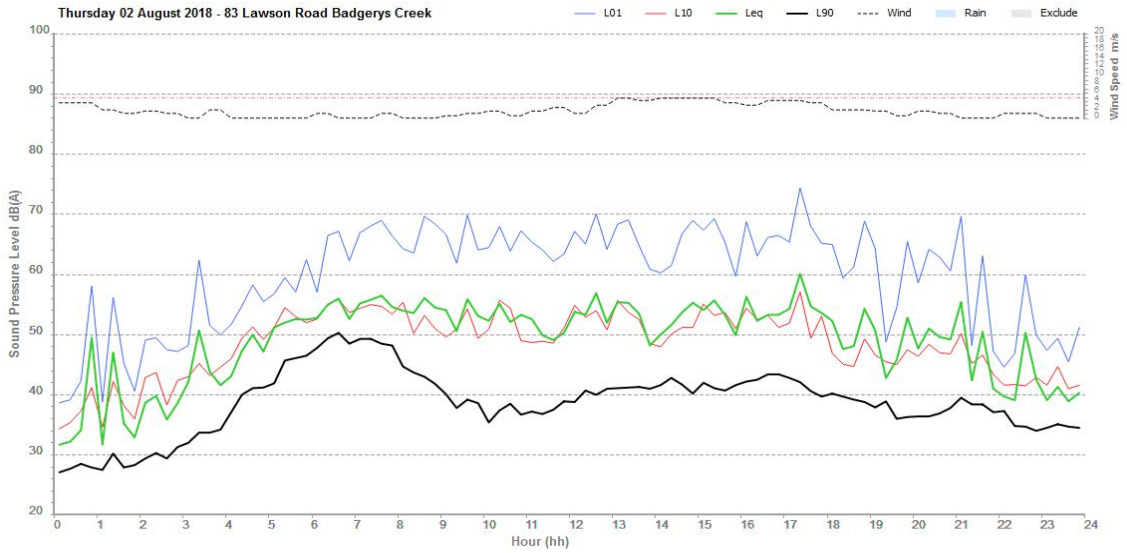




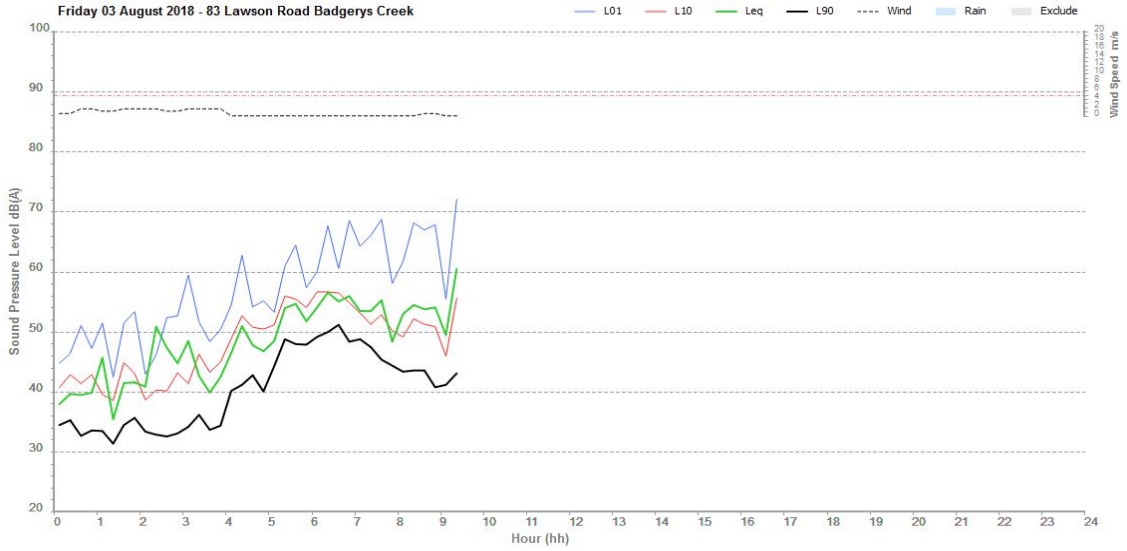
Logger Graphs







Logger Graphs



NL2 - McGarvie Smith Farm - 25/07/18 - 03/08/18

Logger Setup

Logger Type: Rion NL52

Serial No : 386741

Address: 2280 Elizabeth Drive , Badgerys Creek

Location: Paddock

Facade / Free Field: Free Field

Environment: wind noise dominant at location. Bird noise audible. Line of sight to landfill and trucks operating, however they are inaudible

Logger Setup Photo

INP Noise Level, dB(A)

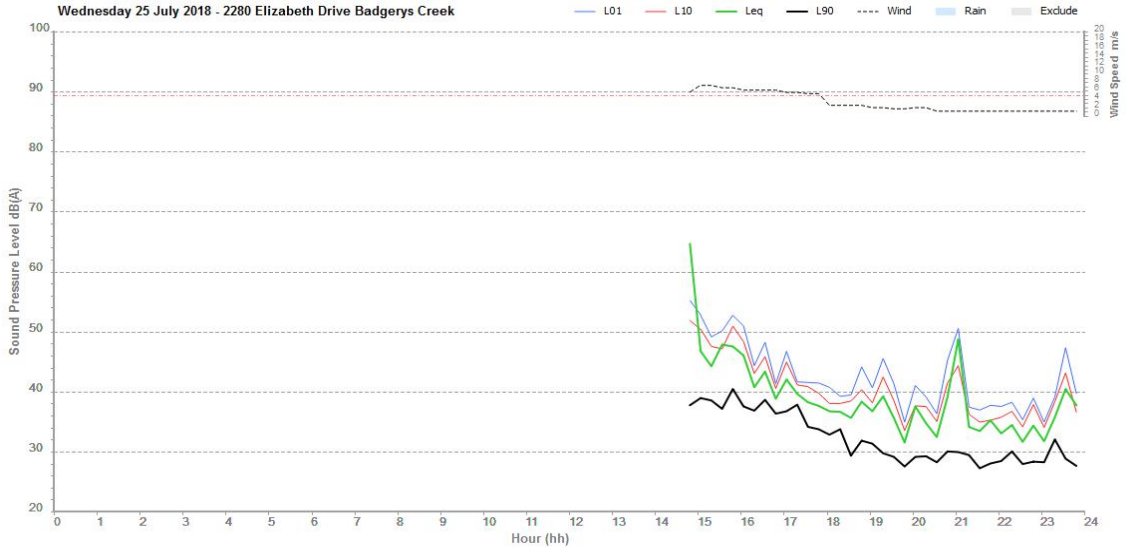
	Log Average	RBL
Day	46	31
Evening	39	32
Night	41	30

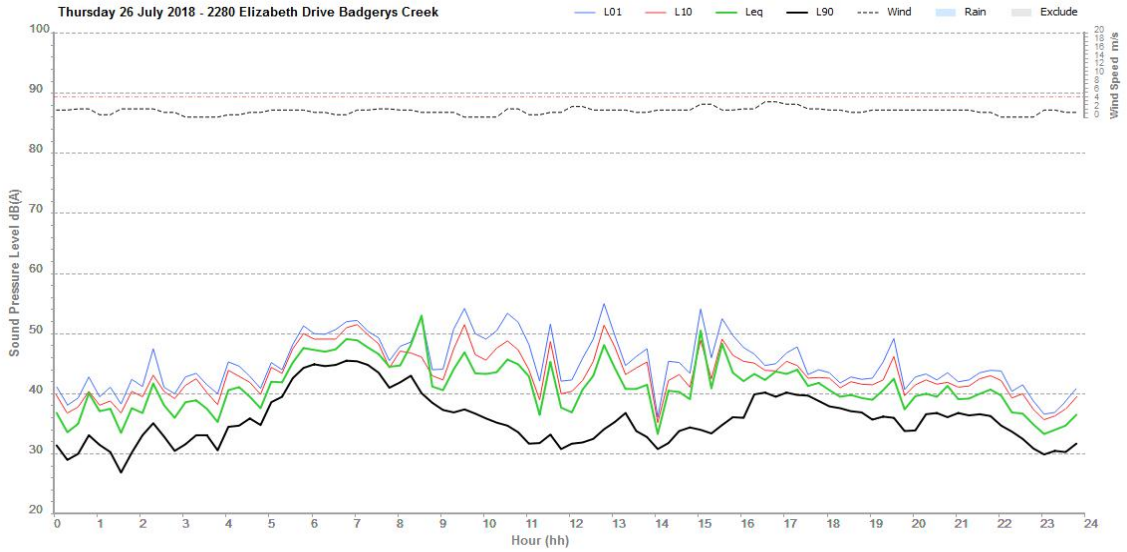
RNP Noise Level, dB(A)

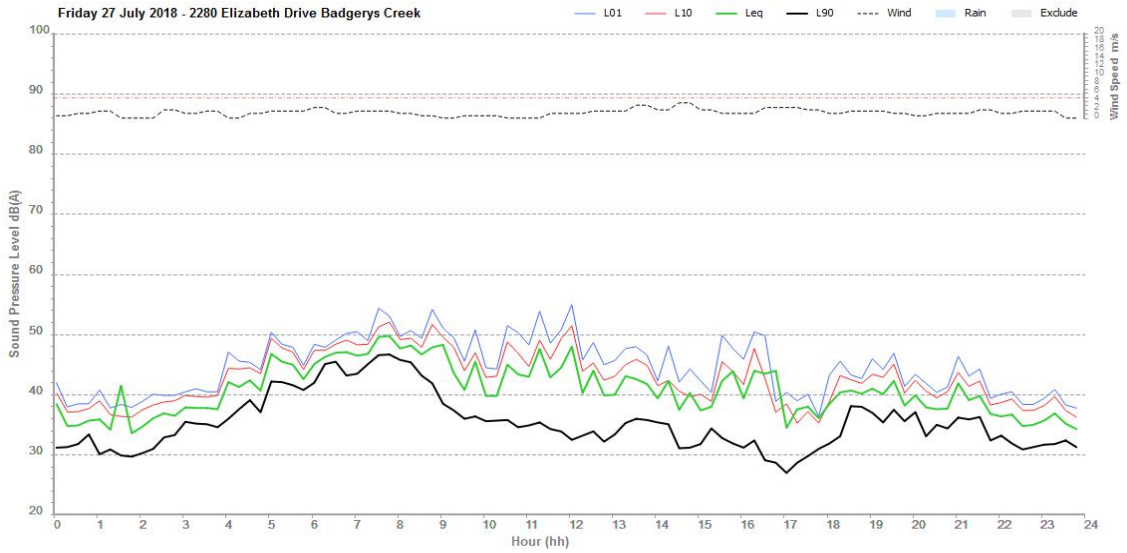
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map

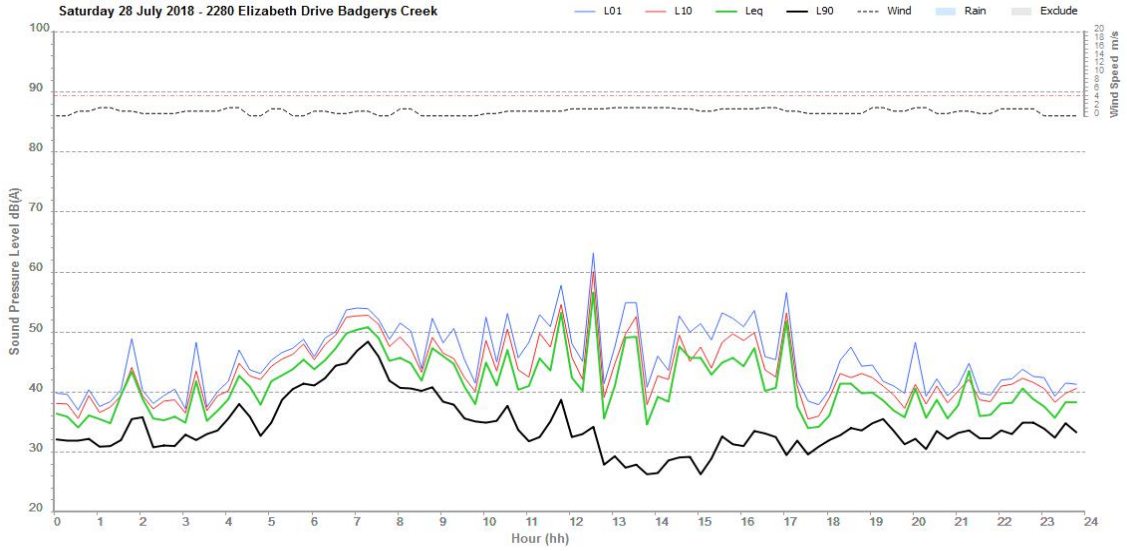
Logger Graphs

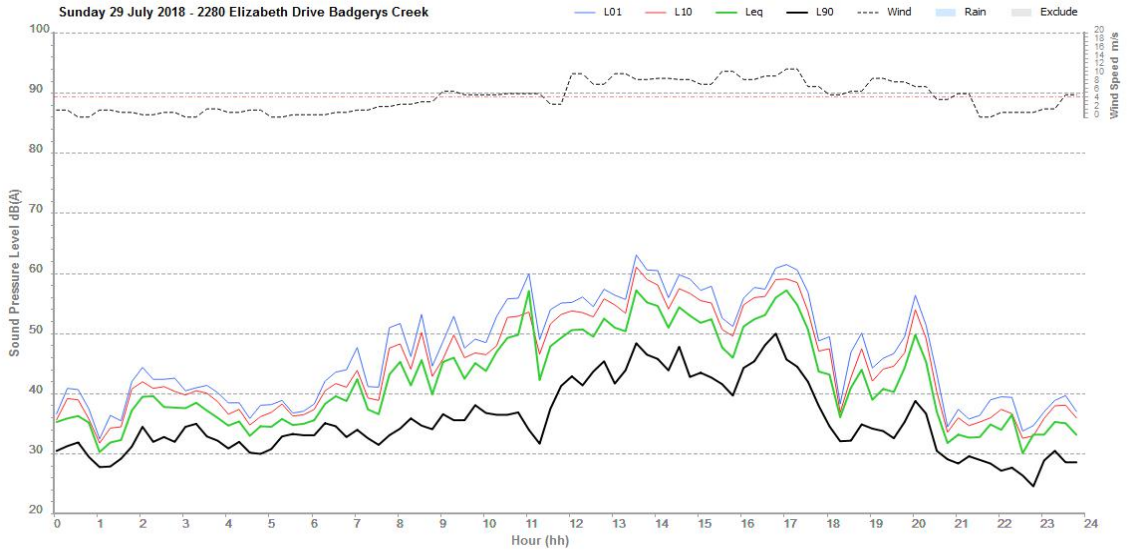


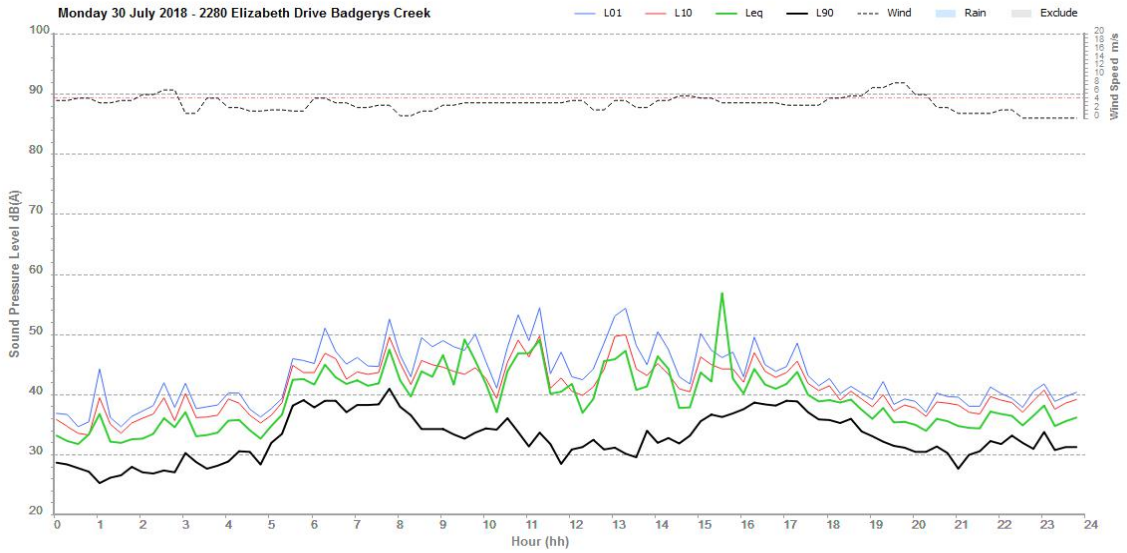




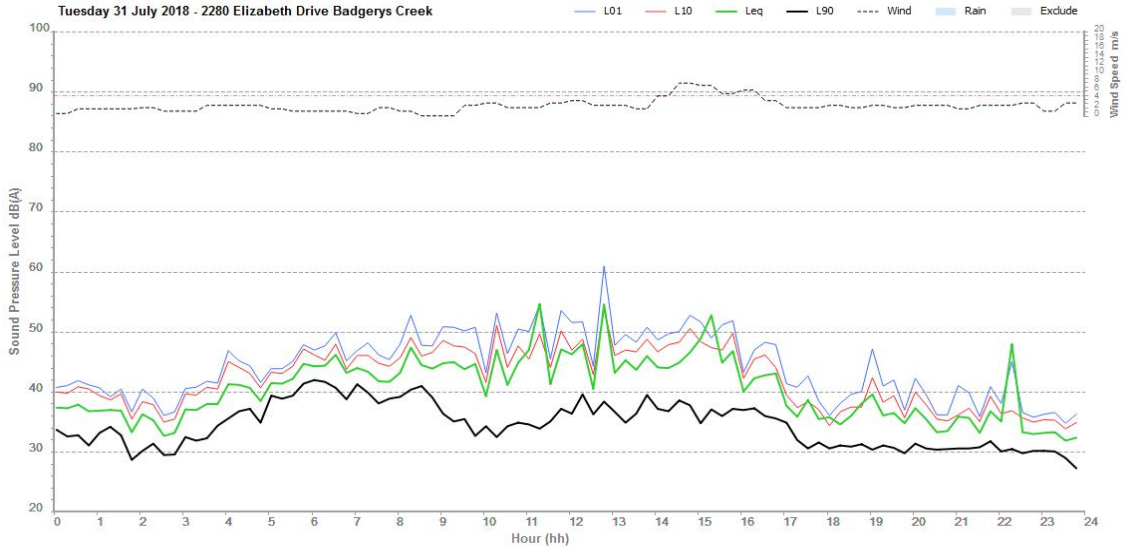
Logger Graphs

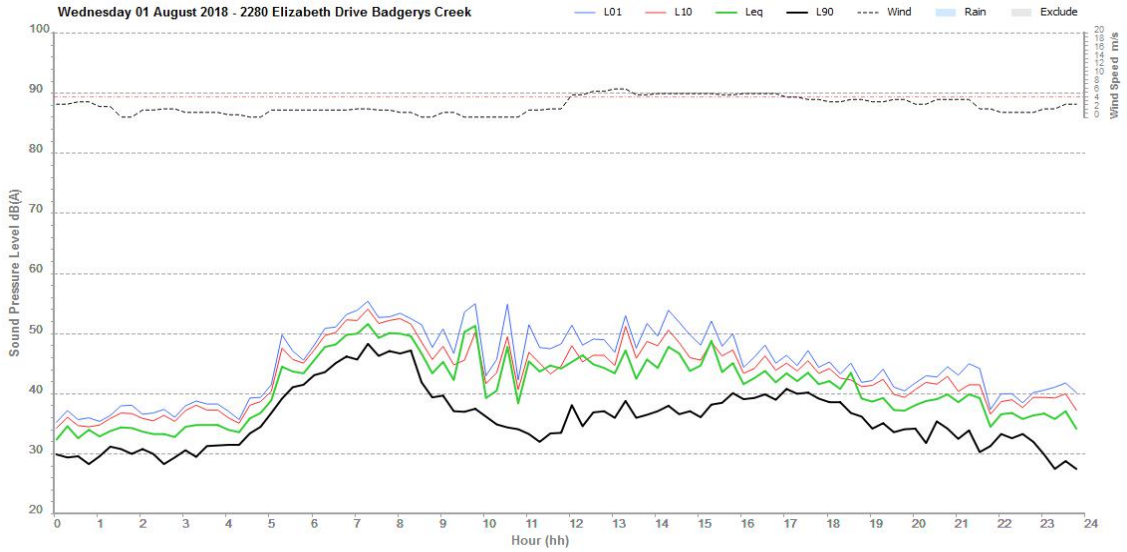


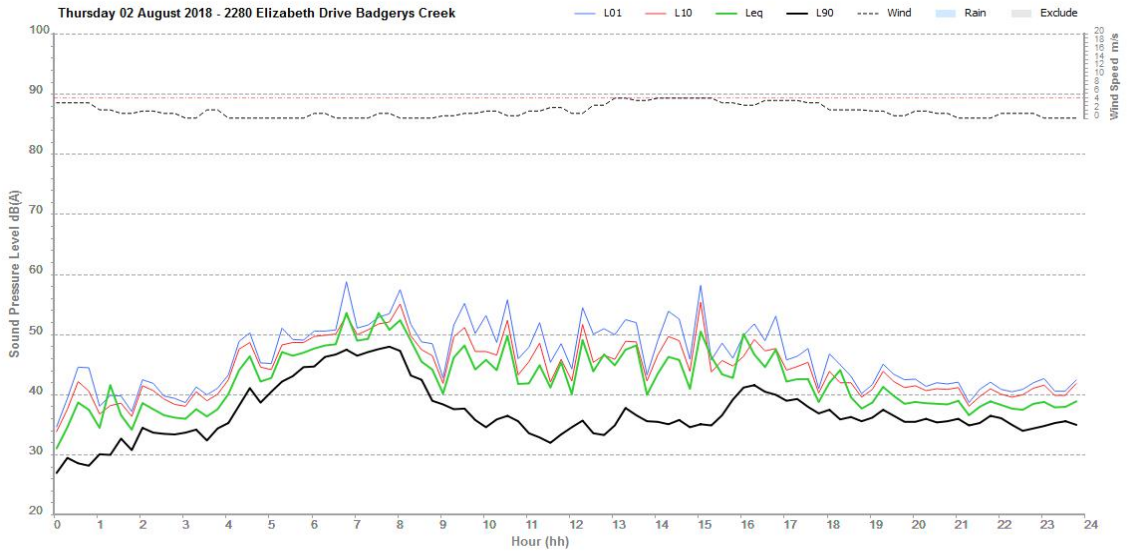




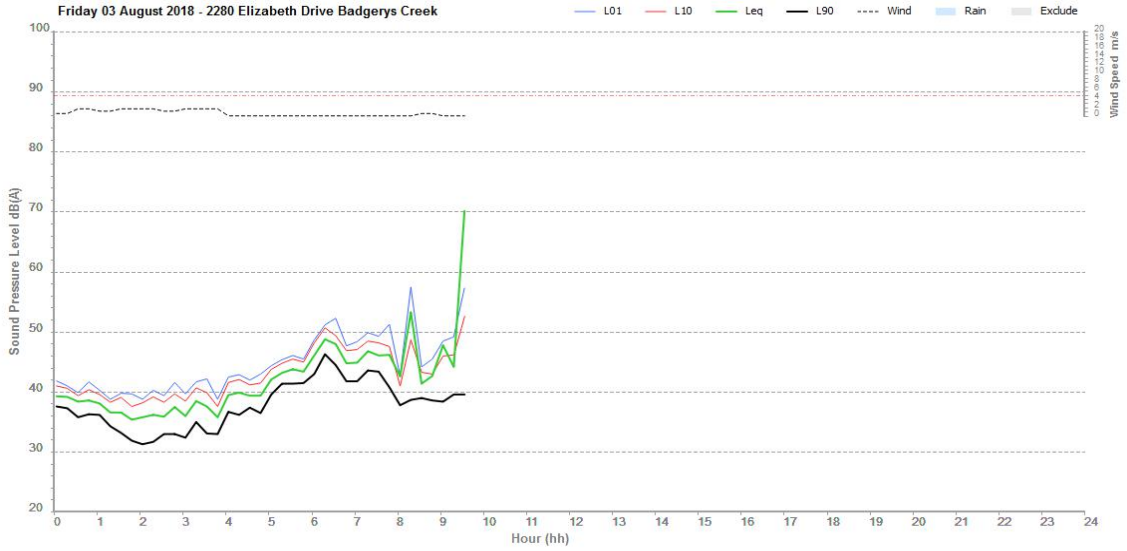
Logger Graphs







Logger Graphs



NL3 - 6 Humewood Place Luddeham - 25/07/18 - 03/08/18

Logger Setup

Logger Type: Rion NL21

Serial No : 00765701

Address: 6 Humewood Place , Luddenham

Location: Front yard

Facade / Free Field: Free Field

Environment: Wind noise dominant at location. Bird noise audible. Some construction noise audible in distance, but not dominant.

Logger Setup Photo

INP Noise Level, dB(A)

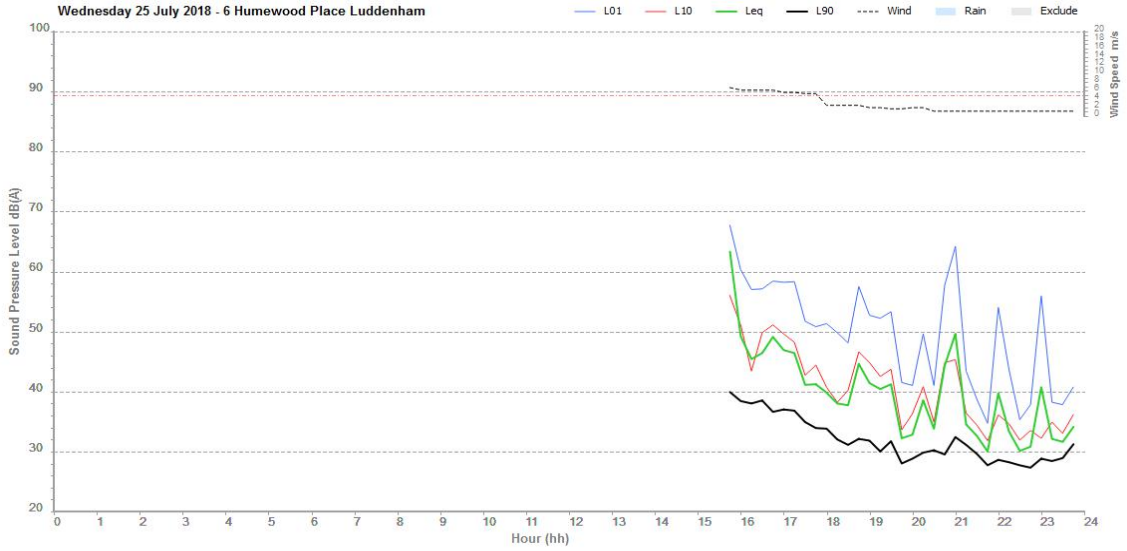
	Log Average	RBL
Day	49	31
Evening	43	32
Night	41	29

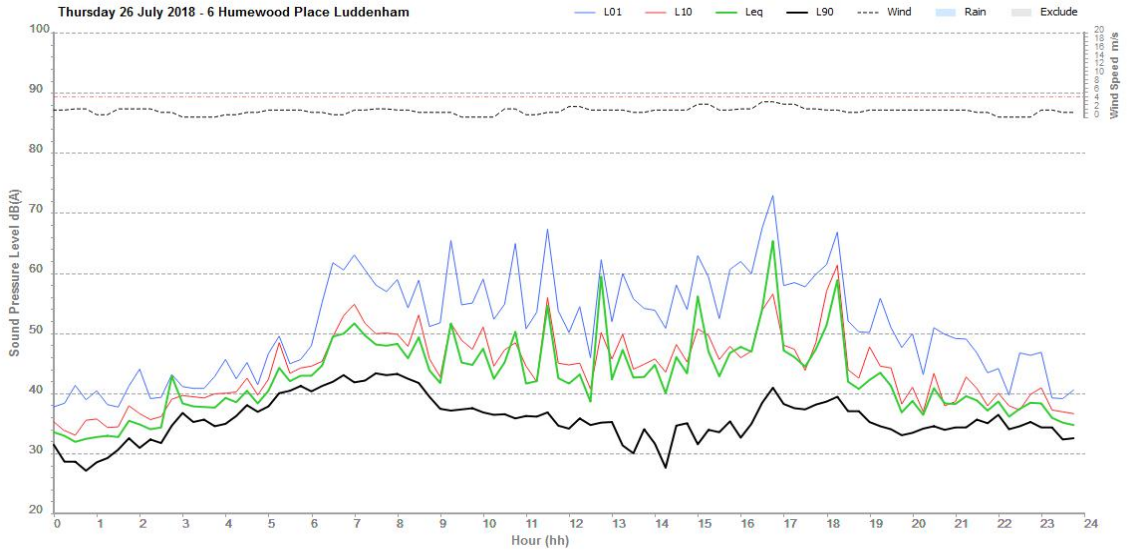
RNP Noise Level, dB(A)

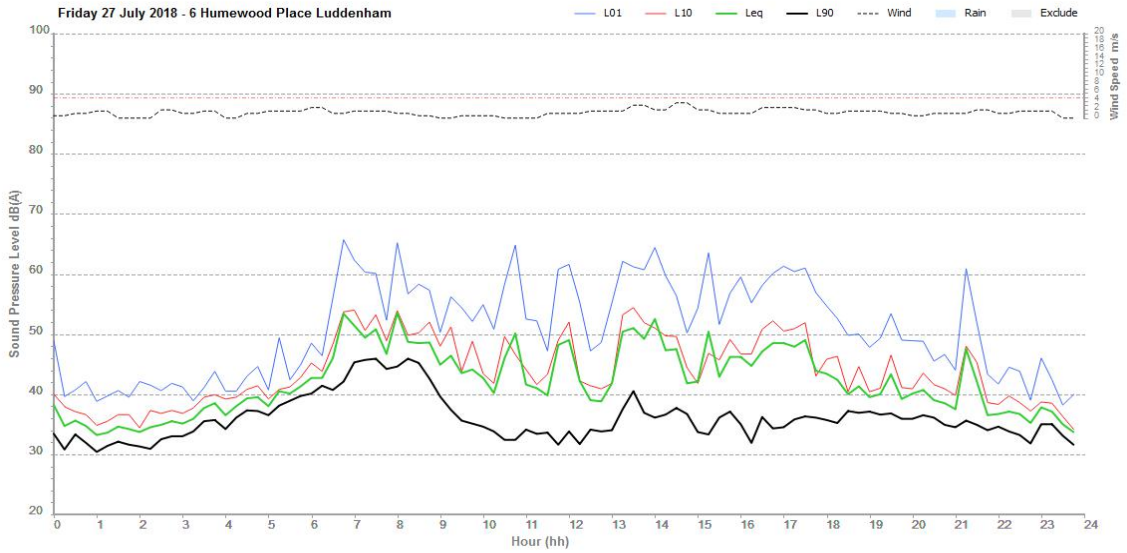
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map

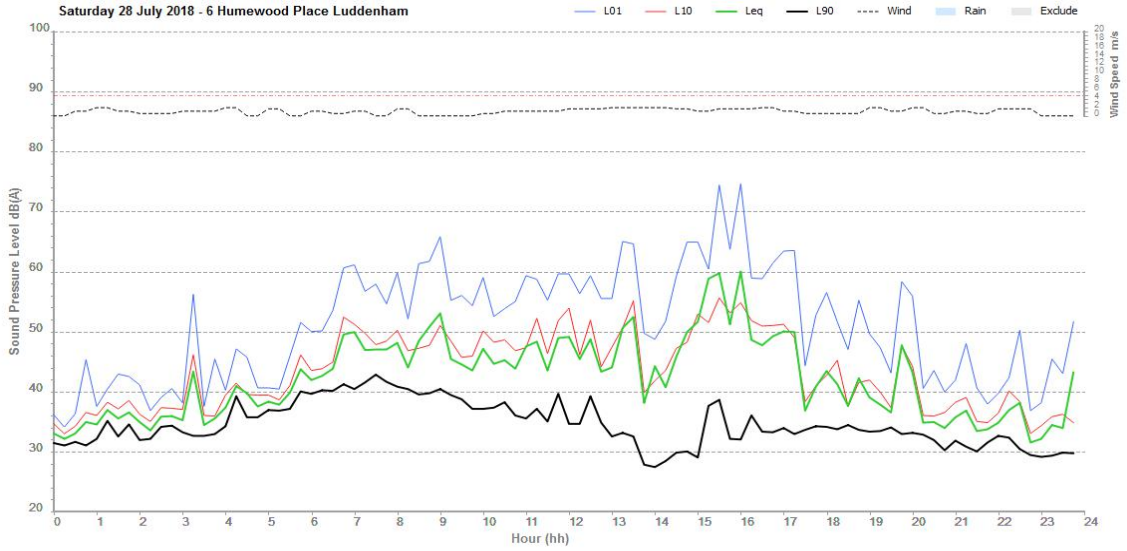
Logger Graphs

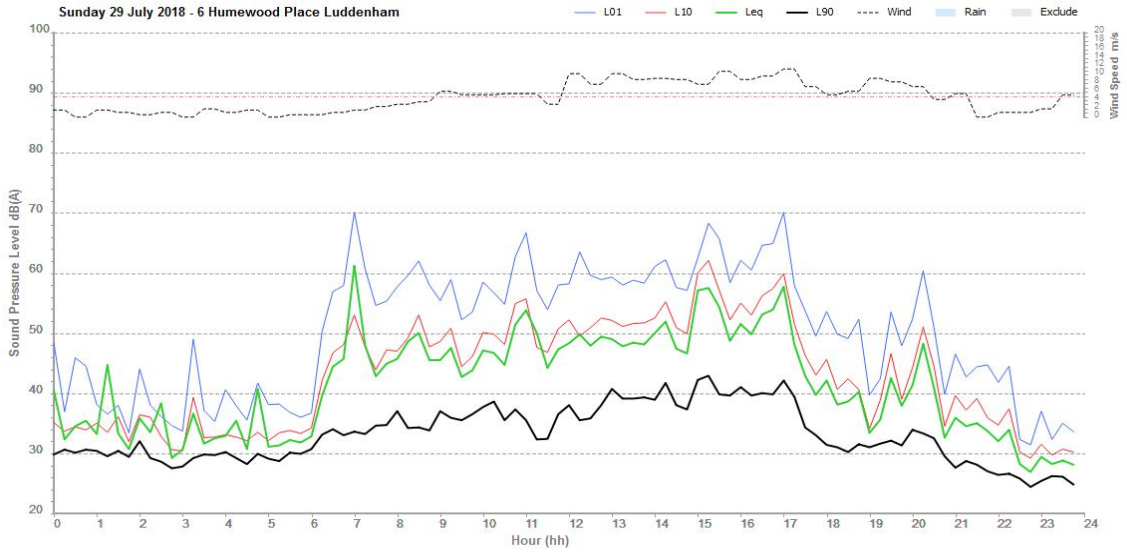


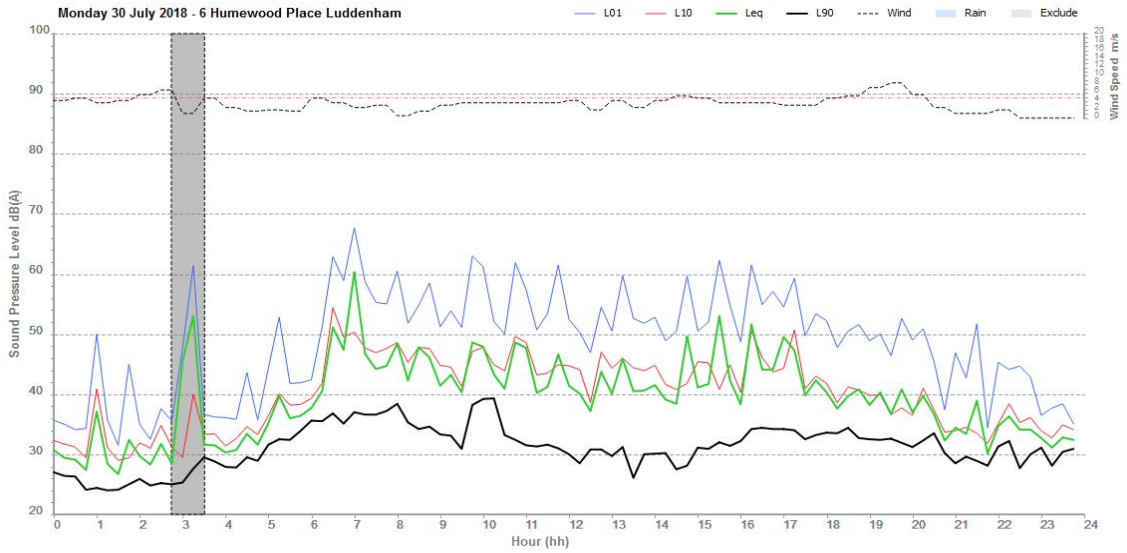




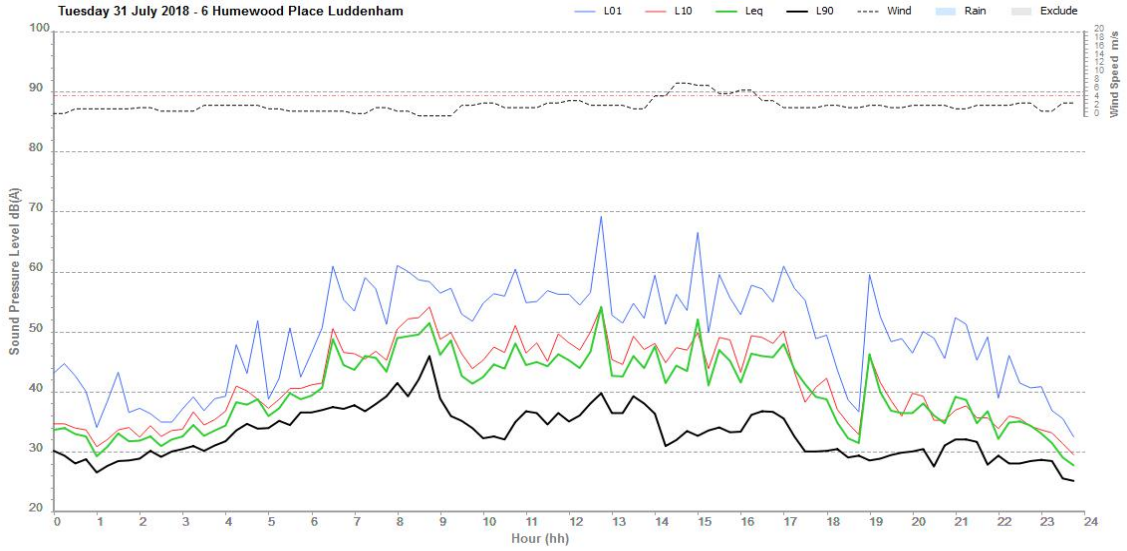
Logger Graphs

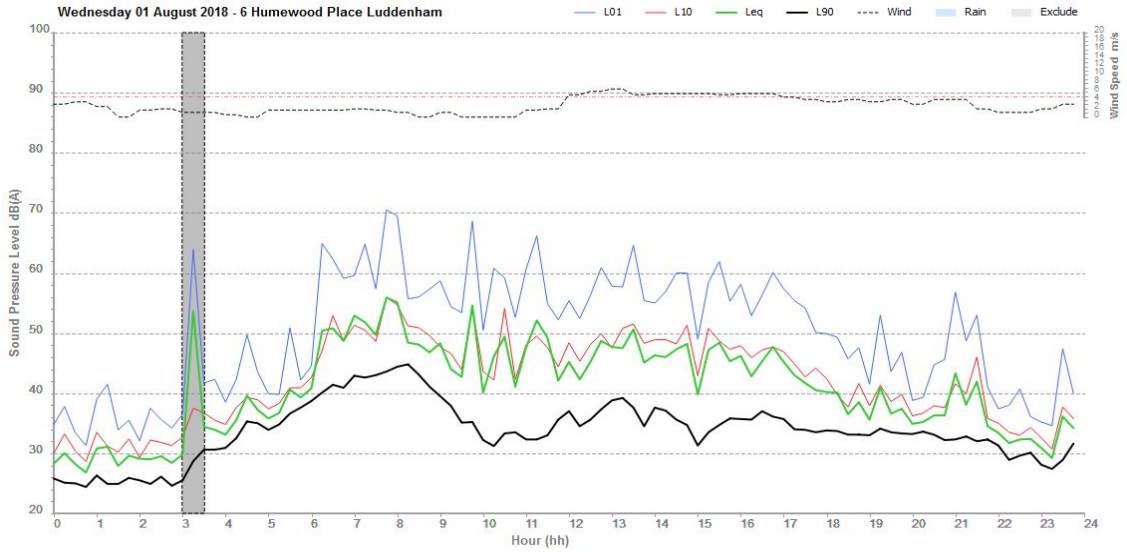


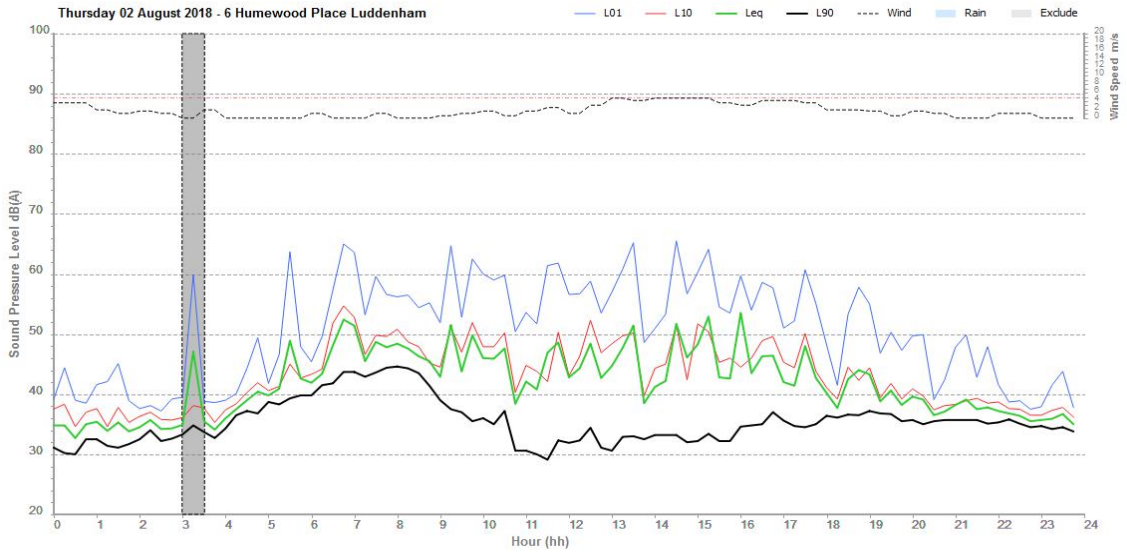




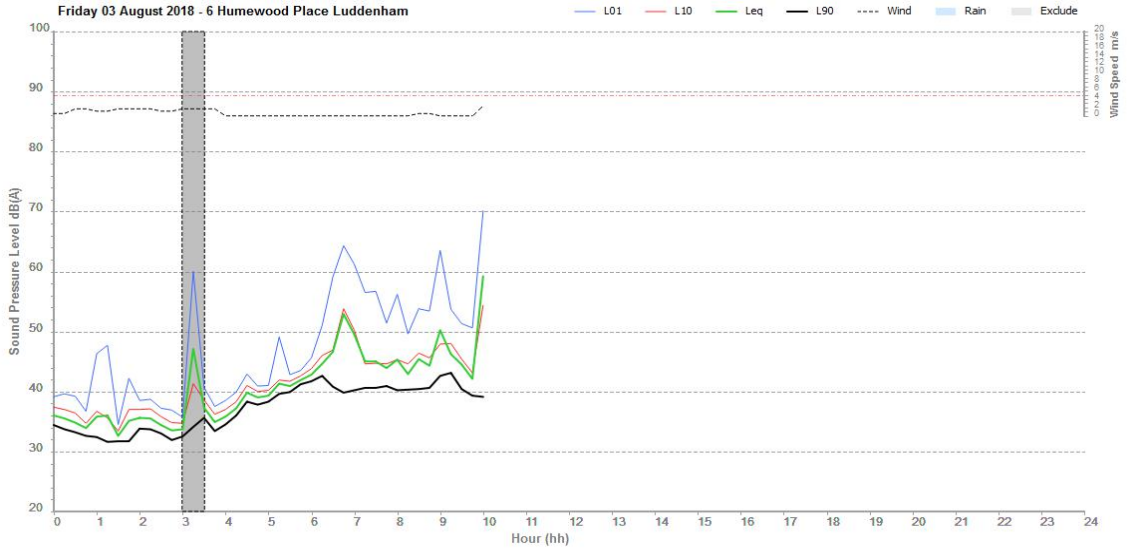
Logger Graphs







Logger Graphs



NL4 - Kingsfield stud eastern border - 25/07/18 - 03/08/18

Logger Setup

Logger Type: Rion NL52

Serial No : 553967

Address: 1669A Elizabeth Drive , Badgerys Creek

Location: Paddock

Facade / Free Field: Free Field

Environment: Background noise dominated by environment. Bird noise audible. Traffiic faintly audible, cannot determinel if is from Elizabeth drive or vehicles entering landfill site

Logger Setup Photo

INP Noise Level, dB(A)

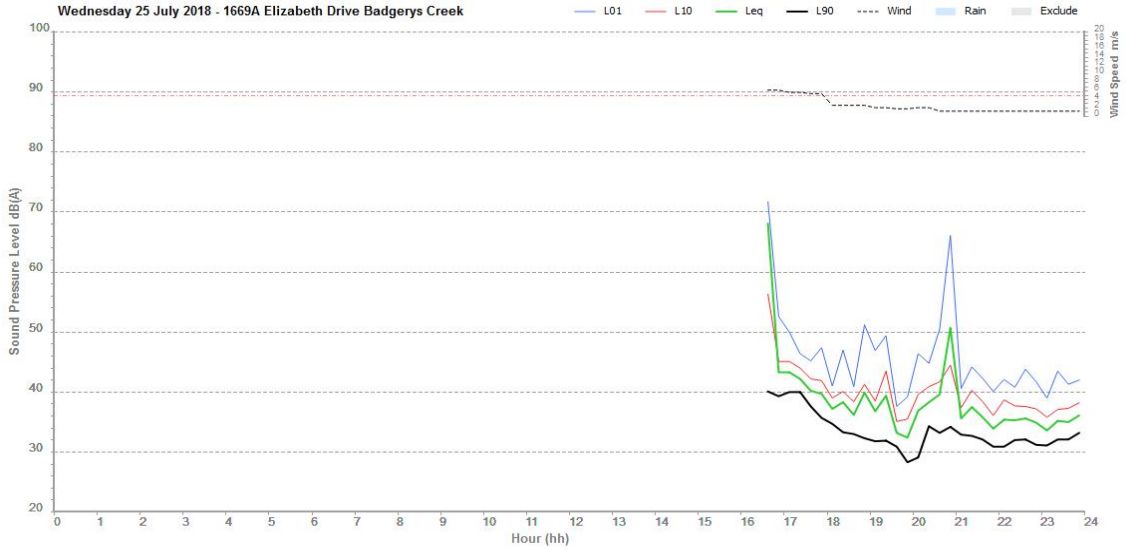
	Log Average	RBL
Day	47	34
Evening	40	33
Night	42	31

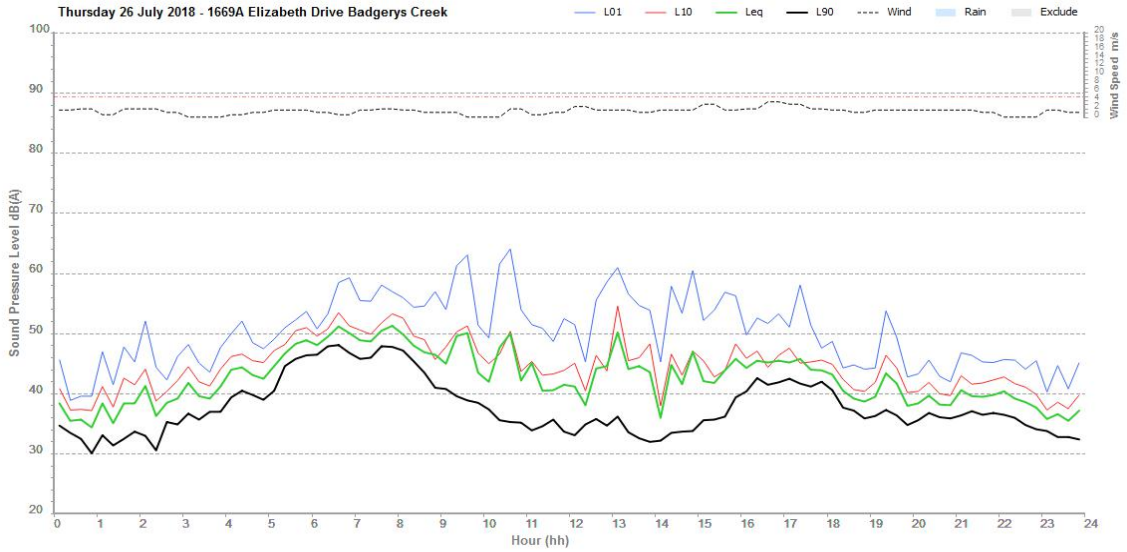
RNP Noise Level, dB(A)

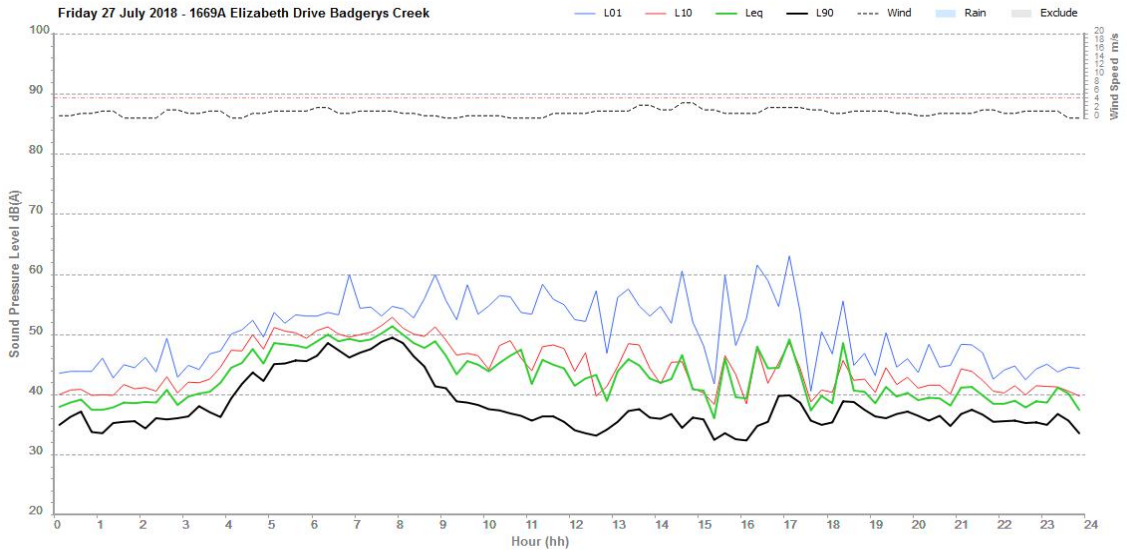
	$L_{Aeq(1hr)}$	$L_{Aeq(period)}$
Day (7am - 10 pm)	-	-
Night (10pm - 7am)	-	-

Logger Location Map

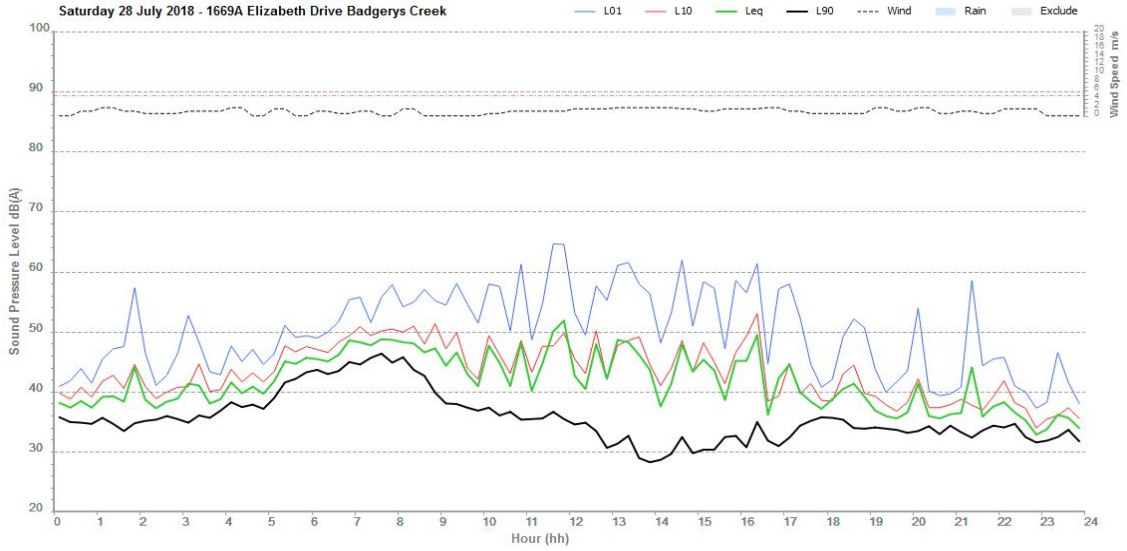
Logger Graphs

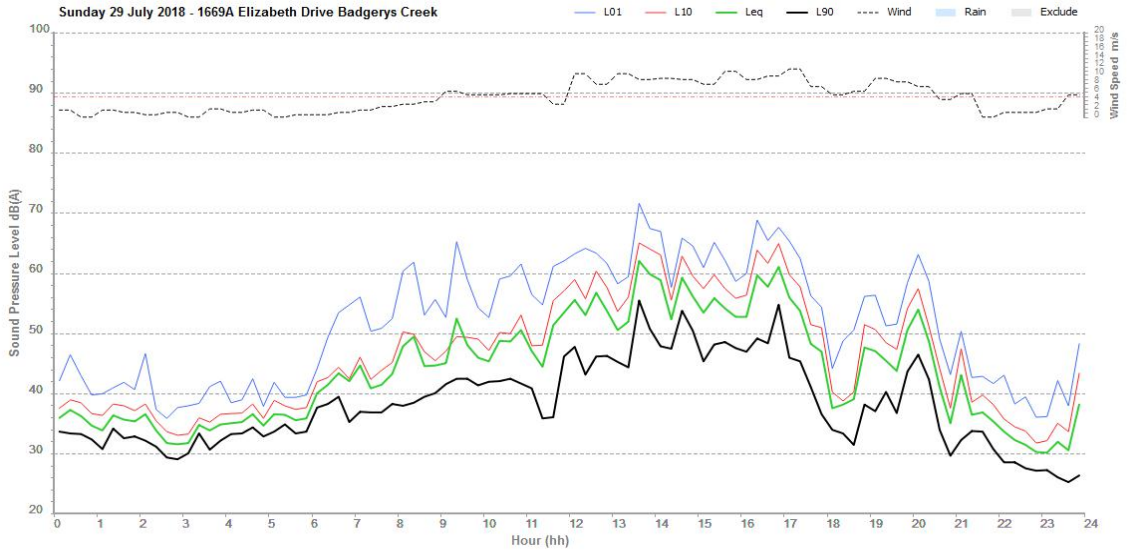


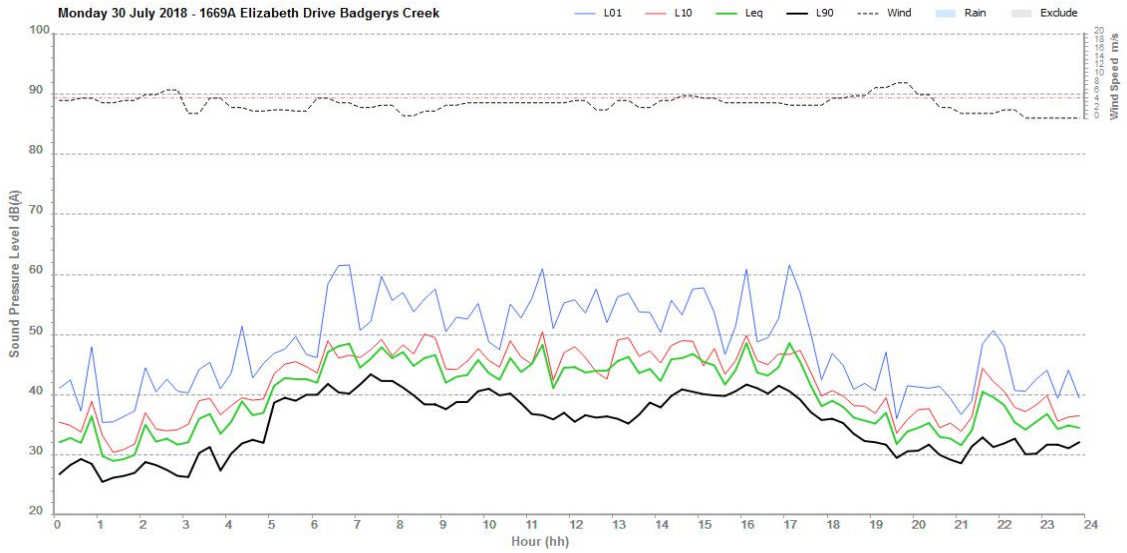




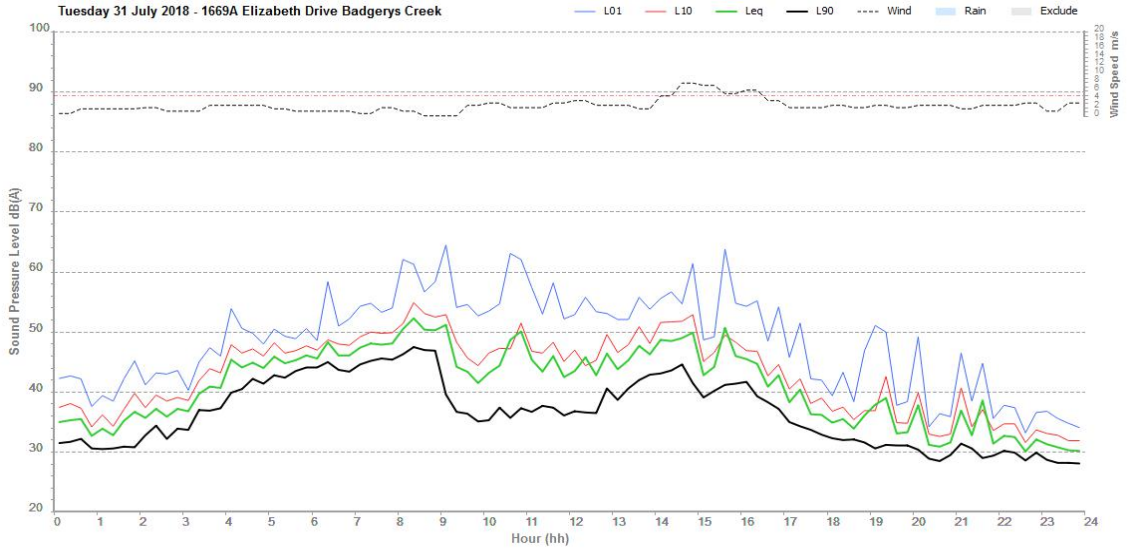
Logger Graphs

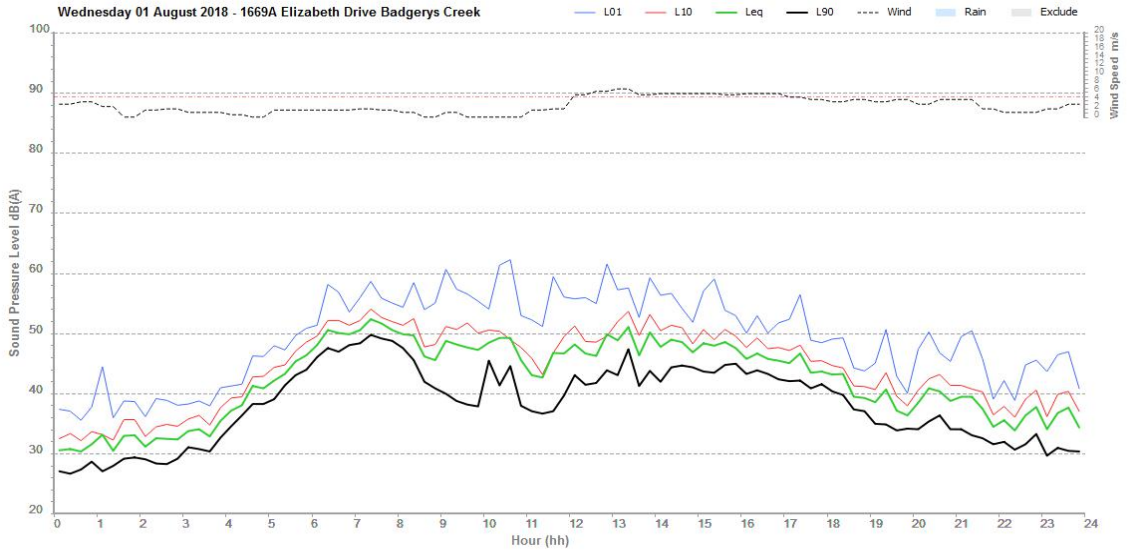


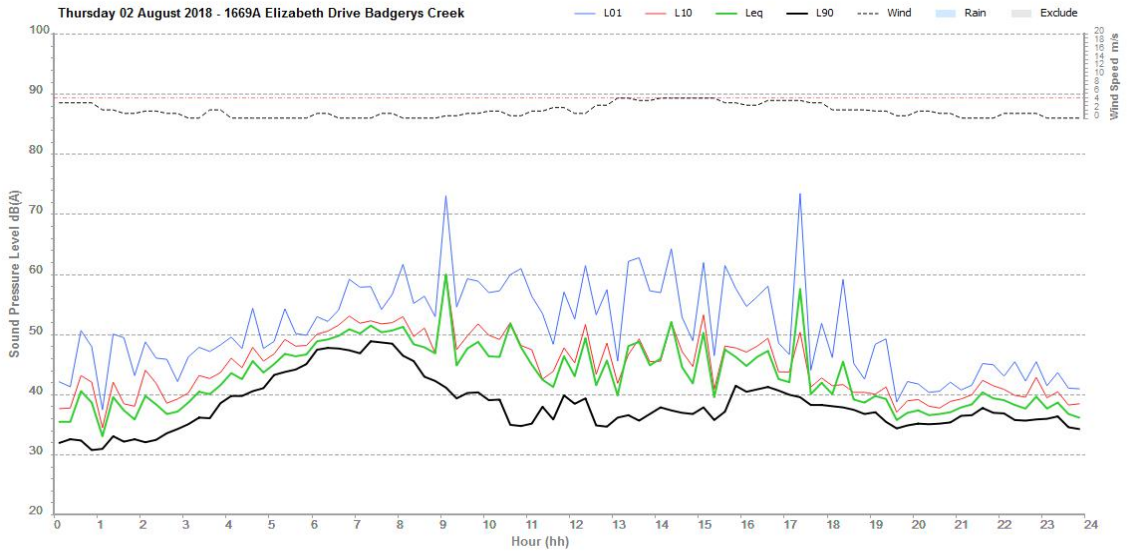




Logger Graphs







Logger Graphs