Response to Submissions

Girraween Waste Recycling and Transfer Facility
224–232 Toongabbie Road Girraween

State Significant Development 9766

Prepared for
BENEDICT RECYCLING PTY LTD
MARCH 2020

EMM
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Response to Submissions

Waste Recycling and Transfer Facility | 224–232 Toongabbie Road Girraween

Report Number

J180524 RP7

Client

Benedict Recycling Pty Ltd

Date

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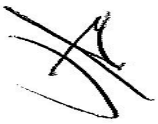
Prepared by



John Arnold
Associate Environmental Planner
25 March 2020

Approved by

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25 March 2020

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1 Introduction

1.1 Overview

Benedict Recycling Pty Ltd (Benedict) proposes to construct and operate the Girraween Waste Recycling and Transfer Facility (the facility) at 224–232 Toongabbie Road, Girraween (the site). The facility will accept up to 220,000 tonnes per annum (tpa) of general solid waste (non-putrescible) including building and demolition waste, selected commercial and industrial waste, uncontaminated soils, vegetation, excavated natural materials (ENM), metals, rail ballast and spoil.

Waste will be processed by screening and sorting to produce segregated recycled materials suitable as feedstock for other recycling facilities. It is not proposed to compost, crush or shred any waste onsite. All stockpiling, screening and sorting activities will occur within enclosed sheds. No special, liquid, hazardous, restricted solid water or general solid waste (putrescible) will be accepted at the facility.

Approval for the facility is being sought under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as a state significant development (SSD). Secretary's Environmental Assessment Requirements (Ref: SSD 9766) for the facility were first issued by the NSW Department of Planning, Industry and Environment (DPIE) on 21 December 2018.

The *Girraween Waste Recycling and Transfer Facility Environmental Impact Statement* (EIS) was prepared by EMM Consulting Pty Limited in November 2019 with input from a range of specialists. It was prepared in accordance with the requirements of DPIE and other government agencies, including Cumberland Council, to address the SEARs.

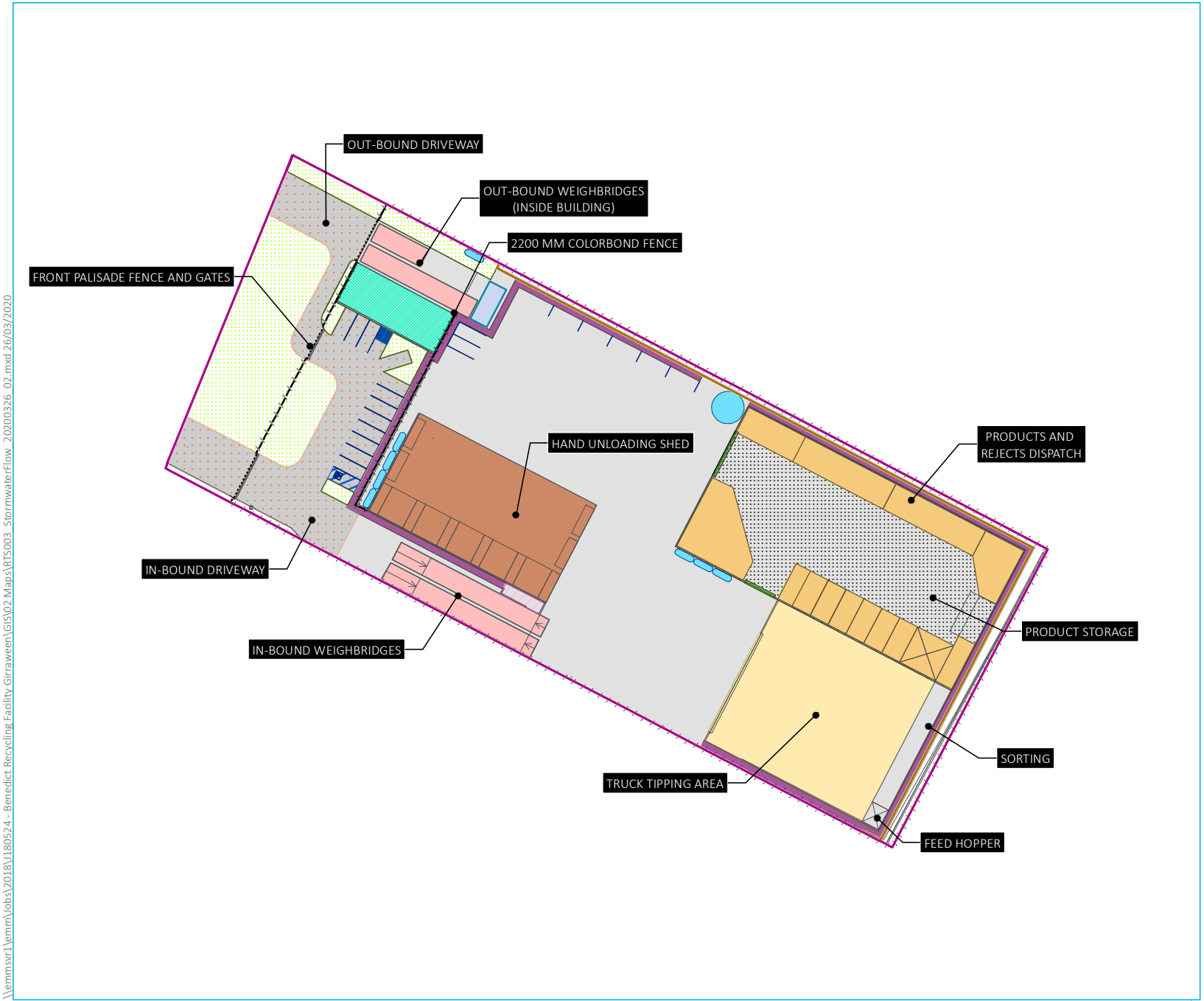
The EIS was placed on public exhibition for 45 days until 18 December 2019. Hard copies were displayed at DPIE's information centre in Sydney and electronic copies of the EIS were available from DPIE's website.

1.2 Response to submissions

In its letter dated 20 December 2019, DPIE requested that Benedict address the matters raised by government and the community in submissions received during public exhibition and provided several additional matters to be addressed (refer Section 3.1.1). This response to submissions (RTS) report responds to the matters raised.

1.3 Updated proposal

The proposal has been updated to address matters raised during public exhibition. While the use is the same, being a waste recycling and transfer facility, and there are no changes to the overall built form, minor changes have been made to the site layout to meet access, parking and water management requirements. The changes are shown on the updated site layout plan (Figure 1.1) and drawings (Appendix A).



KEY

- Subject site

Site features

- Block retaining wall
- Fence
- Gate
- Car park
- Other site feature
- Asphalt/concrete
- Pedestrian access path
- Driveway and car park
- Weighbridge
- Landscaping
- Shared/disabled parking space
- Motorbike parking
- Shed door
- Office and amenites
- Incoming weighbridge office
- Wheel wash
- Hand-unloading shed
- Waste acceptance
- Product storage and dispatch area
- Stockpile
- Rainwater tank
- Stormwater pit

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Source: EMM (2020)

0 25 50 m

GDA 1994 MGA Zone 56

N

Site layout plan (updated)

Girraween Waste Recycling and Transfer Facility
Response to submissions
Figure 2.1

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2 Submission analysis

2.1 Submissions received

During public exhibition of the EIS, submissions were received from:

- nine NSW government agencies:
  - Department of Planning, Industry and Environment (DPIE) (Planning);
  - DPIE (Environment, Energy and Science Group (EES));
  - Cumberland Council (two separate submissions received dated 19 December 2019 and 4 February 2020);
  - Blacktown Council;
  - Environment Protection Authority (EPA);
  - Fire and Rescue NSW;
  - Worksafe NSW;
  - Transport for NSW (TfNSW); and
  - Sydney Water.
- two individual community members.

All submissions are available on DPIE's website: https://www.planningportal.nsw.gov.au/major-projects/project/11566

2.2 Analysis of government submissions

Of the nine agency submissions received, three made no comments (Blacktown Council, Worksafe NSW and DPIE (EES)) and the remaining made general recommendations or requested further assessment. There were no formal objections or recommendations that the application be refused. Table 2.1 provides an overview of the outcomes of these submissions.

Table 2.1 Summary of agency submissions

Government agency	Overview and outcomes of submission
DPIE (Planning)	DPIE (Planning) sought further clarification, justification and information on several matters, mainly in relation to the waste recycling process and the capacity of the site and facility to accommodate the proposed throughput of waste. These are addressed in Section 3.1.1 and through the provision of the updated site plan (Figure 1.1) and drawings (Appendix A).
DPIE (EES)	DIPE (EES) confirmed that a Biodiversity Development Assessment Report (BDAR) waiver was approved by EES on 25 February 2019 and advised that the EIS adequately addresses all potential flooding concerns. Accordingly, there were no responses required.
Cumberland Council	The matters raised in two submissions from Cumberland Council are addressed in Section 3.1.2. The matters raised largely mirrored matters raised by DPIE (Planning), the EPA and TfNSW and, where relevant, responses have been cross-referenced with other relevant responses in Chapter 3.
Blacktown Council	No comments were provided by Blacktown Council.
EPA	The EPA requested further clarification and assessment around the potential noise impacts associated with increased road traffic. This has been addressed in the updated noise and vibration assessment (NVIA) prepared by EMM (March 2020) (Appendix F) and in Section 3.1.3.
Fire and Rescue NSW	The matters raised by Fire and Rescue NSW are addressed in Section 3.1.4.
Worksafe NSW	No comments were provided by Worksafe NSW.
TfNSW	The matters raised by TfNSW are addressed in Section 3.1.5.
Sydney Water	The matters raised by Sydney Water are addressed in Section 3.1.6.

Matters raised in government submissions are addressed in Section 3.1 of this RTS.

2.3 Analysis of public submissions

Submissions were received from two individuals.

2.3.1 Support

The first submission was provided by an individual representing a large primary producer in NSW responsible for growing and processing poultry at multiple sites within the Greater Sydney region who strongly supported the facility. The individual states that, due to the drought conditions, the organisation is under a huge amount of pressure not only in the cost of feed pricing but also in various other inputs, such as the significant cost incurred in the sourcing of available bedding material on which to grow birds. The individual supports the facility as they believe it will provide a cost-effective solution for such suitable material including as examples shredded timber products and mulches, which also has benefits in terms of being a recycled product.

2.3.2 Matters raised

The second submission raised concern about the potential impact on businesses near the facility, including in relation to an increase in traffic and resultant noise disturbance as well as the potential to attract vermin. The submission also states that there will be a devaluation of property prices and a difficulty to lease properties to tenants. Matters raised in this submission are addressed in Section 3.2.

3 Response to submissions

3.1 Government submissions

Matters raised by relevant government agencies (refer to Section 2.2) are addressed in the following sections. It is noted that DPIE (EES), Blacktown Council and Worksafe NSW did not make any specific comments and/or further requirements in their submission and therefore no responses have been provided.

3.1.1 Department of Planning, Industry and the Environment

i The waste recycling process

Point 1 of the DPIE submission states:

> ***Provide a more detailed breakdown of the waste recycling process carried out on site, including timeframes for each individual component of the process***

The waste recycling process is discussed in Section 2.2 of the EIS. This included a step-by-step description of activities, accompanied by an annotated site plan. A further breakdown of the process and the timeframes for each component is provided in Table 3.1.

Table 3.1 Delivery and dispatching activities

Task	Maximum time to complete task
Delivery	
1. Incoming vehicles will enter the site and be weighed and inspected at the weighbridge. Any loads suspected to contain material that cannot be accepted by the site will be rejected and directed to the exit weighbridge.	2 minutes
2. Vehicles will travel to the tipping areas and be unloaded and inspected. A docket will be issued. If unacceptable waste is identified, they will be re-loaded and directed to the exit weighbridges.	10 minutes
3. Outgoing vehicles will be weighed and invoiced at the weighbridges and leave the site.	2 minutes
Total time on site:	***14 minutes***
Dispatching	
1. Incoming empty vehicles will enter the site and will be weighed at the weighbridge.	2 minutes
2. Vehicles will travel to the stockpile area and be loaded from stockpiles as required, receive a docket and travel to the weighbridge.	10 minutes
3. Outgoing vehicles will be weighed and invoiced if necessary at the weighbridge and leave the site.	2 minutes
Total time on site:	***14 minutes***

ii Hours of operation

Point 2 of the DPIE submission states:

> ***Detailed justification is required for the extended hours of operation proposed which includes:***
>
> ***- waste acceptance for 24-hour periods, on Sundays and Monday to Friday; and***
>
> ***- dispatch between 10:00pm and 6:00am on Monday to Friday***
>
> ***Provide an assessment of the extended hours of operation as they relate to the site's processing and storage capacity.***

The proposed hours of operation are shown in Table 2.6 of the EIS and replicated below in Table 3.2 for ease of reference.

Table 3.2 Operating hours

Period	Waste deliveries accepted	Processing	Materials dispatch
Monday–Friday			
6.00 am – 10.00 pm	Yes	7:00 am – 10:00 pm	Yes
10.00 pm – 6.00 am	Yes[2]	No	Yes
Saturday			
6.00 am – 5.00 pm	Yes	7:00 am – 5:00 pm	Yes
5.00 pm – 8.00 am (Sunday)	Yes[2]	No	No
Sunday[1]			
8.00 am – 5.00 pm	Yes	No	Yes
5.00 pm – 6.00 am (Monday)	Yes[2]	No	No

Notes: 1. Opening hours on a public holiday will be the same as a Sunday.

2. There will be a maximum of 10 truck movements per hour over the eight-hour overnight period (10 pm to 6 am), in addition to employee movements.

a Justification for extended hours of operation

Waste acceptance for 24-hour periods, on Sundays and Monday to Friday

As detailed in Section 2.11.2 of the EIS, Benedict is applying for 24 hour opening hours to allow it to accept waste from civil construction and maintenance projects on occasion in the evening and to facilitate the servicing of night-time infrastructure works. The facility is not envisaged to be normally open during the night-time unless demand calls for it.

Large infrastructure projects, such as road and rail construction and maintenance projects, generate large volumes of the types of waste that would be accepted by the facility, particularly excavated materials. Parts of these projects are commonly scheduled during the night for safety and to minimise inconvenience delays to the public. Night works also allow the efficient transport of inert wastes generated by civil works on the less busy road network.

The extended overnight hours would assist these large infrastructure projects, which typically produce waste in the evening and night-time, to deliver waste to the facility without stockpiling at the source.

There would be a maximum of 10 truck movements per hour over the eight-hour overnight period (10 pm to 6 am), in addition to employee movements. All night-time deliveries would need to be booked in advance – otherwise the facility would be unstaffed and closed. When site staff take the delivery booking, contractors would be instructed to use the Great Western Highway and the south of Toongabbie Road to access and leave the site. This would ensure potential noise impacts (as considered further in Section 3.1.3) to residential properties north of the site (on Mandoon Road and Girraween Road) would be minimised.

Dispatch between 10:00 pm and 6:00 am on Monday to Friday

Dispatching of material between 10:00 pm and 6:00 am would allow for normal daytime operations to focus on the delivery of materials, helping minimise traffic movements within the site and as well as on the public road network during peak hours.

Products and unrecyclable materials would generally be dispatched from the facility by trucks owned or contracted by Benedict. Benedict would have control over the routes that these trucks use. Truck drivers with laden trucks would be instructed to turn south on Toongabbie Road and proceed to the Great Western Highway, and to access the site with empty trucks using the same route. As discussed above for deliveries, this would ensure potential noise impacts (as considered further in Section 3.1.3) to residential properties north of the site (on Mandoon Road, Girraween Road and Magowar Road) would be minimised.

Assessment of the extended hours of operation as they relate to the site's processing and storage capacity

There would be no processing of waste during the proposed extended hours, those hours being 10.00 pm to 6.00 am Monday to Friday, 5.00 pm Saturday to 8.00 am Sunday and on Sundays and public holidays.

As for all periods of the day, waste would not be accepted at night if there is not the capacity to stockpile the waste within the limits provided in Table 2.4 of the EIS. Dispatching of materials would largely be undertaken in the afternoon, after the peak period, which would ensure additional capacity during the proposed 24-hour operations and to maximise the available capacity on the following morning.

Operations at night would need to be pre-booked in at the site and details of the type and expected quantity of waste would be required to be provided to ensure that there is sufficient capacity on site. If there is not sufficient capacity, then an alternative booking time would be sought, or the request declined.

iii Operation

Point 3 of the DPIE submission states:

> ***Provide further details of the method of loading and removal of outgoing material. This is to include a description of the location of trucks used for loading and frequency and method of loading.***

As described in Section 2.8 of the EIS, heavy vehicles would drive in the side door of the northern part of the shed and reverse to the applicable stockpile/s for products to be loaded for dispatch. Material would be loaded via a front-end loader. As detailed in Table 3.1, the time for a truck to travel to the stockpile area and be loaded from stockpiles as required, receive a docket and travel to the weighbridge, is about 10 minutes. Updated swept paths are provided in Appendix B and discussed below in relation to Point 7 of the DPIE submission.

Point 4 of the DPIE submission states:

> ***Provide details of the expected quantities of material that will be recycled and sent to landfill per annum for each waste stream.***

The vast majority of waste received at the facility would be co-mingled construction and demolition waste which represents a single broad category of waste. As described in Section 2.3 of the EIS, a portion of this waste (generally making up of less than 10% by mass of the facility's total throughput) would not able to be economically recycled (referred to as 'non-recyclable residues') and would be dispatched to a licensed landfill. This equates to no more than 22,000 tpa.

Point 5 of the DPIE submission states:

> ***Provide the following information for the peak period/s anticipated:***
>
> - ***length of time between arriving on site (queuing to access weighbridge) and exiting the site at peak time/s; and***
>
> - ***differences between weekdays and weekends.***

The length of time it takes for waste delivery and material dispatch vehicles to enter and leave the site is detailed in Table 3.1. During the peak periods these times would not change; however, there may be multiple vehicles on the site at one time, as described further in the response to Point 6 below.

There would be less heavy truck movements during the weekend as there would be no night-time dispatch on Saturday or Sunday and less commercial activity generally at weekends. Therefore, the assessment of the maximum site capacity, which has been based on the number of vehicles and queue times during a 14 minute snapshot at the midday weekly peak period (refer Section iii) is highly conservative.

Point 6 of the DPIE submission states:

> ***Detail how peak times in relation to delivery will be managed. Provide details of the maximum safe capacity of the site in terms of vehicles and people, how often the site's capacity would be reached, measures to manage the site to ensure safe operations should this capacity be reached.***

As identified in Table 3.4 of the TIA, the busiest site peak hour is the midday peak hour (typically 1:00 pm to 2:00 pm), which estimates the total peak hourly traffic movements for the facility as 43, comprising:

- 9 light vehicles (18 movements) for waste receivals;
- 9 heavy vehicles (18 movements) for waste receivals;
- 2 heavy vehicles (4 movements) for dispatch; and
- 3 light vehicles (3 movements) for employees – these vehicles would not enter the main part of the site and would require only access to the front parking area.

As identified in Table 3.1 above, the longest time it would take for a vehicle to enter and leave the site is approximately 14 minutes.

Table 3.3 provides a snapshot of the maximum number of vehicles on site, based on the peak hour traffic estimates and the maximum time a vehicle would be on site.

Table 3.3 Maximum number of vehicles on site

Type of vehicle	Number of site peak hour vehicles	Number of vehicles during 14-minute snapshot	Maximum number of vehicles on site
Light vehicle (waste receival)	9	2.1	3
Heavy vehicle (waste receival)	9	2.1	3
Heavy vehicle (dispatch)	2	0.5	1
Total	20	4.7	7

The site's maximum vehicle capacity is shown in Figure 3.1, demonstrating that a total of 14 vehicles can be adequately accommodated on the site, comprising:

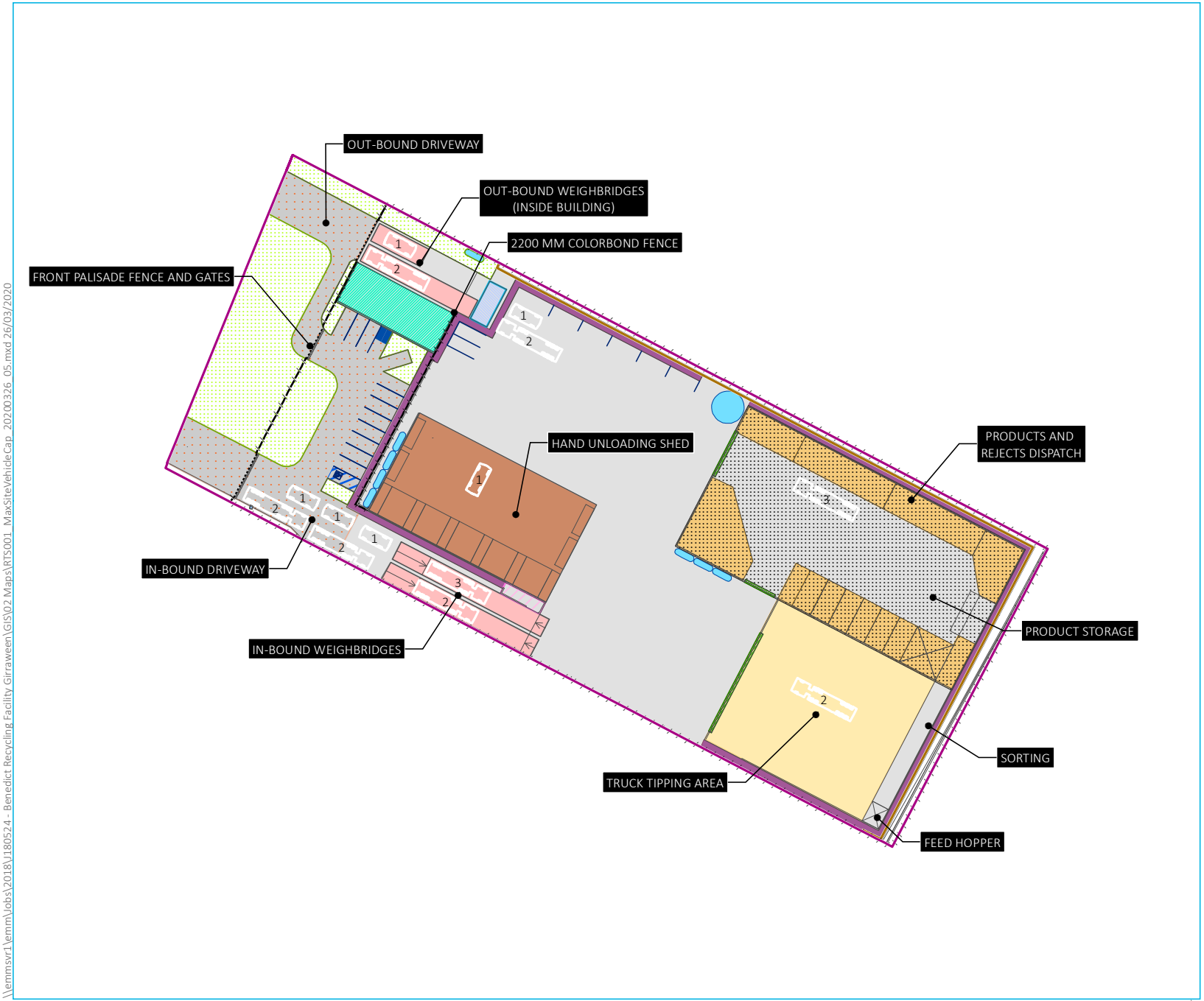
- 6 light vehicles (waste receivals);
- 6 heavy vehicles (waste receivals); and
- 2 heavy vehicles (dispatch).

The calculations for the maximum vehicle capacity have adopted a worst-case assumption that all vehicles within the 14-minute snapshot would arrive on site within the two minutes it takes to enter and exit the incoming weighbridges. Further, the total number of vehicles on site (column 4 of Table 3.3) has been rounded up from the number of vehicles calculated for the 14-minute snapshot (column 3 of Table 3.3).

It is noted that front end loaders would not operate whilst trucks are moving and, therefore, they have not been included in Figure 3.1.

In summary, the site has the capacity for 14 vehicles There would be a maximum of seven vehicles on site during the site-peak hour (typically 1:00 pm to 2:00 pm) so there would be ample capacity on the site at all times. Accordingly, vehicles would not need to queue for on Toongabbie Road prior to entering the site.

Historically, when these facilities get overly busy causing queues, customers patronise alternate facilities as the queuing delays become uneconomical for the customer.



KEY

- Subject site

Site features

- Block retaining wall
- Fence
- Gate
- Car park
- Other site feature
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- Access path
- Driveway and car park
- Weighbridge
- Landscaping
- Shared/disabled parking space
- Motorbike parking
- Shed door
- Office and amenites
- Incoming weighbridge office
- Wheel wash
- Hand-unloading shed
- Waste acceptance
- Product storage and dispatch area
- Stockpile
- Rainwater tank
- Stormwater pit

Vehicle movements within the facility

1 - Light vehicle
2 - Heavy vehicle (Receival)
3 - Heavy vehicle (Dispatch)

Source: EMM (2020)

0 25 50 m

GDA 1994 MGA Zone 56

N

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Maximum site vehicle capacity

Girraween Waste Recycling and Transfer Facility
Response to submissions
Figure 3.1

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Point 7 of the DPIE submission states:

> ***Provide plans showing the swept paths of the front-end loader proposed to be used to move waste onsite and vehicles used for waste collection. The plans should include the stacking of vehicles within the site to demonstrate there is sufficient space onsite at peak periods for all the required operations to be carried out in unison.***

An updated swept path analysis, including for the front-end loader, is provided in Appendix B. As discussed in Section iii, Figure 3.1 shows the stacking of vehicles on site and demonstrates the capacity of the site during the midday peak period.

Point 8 of the DPIE submission states:

> ***Detail how the weight of waste delivered by light vehicles would be determined.***

Light vehicles entering the site would be weighed on one of the two incoming weighbridges and when leaving the site on one of the two outgoing weighbridges to determine the weight of waste delivered.

Point 9 of the DPIE submission states:

> ***Based on the proposed processing capacity, peak delivery times and the duration of time the truck is onsite, provide a worst-case scenario of vehicle stacking onsite. This should be in the form of a scaled plan.***

As described above, Figure 3.1 shows the stacking of vehicles on site and demonstrates the capacity of the site during the midday peak period.

Point 10 of the DPIE submission states:

> ***Provide further details regarding the proposed operational measures to manage traffic arriving at the site during an emergency plant shutdown or similar.***

All Benedict site staff would be immediately notified of an emergency plant shutdown and a traffic controller/s would prevent all vehicles from entering the site and on-site vehicles would remain on site until the incident has been resolved or they are cleared to exit.

Point 11 of the DPIE submission states:

> ***The EIS should provide the average waste disposal and collection time per vehicle. The total time required for waste disposal and collection activities must account for trucks manoeuvring on the site and waiting to unload.***

Waste delivery and dispatch times are provided in Table 3.1.

iv Waste

Point 12 of the DPIE submission states

> ***The EIS also states that vegetative waste will be monitored daily for signs of composting, specified as odour and increased temperature. Detail how odour and temperature would be measured and what are the thresholds for removing the waste. Provide justification for waiting for vegetative waste to compost and smell before removing from the site.***

As detailed in Section 2.5 of the EIS, vegetation waste would be dispatched to another facility licensed to accept vegetation, as soon as there is enough to fill a truck or sooner if the material starts to show signs of composting. Vegetation waste would be monitored daily for any signs that composting is occurring (odour or increased temperature) and if this occurs, the stockpile would be broken apart and arrangements would be made immediately for the material to be dispatched from site in a smaller truck. Composting has never occurred on any of Benedict's waste facilities as the materials received tend to be coarser branches and stumps rather than fine vegetation like grass clippings etc. This is because those materials that are likely to compost can be disposed of for free in Council green bins.

v Unacceptable material

Point 13 of the DPIE submission states:

> ***Specify the procedure for inspecting incoming waste and identifying suspected contaminated loads. Section 2.2.5 notes a preliminary inspection of incoming waste will be undertaken and suspected contaminated loads will be rejected, but what is the criteria of a 'suspicious load' and how is it identified during the inspection?***

There would be two inspections of incoming waste to identify any contaminated loads. The first would be a preliminary inspection of the waste on the vehicle at the tipping area before tipping off and the second would be an inspection after the waste is tipped off, spread and turned over before it is added to the appropriate feed stockpile. The inspections would be undertaken visually to determine whether the load contains any asbestos waste or any other unpermitted waste.

In accordance with the NSW EPA's *Standards for Managing Construction Waste in NSW*, the following training requirements would be completed by all personnel before undertaking any visual inspection activities:

1. Training on:

    a) the requirements of the NSW *Protection of the Environment Operations Act 1997* and its regulations (including the Waste Regulation) applicable to the operations at the facility;

    b) the requirements of the environment protection licence for the facility, with reference to the waste conditions and the wastes permitted to be received; and

    c) the requirements of the EPA's *Standards for Managing Construction Waste in NSW*.

2. Successful completion of a nationally accredited asbestos awareness course.

3. All personnel involved in the process of removing bonded asbestos at the facility must complete a nationally accredited course in bonded asbestos removal before undertaking any task that involves removing bonded asbestos.

vi Weighbridges

Point 14 of the DPIE submission states:

> ***During site inspection undertaken on 11 December 2019 by DPIE staff, the Applicant advised the existing weighbridge would be repurposed for the project. The EIS states in Section 2.1.2 that four new weighbridges will be installed for the site. Please confirm the number of new weighbridges to be installed.***

Three new weighbridges would be installed and the existing weighbridge would be moved from its present location and repurposed.

3.1.2 Cumberland Council

Cumberland Council provided a submission on 20 December 2019 which raised 30 points that have been addressed in Section 3.1.2i. A separate follow-up submission was received on 4 February 2020 which is addressed in Section 3.1.2 ii below.

i Responses to Cumberland Council submission (20 December 2019)

a Planning

Point 1 of the Cumberland Council submission states:

> ***The proposed development is located within 400 m of a residential zone and residential properties. As such, it must be demonstrated that the proposed facility will not impact on the amenity of the residential area by reason of noise, vibration, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic, as it is seeking a 24 hours per 7 days a week operation.***

Noise, air and traffic

The noise and vibration impact assessment (NVIA) (which has been updated to address the comments made by the EPA (refer Section 3.1.3)) and the air quality assessment prepared by EMM for the EIS considered the potential amenity impacts (including road traffic noise – refer Section 3.1.3) of the facility on nearby residential properties, based on the proposed 24-hour operation of the facility. Both assessments found that the potential impacts on nearby residential receivers would comply within relevant government amenity criteria at all assessment locations.

Visual

Potential visual impacts from night-time operations are likely to be limited to those associated with site lighting requirements which are considered further in Section h below.

Vermin

There would be no putrescibles, for example food waste, accepted on to the site. Therefore, animals (native animals or vermin) would not be introduced to the site through waste loads and will not be attracted to the site.

Delivered waste would have a short residence time on the site before being sorted, and the sorted waste dispatched. Waste would not be stockpiled for sufficient time to allow animals (eg rats or termites) to construct nests that could facilitate increasing numbers in the area. If there are termites in timber delivered to the site they are unlikely to cross open ground around the facility or increase termite numbers in the wider area.

Point 2 of the Cumberland Council submission states:

> ***To maintain consistency with the existing Toongabbie Road streetscape, the proposal shall provide at least 15% of the site area as landscaped area, which comprises of grass and tree planting.***

The proposed landscape area extends the width of the site between the two driveways on either side and allows for the retention of existing mature vegetation that helps screen the site from public viewpoints. A detailed landscape plan would be provided post-approval and would be designed to meet specific Council requirements in terms of the quantity and types of plants provided.

Approximately 895 m^2 (or approximately 10%) of the site would be retained for landscaping and would include grass and tree planting. This is the entire front of the site with the exception of the two driveways that are required to allow all vehicles to enter and leave the site in a forward direction. The area proposed to be landscaped is approximately the same amount currently provided on the site.

Enlarging the landscaping area would impact on the operational areas of the site which have been designed to maximise efficiency and vehicle safety, for example by providing a separate car park for employees and visitors and providing for a separate shed for light vehicle waste deliveries. Further, this landscaping would not be visible from any public viewpoints. Therefore, an increase to the size of the proposed landscape area is not considered warranted.

b Traffic

Point 3 of the Cumberland Council submission states:

> ***The proposed parking restrictions (i.e. No Stopping and No Parking) and line marking or any traffic measures on Toongabbie Road are subject to the approval through the Cumberland Traffic Committee and Council. In this regards, the proposed parking restrictions, line marking and road widening shall be reported to the Traffic Committee meeting for consideration.***

As discussed further in Section c below, the proposed bypass lane and associated widening of Toongabbie Road have been removed. Accordingly, the previously proposed parking restrictions on the western side of Toongabbie Road have also been removed.

Based on the updated swept path analysis (Appendix B), proposed parking restrictions have been amended on the eastern side of Toongabbie Road to ensure adequate heavy vehicle movements to/from the site can be provided.

Previously it was proposed to remove 18 on-street car parking spaces. This has been reduced to seven.

Cumberland Council requested that all traffic matters raised by Council be considered at the Local Traffic Committee. EMM provided a response to Council's traffic matters on 3 March 2020 with a request that all matters be considered at the Local Traffic Committee to be held on 1 April 2020. A copy of the response to Council is provided in Appendix C.

An updated signage plan is provided in Appendix A of the response to Council (Appendix C).

Point 4 of the Cumberland Council submission states:

> ***There is no parking rate in Council's DCP 2013 for this type of use. In this regard, the applicant shall undertake a parking survey for similar uses in similar areas and come up with appropriate parking rates. The applicant shall indicate whether the provision of 20 off-street parking spaces is based on parking survey, or not.***

The facility would require a total of nine staff in the morning shift (between 6 am to 2 pm) and eight staff in the evening shift (between 2 pm to 10 pm). Shift changeovers would occur at 2 pm which means there may be a maximum of 17 employees would on-site at any given time during the shift change over period.

The site would provide 20 off-street car parking spaces, which could be used by up to 17 staff members during the shift changeover period and any visitors to the site at that time (up to three). At other times, there would be ample spare parking available within the site. The proposed on-site parking is based on the maximum potential demand and it would not result in any staff or site visitors requiring to park on the nearby streets.

A desktop survey of street parking is provided in Section 2.7 of EIS Traffic Impact Assessment (TIA) for the EIS. This found that on the standard working day analysed, there was approximately 36% usage of street parking on Toongabbie Road between the Great Western Highway and Mandoon Road.

Given that it is proposed to provide ample on-site parking and that the previous parking survey found that, while not required, there is ample on-street parking available, it is considered that a further parking survey is not justified.

Point 5 of the Cumberland Council submission states:

> ***The length of the proposed parallel off-street parking does not comply with Australian Standard 2890.1-2004. In this regards, this matter shall be addressed.***

All off-street car parking spaces have been redesigned in accordance with AS2890.1: 2004, as shown on the updated site layout plan (Figure 1.1) and drawings (Appendix A).

Point 6 of the Cumberland Council submission states:

> ***The submitted swept path analysis indicated that exiting 19m vehicle (turning left onto Toongabbie Rd) is encroaching onto footpath / nature strip which is unacceptable. In addition, the exiting vehicle (turning right onto Toongabbie Rd) is encroaching onto road central line / on the opposite traffic flow. In this regards these matters shall be addressed.***

The exiting swept path analysis has been updated (Appendix B) to minimise the potential effect on pedestrian footpaths. The right turning exit vehicles from the site would not cross unnecessarily over the centreline of Toongabbie Road.

Point 7 of the Cumberland Council submission states:

> ***The submitted traffic and parking report indicated that there will be 390 trips per day (light and heavy vehicles). In this regard, queue area shall be provided within the site and shall be indicated on the plans for the largest vehicle/s in case if there are more than 2 vehicles arrived at the same time.***

As discussed in Section 3.1.1iii, a worst case scenario has been considered whereby all vehicles within a 14-minute snapshot (being the maximum time it takes for a vehicle to enter and leave the site) would arrive on site within the 2 minutes it takes to enter and exit the incoming weighbridges. Figure 3.1 demonstrates that these vehicles could be accommodated on the weighbridge and inside the gate. Notwithstanding, the gate would be controlled manually and the entry gate would remain open during peak operation of the facility to ensure there is no queuing or vehicle delays affecting Toongabbie Road.

Point 8 of the Cumberland Council submission states:

> ***Due to large number of trips that will enter and exit the site, a Loading Dock Management Plan shall be prepared by a suitable qualified traffic practitioner and shall be submitted to the principal certifier for review and approval. The loading dock management plan shall identify measures to deal with issues such as but not limited to heavy vehicle movements within the site, loading/unloading times, queue areas and pedestrian movements etc.***

Details of loading/unloading times are provided in Section 3.1.1i and Table 3.1 and details of queue areas are shown in Figure 3.1. As has been the case with other recently approved Benedict facilities, it is envisaged that a traffic control plan (TCP) would be required to be prepared as part of the operational traffic management plan, which would form part of the overarching operational environmental management plan (OEMP). The TCP would detail

the on-site measures to be implemented to control the movement of trucks in and out of the site, as well as on-site, and include provision for traffic controllers to control the movement of trucks on-site.

Point 9 of the Cumberland Council submission states:

> ***The submitted traffic and parking report indicated that the entry points will be closed with gates, in this regard, queue area shall be provided within the site for the largest heavy vehicle that will enter / exit the site.***

The entry gate would remain open during periods when the arrivals of longer vehicles (ie 19 m long truck) are anticipated. Therefore, it is unlikely that the overhang of any entering truck would impede any pedestrian movements onto the footpath. As this area is an industrial area there is little pedestrian traffic occurring currently.

Point 10 of the Cumberland Council submission states:

> ***The proposed development shall be referred to the RMS for comments/concurrence.***

DPIE referred the application to TfNSW and a submission has been provided. Matters raised in that submission are addressed in Section 3.1.5.

c Development engineering

Point 11 of the Cumberland Council submission states:

> ***The proposed road widening on Toongabbie Road is unlikely to be supported as it will result in the loss of on–street parking. If any road widening is proposed, it shall be reported to the Cumberland Traffic Committee meeting for consideration and approval.***

A further assessment of the capacity of the load road network, in particular the performance of the Toongabbie Road/Mandoon Road intersection, is provided in Appendix D of the response to Cumberland Council's traffic matters (Appendix C). The assessment identified that all intersection movements would have a level of service (LoS) A or B (with the northbound through movement having a LoS A), and therefore the existing intersection configuration can accommodate forecast traffic generation to the site with minimal impact on the northbound through traffic and potential queuing on Toongabbie Road. The requirement for a bypass lane is not therefore warranted and has been removed from the proposal.

Point 12 of the Cumberland Council submission states:

> ***Council mapping identify the site is a flood control lot. In this regard, the following shall be addressed:***
>
> ***(i) The applicant shall submit a survey drawing prepared by a registered surveyor that includes existing site contours and spot levels throughout the site along with the location of all existing structures to the Australian Height Datum (mAHD).***
>
> ***(ii) Ensure that the finished floor level of the proposed warehouse is set a minimum of 500mm above the 1% AEP overland flow path level, at the upstream side of the structure and that the carparking is a minimum of 150mm above the same.***
>
> ***(iii) Reference shall also be made to Holroyd DCP 2013 Part A section 8 including the Flood Risk Precincts table.***
>
> ***(iv) Council flood information can be made available upon submission of the flood advice application to Council.***
>
> ***(v)***

A survey plan is provided in the project plans (Appendix A). An excerpt of flood mapping provided by Cumberland Council which shows the location of the 1% annual exceedance probability (AEP) storm event, is provided below. The majority of the site is identified as being within a medium flood risk precinct pursuant to the Holroyd DCP 2013, which is defined as land below the 1% AEP. Development within this precinct is possible, subject to appropriate management measures, to ensure the safety and protection of both person and property during a critical storm event. As shown on the plan excerpt, the 1% AEP only includes a small area at the very front of the site. The proposed car parking area and site buildings are set back from this and the finished floor level of the car park and the proposed buildings would be a minimum of 150 mm and 500 mm, respectively, above the 1% AEP level.

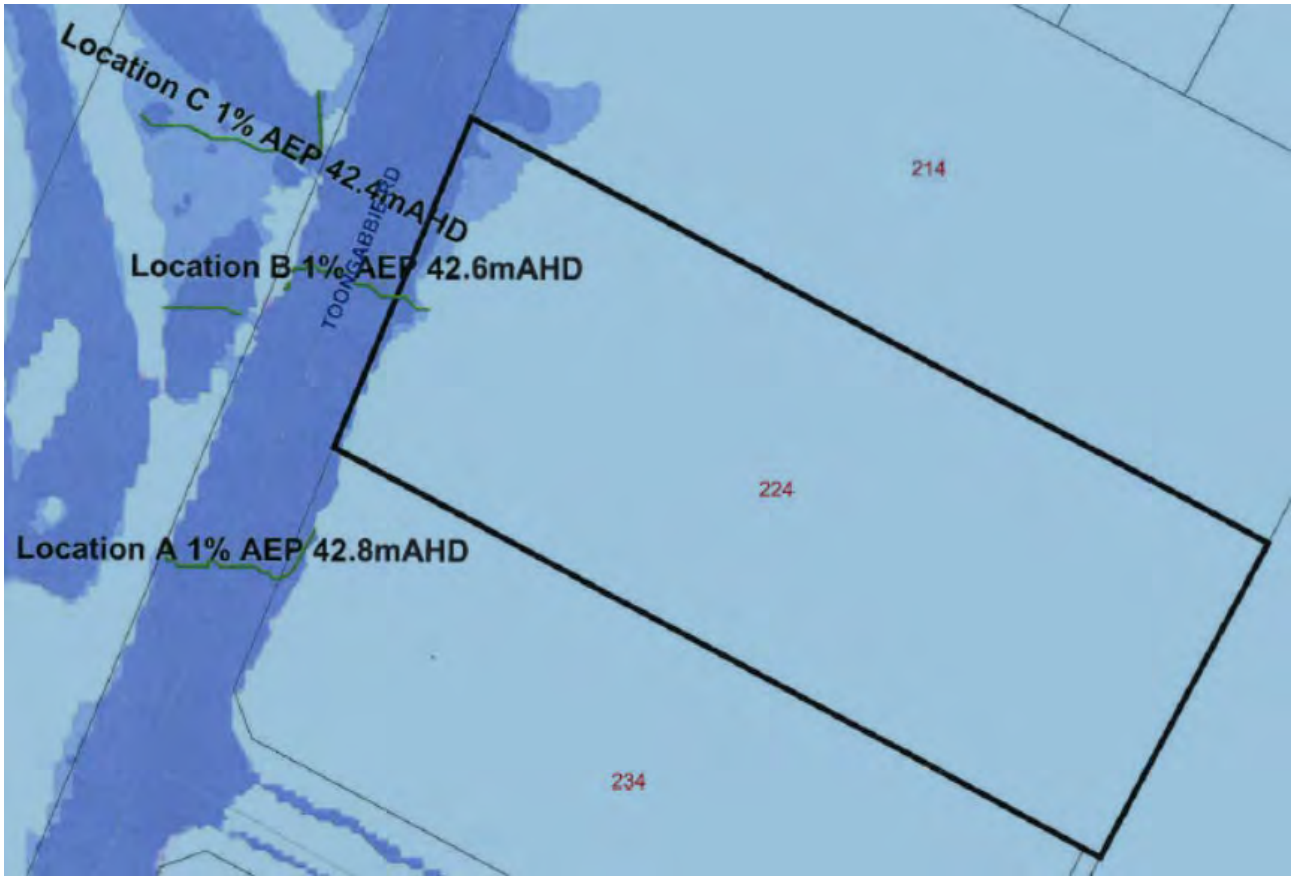


Plate 3.1 Excerpt of Council flood mapping showing extent of 1% AEP storm event

Point 13 of the Cumberland Council submission states:

> ***Demonstrate compliance with section 7.0 Stormwater management of Holroyd DCP 2013, including:***
>
> ***a) Minimise runoff by the reuse and recycling of stormwater.***
>
> ***b) Detailed calculation and modelling for water sensitive urban design in accordance with Clause 7.5, Part A, Holroyd DCP 2013 shall be provided. Any electronic modelling for the analysis shall be submitted to Council.***

Roofs cover approximately 37% of the site area. Roof runoff would be collected in rainwater tanks and reused for dust suppression on the site. This would significantly reduce use of potable water on the site.

Section 7.5 of the Holroyd DCP requires the following removal of pollutants from runoff on an industrial site:

- 70% of litter;
- 50% of fine particles; and
- 90% of hydrocarbons.

The proposed gross pollutant trap (GPT) (a VortSentry 15) would achieve these pollutant capture rates for the site. The pollutant capture specification for this GPT is provided in Appendix D.

Point 14 of the Cumberland Council submission states:

> ***Council's On-site stormwater detention policy for stormwater management applies to this proposal. The policy (which is based on Latest Revision - Third Edition of the Upper Parramatta River Catchment Trust On-site stormwater detention handbook) and associated drawing DA submission checklist are available from customer services or Council's website. The following shall also be addressed:***
>
> ***a) Overland flows up to the 1% Annual Exceedance Probability (AEP) storm from the upstream catchment shall be accepted and conveyed as per Council's OSD policy requirement.***
>
> ***b) Submerged outlet conditions. 1%AEP tailwater at the proposed stormwater connection point shall be referred to Council's issued flood advice letter and the OSD calculation and design shall reflect this requirement.***

An updated on-site stormwater detention design has been prepared to meet Cumberland Council's requirements and is provided in Appendix E.

Point 15 of the Cumberland Council submission states:

> ***All services within the footpath area (eg pits (Telecom, stormwater), poles etc) shall be shown on the engineering drawings.***

All services within the footpath area would be shown on the engineering drawings submitted with the application for a construction certificate.

Point 16 of the Cumberland Council submission states:

> ***Vehicular crossing (VC), concrete footpath, kerb and gutter construction and/or reconstruction requirements would be assessed in accordance with Holroyd DCP 2013.***

Vehicle crossing, footpath and gutter construction would be detailed on the engineering drawings in accordance with the Holroyd DCP and submitted with the application for a construction certificate.

Point 17 of the Cumberland Council submission states:

> ***Generally the vehicular crossings shall be in accordance with Council's VC policy and the following shall also be addressed:-***
>
> ***(i) A minimum 1.5m offset from the side boundary.***
>
> ***(ii) Perpendicular to the line of the kerb and gutter.***
>
> ***(iii) Provide clearance to existing services***

The engineering drawings would have regard to Cumberland Council's VC policy and will be submitted with the application for a construction certificate.

d Acoustics

Point 18 of the Cumberland Council submission states:

> ***The noise and vibration impact assessment by EMM Consulting (Report No J180524 RP1) has indicated that there will be no impacts from this site to residential receivers. It is understood that this assessment was based on heavy vehicles entering and leaving the site 24 hours per day, vehicular movements inside the property and the closure of the processing operations of the plant onsite during the night time hours. It is likely to be difficult to regulate the activities carried out on site to ensure that plant processing does not occur during the night as there will be vehicles continuously entering and leaving the site. It is uncertain whether there will be night time noise impacts if the plant continues to operate.***

Benedict is not applying for night-time processing and the hours of operation would form part of the conditions of any consent.

The NVIA has been updated to reflect comments made by the EPA and includes a potential worst-case assessment of road traffic noise, assuming that there will be up to 10 truck movements per hour during the night-time period. In reality, and as discussed further in Section ii (in response to Cumberland Council's second submission), night-time truck movements would occur infrequently and waste deliveries would be made by contractors working on civil night works with these deliveries having to be booked in advance – otherwise the facility would be unstaffed and closed. The assessment is therefore highly conservative.

Point 19 of the Cumberland Council submission states:

> ***Further, due to the complexity of sites such as these which include multiple vehicle movements especially during the night time hours (as opposed to static plant noise) it is hard to understand all potential impacts as this could depend on the route used by the heavy vehicles to get to and from the site. Also, there are known annoying noise sources with multiple truck/excavator movements such as the use of reversing beepers. Such noise sources are known to travel vast distances especially during temperature inversions/some night time conditions and it is possible that the noise from these activities could travel across the golf course to the residential receivers.***

The NVIA has been updated to reflect comments made by the EPA and considers the potential impact of road traffic noise on residential receivers at all possible routes to the site as a result of the proposed 24 hour operations. This is considered further in Section 3.1.3.

As discussed further in Section ii (in response to Cumberland Council's second submission), during the day and evening time (up to 10 pm), deliveries would be made to the facility by businesses (generally heavy vehicles) and members of the public (generally light vehicles). The majority (80%) are expected to access the site from the Great Western Highway and Toongabbie Road with a far lesser number coming from the north. Signage would be erected within the facility requesting that vehicles access the site from the Great Western Highway and Toongabbie Road so that return customers (ie, the majority of customers) would use this route. At night-time, when site staff take the delivery booking, contractors would be instructed to use the Great Western Highway and the south of Toongabbie Road to access and leave the site.

There would be no processing during the night-time period and therefore limited opportunities for noise from other vehicles, noting that front end loaders would not operate whilst trucks are moving. All noise sources and plant have been considered in the NVIA, including a sleep disturbance assessment which accounts for the lack of buildings on the golf course and hence the unimpeded path to residences west of the golf course in three-dimensional modelling undertaken. Similarly, noise propagation enhanced by weather has been included as required by noise policy. Lastly, Benedict site machinery all utilize "growler" type reversing alarms not the far more intrusive "beeper" type.

Point 20 of the Cumberland Council submission states:

> ***It is understood that a noise modelling program has been utilised to predict the noise implications. Our team does not have access to such modelling tools or would know what information has been added into***

the system (ie if it includes all relevant noise sources). An independent acoustic review may be warranted for this activity.

The NVIA has been updated to reflect comments made by the EPA as considered further in Section 3.1.3 and has been prepared by an appropriately qualified acoustic consultant in accordance with relevant government policy and controls. Therefore, an independent acoustic review is not considered warranted.

e Stormwater

Point 21 of the Cumberland Council submission states:

There will be a wheel wash area at the exit to the site, however, it is unclear where the wastewater from this activity will be directed. If it is to be directed to sewer, a trade waste permit from Sydney Water is likely to be required. Further, there appear to be floor wastes inside the new shed areas however, Council is unable to locate information related to sewer connections other than a brief indication that sewer will be directed to the Sydney Water sewer mains. All internal wastewater treatment areas on site should be included in the plans with details showing the connections to sewer under suitable trade waste agreements.

The facility would not accept liquid wastes and no liquids are generated by any processing. The only water used would be inside the sheds is for dust suppression misting pumps which do not create puddles. The water from the wheel wash would need to be regularly topped up as it continuously loses water on truck tyres passing through it. If the wheel wash needs to be emptied for maintenance, a contractor suction truck would pump it out and remove the liquid from site.

Point 22 of the Cumberland Council submission states:

The plans show a gross pollutant trap will be installed with all overland flow paths from the external yard areas being directed to this pit. It is unclear what gross pollutants will be captured by this device and also how the water will be treated. The external areas may be affected by dirt/dust from vehicles tracked into the facility/ open doorways of the shed sorting facilities/etc. It is therefore possible that the stormwater system and local waterways in turn may be impacted by this material.

As detailed in the response to Point 13 above, a GPT has been selected to remove suspended sediment and associated nutrients and other pollutants as required by the Holroyd DCP.

Point 23 of the Cumberland Council submission states:

There is a 'self bunded fuel tank' noted on the plans, with partial awning over this tank, yet the entire tank should be covered according to best environmental practice. Contingency plans should also be in place should there be a leak in this system as it will be directed to the stormwater system in the event of an overflow.

Self-bunded fuel tanks are commercially available 'off-the-shelf' and are widely used. They have inner and outer tanks with a gap between the two tanks. Fuel is stored in the inner tank and the empty outer tank has a capacity of 110% of the inner tank. The outer tank will capture any leaks, spills or overflow preventing fuel discharging to the environment. There is no advantage of having an awning over the tank.

It is proposed to fuel vehicles within a bunded refuelling area that would be covered by an awning. The bund would include a sump that would capture any fuel spilled during refuelling is dispensed. The awning would minimise any rainwater falling within the bunded area and accumulating within the sump, and so reducing its capacity.

As a precaution, the site would also have spill kits should fuel spill or leak outside of the bunded area.

These measures are similar to those employed at any service station which store and handle far greater fuel volumes.

Point 24 of the Cumberland Council submission states:

> ***It is unclear if there will be any waste stockpiled in the external yard areas. If there is, this may impact on the stormwater systems.***

There would be no stockpiling of waste in the external yard areas.

f Contamination

Point 25 of the Cumberland Council submission states:

> ***The preliminary assessment has indicated that the site is suitable for the continued use. It should be noted however that there is a sealed (compaction) layer on the surface of the site due to previous potential contamination (including asbestos) from the previous use (unauthorised waste storage). This layer might be disturbed during construction/demolition works and could generate dust and runoff during which would be directed to the stormwater systems.***

As described in sections 2.2 and 2.6 of the preliminary contamination assessment (Appendix I of the EIS), the site has been cleaned by Benedict in consultation with Cumberland Council, the EPA and neighbours. The site clean-up consisted of removal of all stockpiled waste materials, removal of top fill in the operational area of the site down to natural clay (approximately 1 m) and establishing a Rotamill base in the operational area. After the waste stockpiles and surface cover were completely removed, the underlying natural virgin clay surface level of the site was regraded and compacted to provide an effective drainage gradient before Rotamill application. As per the application, this surface would ultimately be either sealed with asphalt or concrete.

All records relating to the removal and lawful disposal of the waste were provided to the EPA monthly as required and a final notification of completion of the site clean-up was subsequently provided to EPA on 5 February 2018.

The proposal only includes minor excavation to install concrete footings for shed uprights and to install a water management system. Potential dust and runoff would be managed in accordance with the relevant management measures included in the EIS.

Point 26 of the Cumberland Council submission states:

> ***A construction management plan does not appear to be submitted and should be submitted to cover all aspects of the construction, excavation and demolition activities not only for sediment and erosion control but also protection of systems against any potential contamination material that may be present.***
>
> ***It is also recommended that a full Environmental Management Report is prepared for the entire site.***

As has been the case with other recently approved recycling facilities, it is envisaged that, prior to the commencement of construction, Benedict would be required to prepare a CEMP and prior to commencement of operations, would be required to prepare an OEMP. These plans would be prepared to the satisfaction of the Secretary and would form the environmental management plans for the site's construction and operation. The CEMP would include an unidentified finds protocol for contaminated material.

g Surface water

Point 27 of the Cumberland Council submission states:

> ***The site is affected by stormwater overflow flooding risk. It is also noted that there is a waterway (Girraween Creek) on the western side of Toongabbie Road and this creek also connects to an area (northwards) of biodiversity vegetation. Therefore, as part of the surface waterflows assessment in the EIS this flood risk and implications to the waterway are requested to be addressed and mitigated as appropriate.***

As detailed in the flood risk assessment (Appendix H of the EIS), summarised in Section 6.5.4 of the EIS and as mentioned in response to Point 12 above, only a small area at the very front of the site is affected by the 1% AEP storm event (refer plan excerpt in Plate 3.1). No parking or buildings would occur within the affected area. Accordingly, there would be no loss of floodway or conveyance capacity and any changes in flood levels and flow velocities would be negligible. Therefore, development of the facility would not have a significant adverse impact on flooding and flooding would not have a significant adverse impact on the facility.

h Lighting

Point 28 of the Cumberland Council submission states:

> ***The proposed night activity on the site (delivery times and processing operations) indicates a need for external lighting. It is requested that consideration be given to this lighting - as the individual site and also in the context of other lighting in the immediate surrounds and in particular for those properties fronting Toongabbie Road - for implications to wildlife at the golf course open space area.***

Potential night-time lighting impacts from the facility would be limited as the majority of the lighting would be at the rear of the site and within the main waste acceptance and storage shed. Any external lighting would be designed to meet relevant Australian Standards (AS 4282 (IUNT) – Control of Obtrusive Effects of Outdoor Lighting) and would include hoods and be mounted, screened and directed in such a manner that does not create a nuisance to surrounding properties or the public road network at night.

Existing night-time light impacts, such as street lighting and vehicles headlights would mean that the potentially low lighting impacts from the facility are unlikely to have implications to wildlife at the golf course open space area.

i Aboriginal heritage

Point 29 of the Cumberland Council submission states:

> ***The AHIMS only lists known sites of aboriginal significance / items. The subject site is located within 100m of a waterway – waterways have a higher potential for aboriginal significance/items to be present. It is unclear at this stage if the proposed works on the site will involve excavation below the level that was undertaken associated with previous development of the site. Therefore, the EIS is requested to address the potential for aboriginal heritage on the site, with regard to the depth of works proposed and the previous development of the site.***

As detailed in Section 6.9 of the EIS, the site has been extensively disturbed and modified, including installation of a clay cap across the site. The proposal only includes minor excavation to install concrete footers for shed uprights and to install a water management system. In the unlikely event that any Aboriginal objects are identified during construction or operation of the facility, Benedict would cease work in the immediate area of the find and fence off the area. The find would be reported to DPIE and management measures would be implemented based on the significance of the item. The unexpected finds protocol would be developed further and included in the CEMP and OEMP for the site.

j Landscape

Point 30 of the Cumberland Council submission states:

> ***The proposal will require fully documented Landscape Plan prepared by a qualified Landscape Architect/ Designer at a minimum scale of 1:100 to show all surface treatments and any required OSD system, walls, pits, drainage swales, easements etc. and designed to correspond with all other plans. The Landscape Plan is to provide a mix of suitable trees, shrubs, groundcovers and turf; low water use species are recommended.***

As has been the case with other recently approved recycling facilities, it is envisaged that, prior to the commencement of operations, Benedict would be required to prepare a Landscape Management Plan for the site in consultation with Cumberland Council. The plan would detail the species to be planted on site and describe the monitoring and maintenance regime for all landscaping components.

ii Response to Cumberland Council submission (4 February 2020)

The follow-up submission from Cumberland Council dated 4 February 2020 states that:

> ***Council has received significant concerns and objections from local residents on Mandoon Road regarding the proposed 20% apportionment of the overall truck movements on the Toongabbie Road/Mandoon Road intersection. By reasons of noise, vibration, and traffic impacts, Council considers the concerns and objections from local residents on Mandoon Road, and strongly objects to the proposed truck movements on the Toongabbie Road/Mandoon Road intersection. If the application was to be approved, a condition to restrict any heavy vehicles movements on the Toongabbie Road/Mandoon Road intersection, including single axle heavy vehicles and skin-bin trucks, and multiple axle combination heavy vehicles, should be imposed.***
>
> ***Council is concerned that any heavy vehicle movement along Mandoon Road will significantly impact on the amenity of residential properties. It is therefore suggested that a condition be imposed on any forthcoming approval restricting all heavy vehicle movements to Toongabie Road.***

Traffic generation predictions for the site are provided in the TIA (Appendix F of the EIS). The TIA estimates that approximately 10% of site related traffic would travel north of site on Toongabbie Road (north of Mandoon Road) and 10% of site related traffic would travel on Mandoon Road (east of Toongabbie Road) and Girraween Road (with 5% travelling north and 5% traveling south at the Mandoon Road intersection). Notwithstanding, Benedict would implement the following measures to minimise or eliminate traffic noise increases from site related traffic:

- During the day and evening time (up to 10 pm), deliveries would be made to the facility by businesses (generally heavy vehicles) and members of the public (generally light vehicles). The majority (80%) are expected to access the site from the Great Western Highway and Toongabbie Road with a far lesser number coming from the north. Signage would be erected within the facility requesting that vehicles access the site from the Great Western Highway and Toongabbie Road so that return customers (ie, the majority of customers) would use this route.

- At night (10 pm to 6 am), waste deliveries would be made by contractors working on civil night works. These deliveries would need to be booked in advance – otherwise the facility would be unstaffed and closed. When site staff take the delivery booking, contractors would be instructed to use the Great Western Highway and the south of Toongabbie Road to access and leave the site.

- Products and unrecyclable materials generally would be dispatched from the facility by trucks owned or contracted by Benedict. Benedict would have control over the routes that these trucks use. Truck drivers with laden trucks would be instructed to turn south on Toongabbie Road and proceed to the Great Western Highway, and to access the site with empty trucks using the same route. Truck drivers would be instructed not to use any smaller roads, including Mandoon Road, Girraween Road and Magowar Road.

These measures to minimise the use of local roads would be documented in the operational traffic management plan that would be part of the facility's OEMP (see EIS Section 2.8.3).

Potential amenity impacts on local residents as a result of increased road traffic noise are addressed in the updated NVIA (Appendix F) and considered further in response to the EPA's submission in relation to road traffic noise in Section 3.1.3 below. Based on the outcomes of this further assessment it is considered that a condition restricting truck movements to Toongabbie Road is not warranted nor could it be enforced for non-Benedict businesses or members of the public.

3.1.3 NSW Environment Protection Agency

The EPA submission primarily relates to road traffic noise and states that:

> ***EPA's assessment of Section 6.3 of the EIS, Noise and Vibration (pg. 75-81) and Appendix E Noise and Vibration Impact Assessment (NVIA) (dated 6 November 2019) has concluded that the road traffic noise assessment is inadequate. EPA asserts the NSW Road Noise Policy (RNP) has been incorrectly applied in the EIS and the noise criteria and noise modelling used by the proponent is inadequate for the following reasons:***
>
> - ***Mandoon and Girraween roads are local roads. Sub-arterial road criteria is used in the EIS and NVIA. The proponent is required to provide a traffic noise impact assessment using local road criteria for Mandoon and Girraween roads;***
>
> - ***Modelling distance from the traffic to the houses in Mandoon Road is stated at 13 meters in Table 6.7 of the NVIA. An analysis of Google maps shows this distance is significantly less than the 13 meters stated. This will result in under prediction; and***

- ***Although the predicted traffic noise level in the NVIA is compliant with the nominated RNP noise criteria, if correct local road criteria is used and precise distances are used for the modelling, a more accurate assessment would be provided that would reflect a correct RNP application.***

The NVIA for the EIS has been updated to address the relevant EPA comments and is provided in Appendix F. A summary of the updated sections is provided below.

Some site-related traffic is likely to travel on Mandoon Road and Girraween Road (and the section of Toongabbie Road north of the site) when accessing or leaving the site during the day. The nearest residential facades potentially affected by an increase in road traffic volumes on these roads are approximately 9 m to 15 m from the nearside carriageway. These roads are frequently used to service nearby commercial and industrial uses within the Girraween industrial area and connect to other major roads (eg Great Western Highway and Toongabbie Road).

To assess road traffic noise appropriately, the road category for roads being used by a development creating additional traffic needs to be determined as per the definitions of the NSW Department of Environment, Climate Change and Water's *Road Noise Policy* (March 2011) (RNP) (ie defined in noise terms as opposed to traffic planning or engineering terms). The 'local' roads category as defined in the RNP does not describe Girraween Road or Mandoon Road. These roads are designated for use by industry and act as collector roads or principle haulage roads for industry and would normally be listed as 'classified' roads by Council. In these circumstances, they would be assessed against the sub-arterial noise targets. The RNP categorises them as 'sub-arterial' by virtue of them being 'collector' roads, a term used in the EPA's previous guideline *Environmental Criteria for Road Traffic Noise* (1999), as referenced in the RNP. The definition provided in Table 2 of the RNP for sub-arterial (and collector) roads is as follows:

> Provide connection between arterial roads and local roads.
>
> May support arterial roads during peak periods.
>
> May have been designed as local streets but can serve major traffic-generating developments or support non-local traffic.

This RNP definition for sub-arterial roads is aligned with how Mandoon Road and Girraween Road are operating and being used. Hence, these roads have been assessed against the sub-arterial road noise targets of the RNP. Importantly, the road category is inconsequential to the noise assessment given that the level of existing traffic noise on these roads exceeds the RNP targets, as considered further below.

Table 3.4 presents the road noise assessment criteria for residential land uses, reproduced from Table 3 of the RNP.

Table 3.4 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria (dB)	
		Day (7 am–10 pm)	Night (10 pm–7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors. Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)

Table 3.4 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria (dB)	
		Day (7 am–10 pm)	Night (10 pm–7 am)
Local roads	Provide vehicular access to abutting property and surrounding streets. Provide a network for the movement of pedestrians and cyclists, and enable social interaction in a neighbourhood. Should connect, where practicable, only to sub-arterial roads.	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hour}$ 50 (external)

Road traffic noise levels predicted at the nearest receivers to Mandoon Road (facades facing the road) during the RNP night period are provided in Table 3.5. Both the $L_{Aeq,period}$ and $L_{Aeq,1hour}$ noise levels are shown. Given the road traffic volumes adopted for the assessment are average number of movements, the $L_{Aeq,period}$ and $L_{Aeq,1hour}$ noise levels are consistent.

Table 3.5 Road traffic noise results

Road	Road section	Distance from road[1]	Calculated existing (2019) noise level $L_{Aeq,Night}$, dB	Predicted future[2] noise level $L_{Aeq,Night}$, dB	Criterion $L_{Aeq,Night}$, dB	Increase from existing noise level, dB
Mandoon Road	West of Girraween Road	9 m	57 (or 57 $L_{Aeq,1hour}$)	58 (or 58 $L_{Aeq,1hour}$)	55 (or 50 $L_{Aeq,1hour}$)	1.7

Notes: 1. Distance from the nearest residential facade to the edge of the nearest lane.
2. Includes site related traffic.

The results show that the existing (2019) level of road traffic noise calculated for the night period at the nearest residential facade along Mandoon Road currently exceeds the relevant criterion. Future (with site-related traffic) road traffic noise level at the nearest residential facade along Mandoon Road is predicted to negligibly increase (by 1.7 dB) during the night period and therefore satisfies the RNP 2 dB allowance increase criterion. It is important to highlight that the existing road traffic $L_{Aeq,1hour}$ noise level is significantly above the RNP target for a local road (ie 50 dB), reaffirming that Mandoon Road at this location does not match the RNP definition for a local road.

The predicted future noise level for the night period also satisfies the RNP road traffic relative increase criterion ($L_{Aeq,period}$ + 2 dB) for residential land uses and overall road traffic noise levels.

Furthermore, future road traffic noise levels are not expected to cause an impact at any other residential receivers along the transport route. Therefore, the impact of road traffic noise as a result of the facility is predicted to be negligible at the nearest residential receivers and within the 2 dB allowable increase criterion for land use developments in accordance with the RNP.

Notwithstanding the above, the measures recommended in Section 3.1.2ii would be implemented to minimise the use of Mandoon Road and Girraween Road.

The EPA submission also notes that:

> ***There is also an issue for trucks using Mandoon and Girraween Roads, as the roundabout is designed for light vehicles only.***

It is understood that public roads are not only designed for light vehicles as they need to accommodate vehicles such as garbage, fire and removalist trucks as an example. Furthermore, the roundabout at Mandoon Road and Girraweeen Road is mountable meaning that there would be no design issues for any trucks using this route.

3.1.4 Fire and Rescue NSW

The Fire and Rescue NSW submission states:

> ***It is understood that the Applicant is seeking to construct and operate a waste recycling and transfer facility that would accept; general solid waste (non-putrescible), commercial and industrial waste, uncontaminated soils, vegetation, excavated natural materials, metals, rail ballast and spoil. It is identified within Table 2.4 the expected daily throughputs and maximum stockpile volumes, with an associated maximum stockpile height of 5m. FRNSW would consider a significant portion of such waste streams to be combustible in nature and would require the provision of fire safety systems and measures commensurate with a worst credible fire scenario.***

The proposed indicative locations of fire safety measures are shown in Figure 3.2 and would be finalised as part of the detailed design process in accordance with BCA provisions.

In summary, the following fire safety measures are proposed at a minimum:

- six fire hydrants;
- six fire extinguishers;
- six fire blankets;
- six water cannons;
- six fire hose reels; and
- smoke alarms.

In addition, Benedict propose to use an automated remote fire suppression system similar to those that successfully operate at Benedict's Unanderra and Newcastle sites. The system would integrate thermal imaging technology with fire suppression equipment, CCTV and third-party remote monitoring. Together, the thermal imaging cameras and software are capable of pin-pointing hot spots around the waste stockpiles and initiating an automated fire-fighting response.

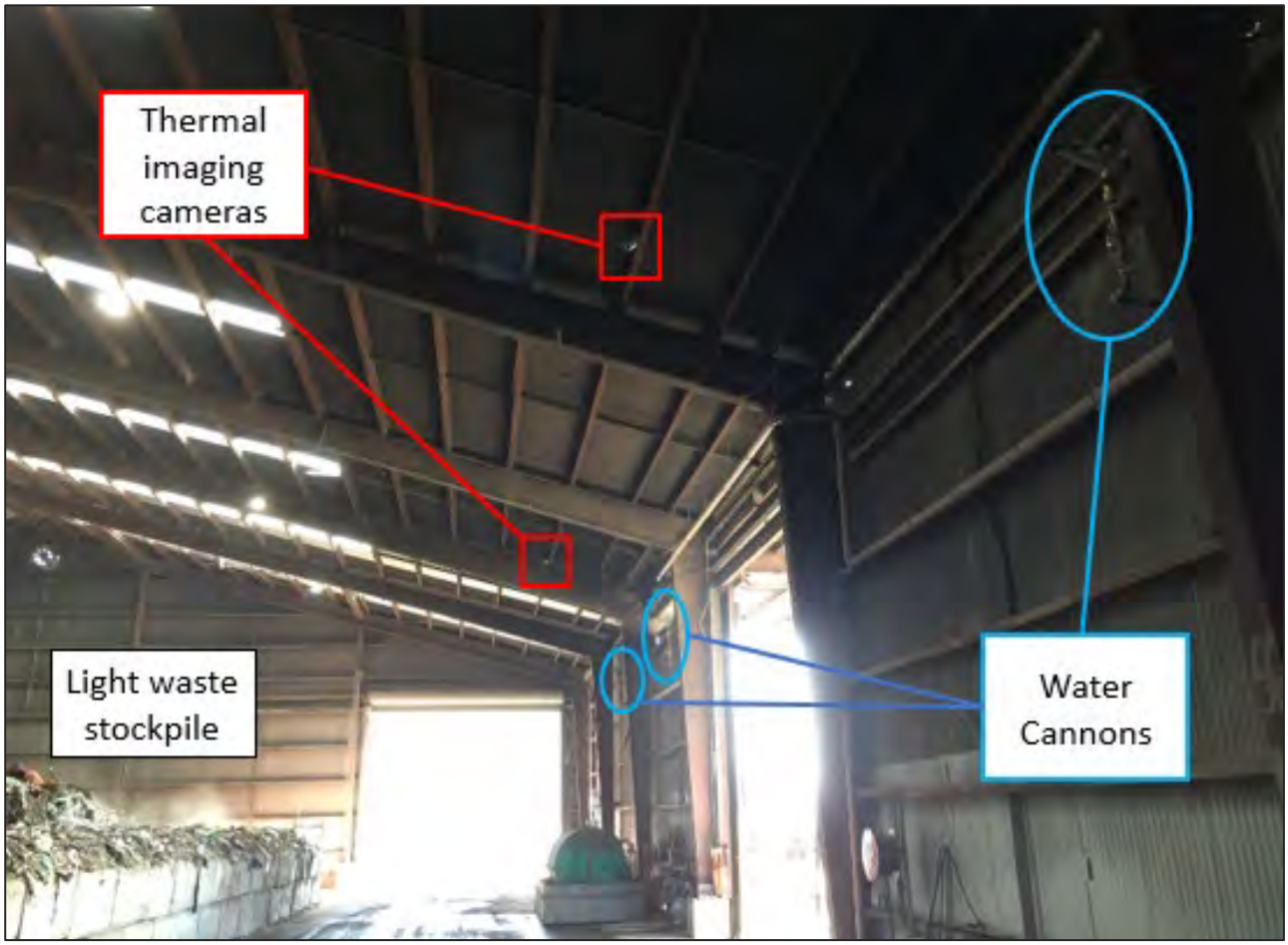
The system would be used primarily outside of normal operating hours, when the site is unmanned, however it has the benefit of instantaneous drenching of the waste stockpile if required during normal business hours. Having the thermal imaging technology and fire suppression equipment integrated with the CCTV and third-party remote monitoring, effectively provides 'around the clock' visibility.

A thermal monitoring system such as this would be capable of detecting rising temperatures before any fire has the chance to establish and spread. Additionally, continuous remote monitoring of temperatures in waste stockpiles can assist in preventing fires by detecting even modestly rising temperatures ('hot spots') before they have the opportunity to ignite.

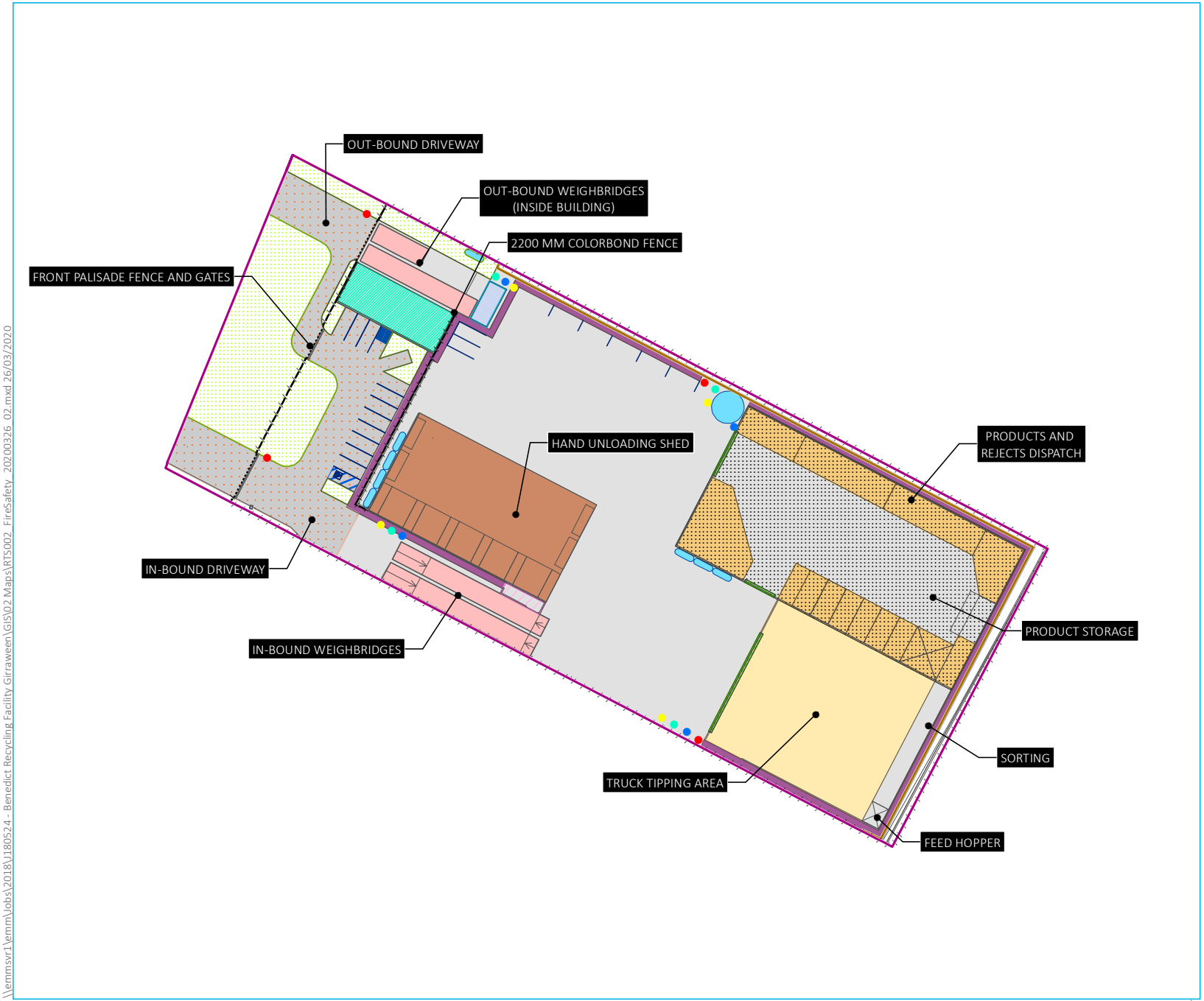
With a programmable temperature limit, the system would be able to cater for seasonal variations in ambient temperature, that is, in the colder winter months it would be possible to set the temperature limit lower than usual, enabling earlier detection of any rising temperatures within the stockpile.

Remote live 'streaming' of the thermal imaging cameras would be accessible to key operational personnel using mobile/tablet/desktop computer, enabling essentially 24 hour/seven day monitoring.

The thermal imaging cameras would be integrated with fire suppression equipment (ie water cannons). The final location of the cameras in relation to the fire suppression equipment would be finalised as part of the detailed design process; however, based on Benedict's other facilities it is envisaged the water cannons would be positioned on either side of the light waste stockpile area, as shown in the example photograph below.



Photograph 3.1 Example of automated remote fire suppression system



KEY

- Subject site

Fire safety

- Fire blanket
- Fire extinguisher
- Fire hydrant
- Fire reel

Site features

- Block retaining wall
- Fence
- Gate
- Car park
- Other site feature
- Asphalt/concrete
- Access path
- Driveway and car park
- Weighbridge
- Landscaping
- Shared/disabled parking space
- Motorbike parking
- Shed door
- Office and amenites
- Incoming weighbridge office
- Wheel wash
- Hand-unloading shed
- Waste acceptance
- Product storage and dispatch area
- Stockpile
- Rainwater tank
- Stormwater pit

\\emmsvr1\emm\Jobs\2018\J180524 - Benedict Recycling Facility Girraween\GIS\02 Maps\RTS002_FireSafety_20200326_02.mxd 26/03/2020

Source: EMM (2020)

0 25 50 m

GDA 1994 MGA Zone 56

N

Fire safety measures

Girraween Waste Recycling and Transfer Facility
Response to submissions
Figure 3.2

EMM
creating opportunities

The Fire and Rescue NSW submission states:

> ***It is recommended that advice and considerations contained within FRNSW's Fire Safety Guideline – Emergency Vehicle Access be addressed. This is required such that FRNSW are able to safely access all parts of the site where an incident may occur.***

The *Fire Safety Guideline – Access for Brigade Vehicles and Firefighters* requires facilities to be designed to accommodate a general fire appliance vehicle (10 m long) and a specialist fire appliance vehicle (12.5 m long). The updated swept path analysis (Appendix B) demonstrates that a 19 m articulated truck (and therefore the smaller fire appliance vehicles) can access all areas of the site.

The Fire and Rescue NSW submission states:

> ***It is recommended that advice and considerations contained within FRNSW's Fire Safety Guideline – Fire Safety in Waste Facilities be addressed. Advice and recommendations contained within the guideline have been developed to enable FRNSW to adequately manage an incident at such facilities.***

As identified in response to FRNSW's first point above, fire safety measures would be finalised as part of the detailed design process and would ensure compliance with the *FRNSW's Fire Safety Guideline – Fire Safety in Waste Facilities*, specifically in relation to a fire hydrant system, an automated fire sprinkler system, smoke hazard management and fire water run-off containment.

The Fire and Rescue NSW submission states:

> ***It is recommended that provisions be made for the containment of contaminated fire water run-off based on the worst credible fire scenario for the site. Any system(s) provided is to be automatic in nature and should not rely upon on-site staff or emergency services personnel to access or activate provided systems or valves in the event of fire.***

The entire operational area would be bunded with a 0.1 m kerb. This would ensure that, in the event of a fire, the site could store approximately 500 m^3 (500,000 L) of firewater. A fully automated system would be designed to meet the worst credible fire scenario as part of the detailed design and having regard to the other fire management measures identified above.

After a fire event, the retained fire water would be tested to determine if it is safe to discharge into the stormwater system. If not, firewater would be pumped to tankers and transported offsite for disposal of at an appropriately licensed facility. This process would be detailed as part of a water management plan for the site.

The Fire and Rescue NSW submission states:

> ***It is recommended that if the development proposes to incorporate a fire engineered solution (FES), whether a building design having a performance solution in accordance with the National Construction Code (NCC) or other infrastructure where building codes are not applicable, FRNSW should be engaged in the fire engineering brief (FEB) consultation process at the preliminary design phase, post approval of the development application. FRNSW also recommend that clauses E1.10 and E2.3 be addressed where a FES is required.***

Noted. FRNSW would be consulted in relation to the FEB consultation process at the preliminary design phase.

The Fire and Rescue NSW submission states:

> ***It is recommended that a Condition of Consent be included that would require the fire and life safety measures for the development to be reassessed for adequacy in the event that either; significant changes are made to the site configuration, processing capacity is increased from 220,000 tpa, or there are changes to either the accepted waste streams or a significant increase in streams that are combustible in nature.***

Noted. Benedict would accept a condition that requires the fire and life safety measures to be reassessed in the event that the capacity of the facility is increased or there are changes to combustible waste streams.

The Fire and Rescue NSW submission states:

> ***It is recommended that an emergency plan for the waste facility in accordance with AS 3745–2010 Planning for emergencies in facilities be prepared for the development. An external consultant should be engaged to provide specialist advice and services in relation fire safety planning and developing an emergency plan.***

As has been the case with other recently approved recycling facilities, it is envisaged that, prior to commencement of operations, Benedict would be required to prepare an emergency and evacuation management plan.

3.1.5 Transport for NSW

i Truck parking

The TfNSW submission states:

> ***The TIA makes no specific reference to the location of truck parking within the site, confirmation is required as to where truck parking within the site is located.***

Truck parking on site would only occur outside of operating hours. Trucks would be parked within and in front of the hand unloading shed to avoid conflict with trucks accessing the main waste acceptance and storage area during night-time deliveries and dispatch.

ii Proposed driveways

The TfNSW submission states:

> ***Australian Standards AS2890.2 for driveway dimensions and design principles stipulate that the minimum access driveway width for articulated vehicles is to be 10m.***
>
> ***The TIA states that a 7 metre wide inbound driveway is proposed on the southern portion of the site by widening the existing driveway, as well as a new 7 metre outbound driveway on the northern portion of the site. Provided swept paths for both driveways demonstrate a 19m articulated truck.***
>
> ***The proposal should be redesigned to conform to AS2890.2 and amended swept paths indicating adequate ingress and egress of the largest vehicle should be provided accordingly.***

The proposed outbound driveway width has been increased to 9 m while the inbound driveway width remains at 9 m. The updated swept path analysis (Appendix B) demonstrates that a 19 m articulated truck can adequately enter and leave the site. The full 10 m width requirement is not considered to be warranted given that the swept paths demonstrate adequate access/egress and given that Benedict want to maximise area of landscaping at the front of the site in keeping with Council's desires (refer Section 3.1.2ij).

iii Road widening

The TfNSW submission states:

> ***The TIA refers to the road widening works proposed for Toongabbie Road to allow a second northbound lane (a bypass lane) to be constructed so that northbound through vehicles can pass trucks turning right into the site, thereby alleviating any potential queuing.***
>
> ***TfNSW would like to further assess the proposed road widening in relation to the surrounding road network. Further information and detailed designs specified to the proposed road widening and its relation to the site, Toongabbie Road and surrounding road network are therefore requested.***

As described in Section 3.1.2ic, the proposal has been amended to remove the bypass lane and proposed road widening.

iv Signage

The TfNSW submission states:

> ***Entry and exit signs for the proposed site are to be clearly signposted.***
>
> ***'No Stopping' signs are recommended to be installed on the western side of Toongabbie Road.***
>
> ***The proposed 'No Parking' sign on the eastern side of Toongabbie Road is recommended to be changed to 'No Stopping'.***

The proposed signage plan has been amended to incorporate these proposed changes. As detailed in Section 3.1.2ib, the proposed signage plan is scheduled to be presented to Council's Traffic Committee at the 1 April 2020 meeting.

v Construction traffic impact

The TfNSW submission states:

> ***A detailed Construction Pedestrian and Traffic Management Plan for various stages detailing construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be submitted to the relevant consent authority for approval prior to the issue of a Construction Certificate.***

As has been the case with other recently approved recycling facilities, it is envisaged that, prior to commencement of construction, Benedict would be required to prepare a construction traffic management plan.

3.1.6 Sydney Water

i Water servicing

The Sydney Water submission states:

> ***The proposed facility is within Prospect Hill Water Supply Zone. The development is fronted by a DN250 main.***
>
> ***The DN250 fronting the development has sufficient capacity to cater for the proposed demands although amplifications may be required.***

Noted.

ii Wastewater servicing

The Sydney Water submission states:

> ***The proposed development is within Girraween SCAMP which is a part of the Sydney Water North Head System.***
>
> ***The development is fronted by a DN525 main and amplifications may apply.***
>
> ***As there is limited capacity in the system during wet weather. The developer will need to provide storage on-site to contain wastewater flows during wet weather.***

Stormwater runoff would be treated by the GPT (designed to meet Cumberland Council requirements – refer Section 3.1.2ie) and discharged directly to the stormwater system.

As detailed in Section 3.1.2ie, the facility would not accept liquid wastes and no liquids would be generated by any processing. The only water used would be inside the sheds is for dust suppression misting pumps which do not create puddles. The water from the wheel wash would need to be regularly topped up as it continuously loses water on truck tyres passing through it. If the wheel wash needs to be emptied for maintenance, a contractor suction truck would pump it out and remove the liquid from site.

Wastewater associated with office ablutions would be minor and discharged direct to the sewer.

Accordingly, there would be no requirement for the on-site storage of wastewater.

iii Trade waste

The Sydney Water submission states:

Due to the anticipated trade waste generated by this proposed development's operations, Sydney Water requests the proponent adhere to our trade waste requirements. This may include the provision of sufficient on-site storage of wastewater so it can be treated to our specifications before it is discharged into our wastewater network. The exact type and sizing of any required on-site storage is to be determined through the trade waste process following confirmation of dedicated disposal routes for wastewater. Details of these requirements and the process for progressing applications are found in Attachment 2.

As described above, there would be no requirement for wastewater disposal associated with the operation of the facility and, therefore, no requirement for on-site detention or trade waste.

iv Stormwater

The Sydney Water submission states:

> ***Sydney Water raises a concern as to the suitability of discharging potentially contaminated wash water from wheel-washing, wash-down water, from inside or outside buildings or any, as yet undefined processes, into the stormwater system in particular, and the impact this could have on wastewater loading. The proponent must consult Council regarding suitable trade waste requirements to ensure the correct controls are in place to safely dispose of trade wastewater into their stormwater system.***

As described above, there would be no requirement for wastewater disposal associated with the operation of the facility and, therefore, no requirement for a trade waste agreement.

3.2 Community submissions

As discussed in Section 2.3, two submissions were received from the community. One submission strongly supports the facility. The other submission raised the following matters identified in italics and addressed below.

Impact on businesses near the facility as a result of increased traffic, noise and disturbance and the potential to attract vermin

Potential traffic and associated noise impacts were also raised by the EPA and Council and are addressed in Section 3.1.3. The matter of attracting vermin was also raised by Cumberland Council and is addressed in Section 3.1.2ia.

Devaluation of properties near the facility and difficulty to lease to tenants

As described in Section 1.3.2 of the EIS, there were historical issues at the site, including the storage of a large volume of unauthorised waste in a stockpile on the eastern half of the site and uncontained waste tipped across the site. Several penalty notices and Section 91 clean up notices were issued under the NSW *Protection of the Environment Operations Act 1997* (POEO Act) from 2011 to 2018. Since purchasing the site, Benedict has removed the large stockpiles and cleaned up the site in consultation with Cumberland Council, the EPA and neighbours. The proposed facility is in keeping with the industrial character and appearance of the area and, given the prior use and state of the site, it is considered that the overall amenity of the area has been improved by Benedict. It is considered that this would have only positive impacts on the value of nearby properties and the ability of owners to be able to lease to tenants.

4 Revised statement of commitments

Chapter 7 of the EIS included a table of commitments made to negate or minimise potential environmental impacts arising from the facility. Table 4.1 provides updated commitments for the facility, reflecting the updates outlined in this response to submissions. The management measures will be included as part of a construction environmental management plan (CEMP), operational environmental management plan (OEMP), supporting plan/s to the CEMP or OEMP, or otherwise undertaken prior to the commencement of construction or operations. **New commitments are highlighted in bold.**

Table 4.1 Revised management measures

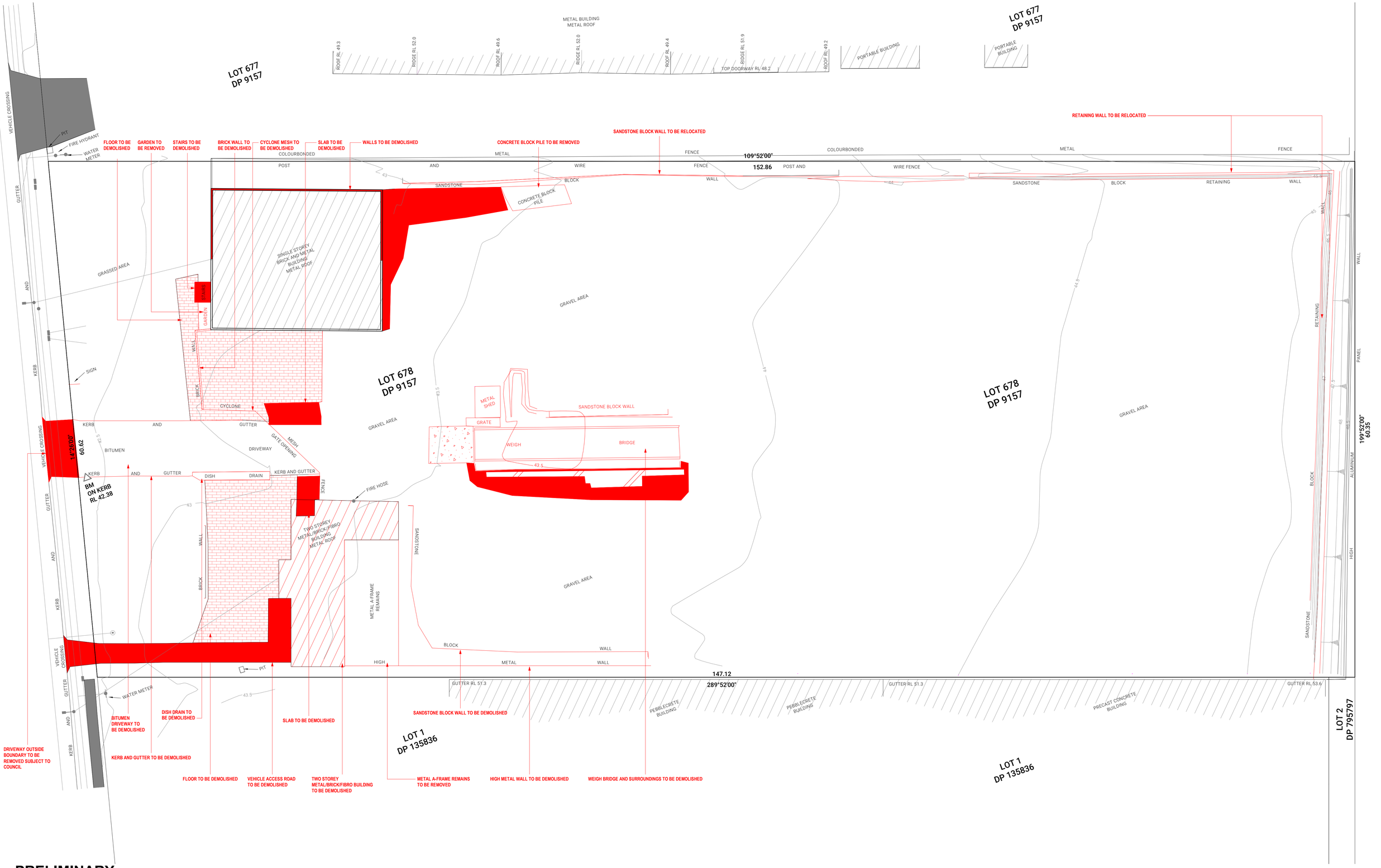
Environmental attribute	Management measure
Air quality	The following management measures will be implemented to minimise the potential for air quality impacts: • all material storage, sorting and transfer and loading will occur within enclosed sheds; • the main waste acceptance and storage shed will to be fitted with an internal water misting system to control dust; • only paved areas will be used by heavy and light vehicles; and material drop heights will be minimised.
Noise	The following management measures will be implemented during construction and operations to minimise the potential for noise impacts: • plant and equipment will be regularly maintained and serviced; • broadband reversing alarms (growlers) will be exclusively used on all mobile plant; • the site layout minimises the need for mobile plant to reverse; • plant and equipment will be switched off when not in use; • material drop heights will be minimised and dragging materials along the ground will be minimised; • site contact details will be provided on a board at the front of the site; • any noise-related complaints will be handled promptly; and a complaints register will be maintained.
Traffic and transport	The following management measures will be implemented to improve traffic safety: • **a total of seven street parking spaces along the eastern side of Toongabbie Road (near site boundary) will need to be removed to allow for access to the facility; and** • no parking signs are to be provided as shown in the concept parking signage plan and/or as agreed by Cumberland Council.

Table 4.1 Revised management measures

Environmental attribute	Management measure
Water and soil	The following management measures will be implemented to minimise the potential for water and soil impacts: <u>Construction:</u> • construction on the site for concrete, drainage pipes and block elements will be undertaken in accordance with the NSW Department of Environment and Climate Change's guidelines for saline soils which recommend use of separation methods or classes of concrete suitable for saline soil environments; • the runoff erosion and sediment control strategy will be implemented to manage runoff and sediment during the construction phase; • specific runoff sediment traps will be incorporated along the flow path to remove sediment and debris at the source; • bund and silt fencing will be incorporated around the perimeter of the site to ensure runoff does not flow onto adjacent sites; • the sediment and runoff control measures will be maintained on a regular basis and after storm events. <u>Operations:</u> • all waste transfer and sorting will occur in sheds so that no leachate is produced; • no water will be used in the transfer or sorting of waste except for dust control; • runoff from the roof and the hardstand and carpark will be separated; • roof runoff will be stored in reuse tanks and reused for irrigation and dust control to minimise runoff volume and improve runoff quality; • runoff water quality from hardstand will be treated in a VortSentry HS 15 to achieve the pollution reduction rates in the Holroyd DCP 2013 prior to discharge from the site; • above ground storage for onsite fire water during firefighting will be provided by way of shed bunding to prevent discharge off the site; and the fuel storage will be bunded to eliminate spills.
Contamination	The CEMP will identify intrusive ground construction activities and detail how these activities will be managed to avoid or mitigate negative environmental impacts.
Heritage	**If any Aboriginal objects are identified during construction or operation of the facility, Benedict would cease work in the immediate area of the find and fence off the area. The find would be reported to DPIE and management measures would be implemented based on the significance of the item. An unexpected finds protocol will be developed futter and included in the CEMP and OEMP.**

Appendix A

Project drawings



TOONGABBIE

PRELIMINARY

Revisions

P1	19.03.19	FOR INFORMATION	JG
P2	12.04.19	FOR INFORMATION	JG
P3	25.07.19	FOR INFORMATION	JG
P4	30.07.19	FOR INFORMATION	JG

24/03/2020 12:52:03 PM

Project: **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing: **Demolition Plan**

Project No: **219034**

Date: **19.03.19**

Author: **JG**

Scale: @ A1 **1 : 200**

Drawing No: **SK00.03 P4**

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TOONGABBIE

LOT 677 DP 9157

METAL BUILDING METAL ROOF

ROOF RL 49.3 | RIDGE RL 52.0 | ROOF RL 49.6 | RIDGE RL 52.0 | ROOF RL 49.4 | RIDGE RL 51.9 | ROOF RL 49.2

TOP DOORWAY RL 48.2

PORTABLE BUILDING

PORTABLE BUILDING

LOT 677 DP 9157

VEHICLE CROSSING | GUTTER | AND | KERB | VEHICLE CROSSING | GUTTER | AND | KERB | VEHICLE CROSSING | GUTTER | AND | KERB

56000 | 1000 | 3500

22000 | 10000

COLOURBONDED POST AND WIRE FENCE | BLOCK RETAINING WALL | METAL FENCE | COLOURBONDED POST AND WIRE FENCE | METAL FENCE

109°52'00"

152.86

1800mm PALISADE FENCE

8000L OSD TANK

FOOTPATH 1200

16 | 17 | 18 | 19 | 20

ACCESS PATH

BLOCK RETAINING WALL

OUT-BOUND WEIGH BRIDGE (IN-GROUND)

OUT-BOUND WEIGH BRIDGE (IN-GROUND)

3500 | 600 | 3500 GATE

WHEEL WASH

FOOTPATH 1200

133kL STEEL OSD TANK ON CONCRETE BASE SLAB

RL 44.300

NEW SHED A
1587.6 m²
RL 44.300

28450

OFFICE AND AMENITIES
150 m²

15 | 14

FALL | FALL | FALL

SECURITY GATE

BELOW GROUND OSD TANK 230m³

MB | MB | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1

1200

2200mm COLOURBOND FENCE

36000

FALL

3x 8000L OSD TANKS

GATE 6D

LANDSCAPING

14°26'00" 60.62

BERM

FOOTPATH 1200

RELOCATED SHED
720.0 m²
RL 43.900

4X 8000L OSD TANK

20000

FALL

1800mm PALISADE FENCE

1200

8000

FHR | FHR

SELF BUNDED FUEL TANK

AWNING OVER

ASPHALT

28450

NEW SHED B
1026.0 m²
RL 44.600

RL 44.600

FALL

GATE 6D

FOOTPATH 1200

WEIGH BRIDGE OFFICE
15.2 m²

2200 | 2210

IN-BOUND WEIGH BRIDGE (ABOVE GROUND) | 3500

RL 44.062

IN-BOUND WEIGH BRIDGE (ABOVE GROUND) | 600 | 3500

2200mm COLOURBOND FENCE

CYCLONE WIRE FENCE

FALL

220

1199

ACCESS PATH

1448

GUTTER RL 51.3 | GUTTER RL 51.3 | GUTTER RL 53.6

289°52'00"

6000 | 22000 | 2000

PEBBLECRETE BUILDING | PEBBLECRETE BUILDING | PRECAST CONCRETE BUILDING

1800mm PALISADE FENCE

20000 | 36000

LOT 1 DP 135836

LOT 1 DP 135836

LOT 2 DP 795797

WALL | PANEL | ALUMINIUM | HIGH

199°52'00" 60.35 56900

1000 | 2200

2 | 5 | 6 | 1

PRELIMINARY

Revisions			
P1	25.02.20 20	FOR INFORMATION	SM
P2	23.03.20 20	For Information	SM

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Project: **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing: **OSD Plan**

Project No: **219034**

Date: **02/25/20**

Author: **SM**

Scale: @ A1 **1 : 200**

Drawing No.: **SK00.04 P2**

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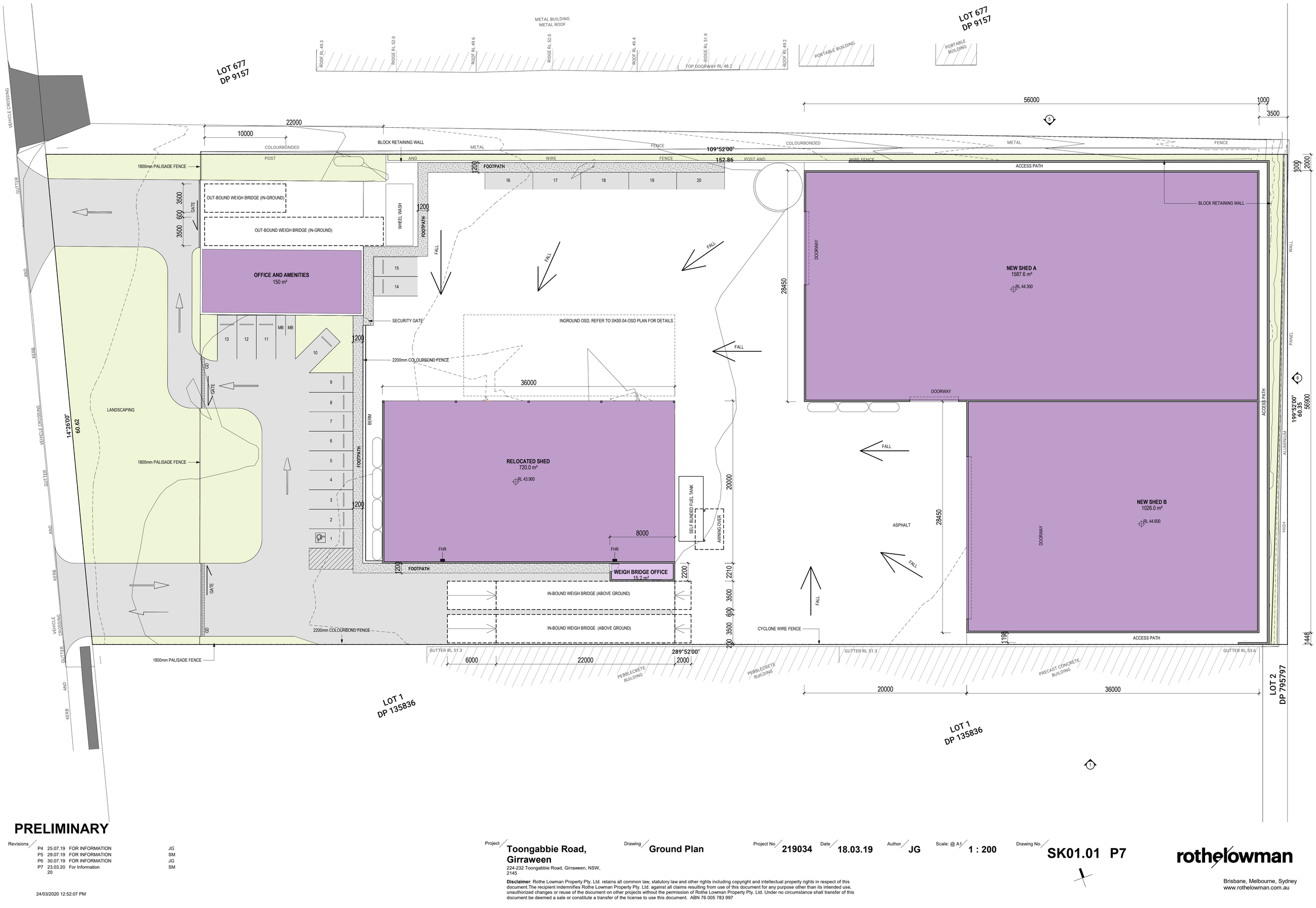

PRELIMINARY

Revisions			
P4	25.07.19	FOR INFORMATION	JG
P5	29.07.19	FOR INFORMATION	SM
P6	30.07.19	FOR INFORMATION	JG
P7	23.03.20	For Information	SM

24/03/2020 12:52:07 PM

Project: **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing: **Ground Plan**

Project No: **219034**

Date: **18.03.19**

Author: **JG**

Scale: @ A1 **1 : 200**

Drawing No.: **SK01.01 P7**

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TOONGABBIE

LOT 677 DP 9157

METAL BUILDING METAL ROOF

ROOF RL 49.3 | RIDGE RL 52.0 | ROOF RL 49.6 | RIDGE RL 52.0 | ROOF RL 49.4 | RIDGE RL 51.9 | ROOF RL 49.2

TOP DOORWAY RL 48.2

PORTABLE BUILDING

LOT 677 DP 9157

PORTABLE BUILDING

VEHICLE CROSSING

GUTTER

AND

KERB

COLOURBONDED METAL FENCE AND POST AND WIRE FENCE

109°52'00"

152.86

COLOURBONDED METAL FENCE AND POST AND WIRE FENCE

OUT-BOUND WEIGH BRIDGE (IN-GROUND)

OUT-BOUND WEIGH BRIDGE (IN-GROUND)

WHEEL WASH

EXISTING BUILDING - SINGLE STOREY BRICK AND METAL BUILDING METAL ROOF

FALL

2200mm COLOURBOND FENCE

36000

RL 49.900 EAVE

BERM

GATE

LANDSCAPING

14°26'00"

60.62

PALISADE FENCE

CLEAR COLOURBOND

1:5

RELOCATED SHED

RL 52.030 RIDGE

SELF BUNDED FUEL TANK

AWNING

20000

1:7

IN-BOUND WEIGH BRIDGE (ABOVE GROUND)

IN-BOUND WEIGH BRIDGE (ABOVE GROUND)

2200mm COLOURBOND FENCE

1800mm PALISADE FENCE

CYCLONE WIRE FENCE

GUTTER RL 51.3

289°52'00"

GUTTER RL 51.3

GUTTER RL 53.6

PEBBLECRETE BUILDING

PEBBLECRETE BUILDING

PRECAST CONCRETE BUILDING

LOT 1 DP 135836

LOT 1 DP 135836

LOT 2 DP 795797

2000

RL 52.300 EAVE

28450

1:7

NEW SHED A

RL 54.300 RIDGE

RL 52.300 EAVE

RL 56.600 RIDGE

CLEAR COLOURBOND

1:9

NEW SHED B

RL 54.600 EAVE

RL 54.600 EAVE

ASPHALT

28650

28650

1448

20000

36000

56000

3500

1000 2500

1000

WALL

28250

PANEL

ALUMINIUM

199°52'00"

60.35

HIGH

28650

PRELIMINARY

Revisions			
P3	12.04.19	FOR INFORMATION	JG
P4	25.07.19	FOR INFORMATION	JG
P5	30.07.19	FOR INFORMATION	JG
P6	23.03.20	For Information	SM

24/03/2020 12:52:08 PM

Project: **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing: **Roof Plan**

Project No: **219034** Date: **18.03.19** Author: **JG** Scale: @ A1 **1 : 200** Drawing No: **SK01.02 P6**

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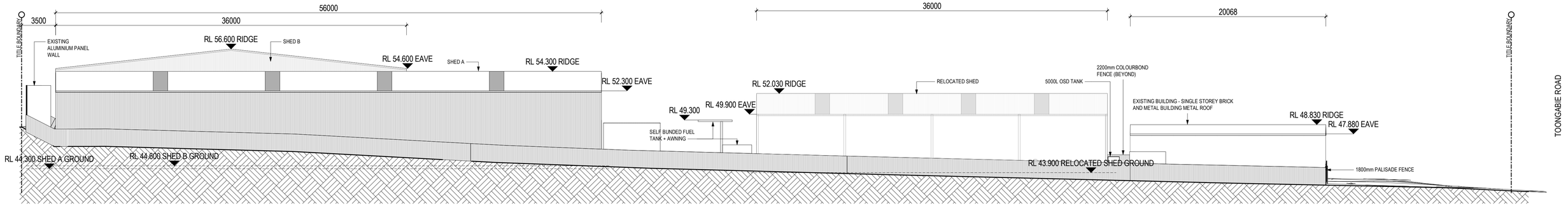
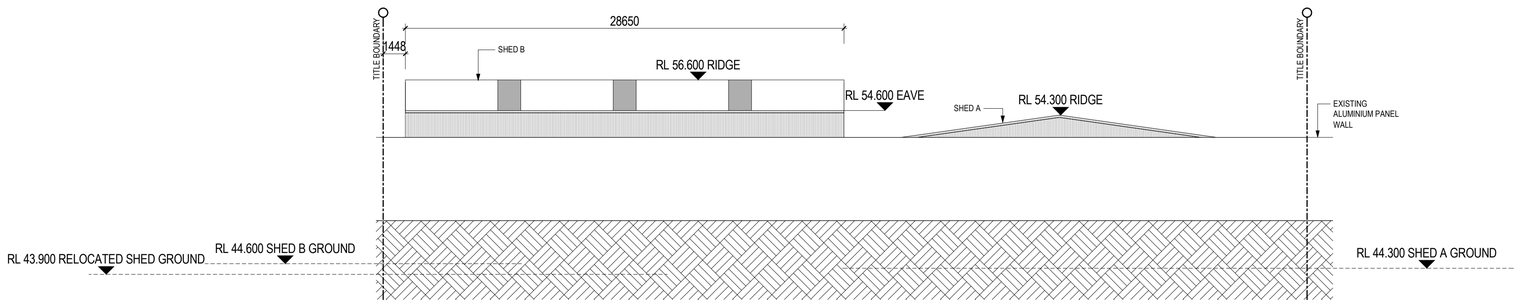


5 SK00.04 SCALE 1 : 200

SITE ELEVATION - NORTHERN



6 SK00.04 SCALE 1 : 200

SITE ELEVATION - EASTERN

PRELIMINARY

Revisions			
P1	12.04.19	FOR INFORMATION	JG
P2	25.07.19	FOR INFORMATION	JG
P3	30.07.19	FOR INFORMATION	JG

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Project **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing **Site Elevations** | Project No **219034** | Date **12.04.19** | Author **JG** | Scale: @ A1 **1 : 200** | Drawing No. **SK02.10 P3**

rothelowman

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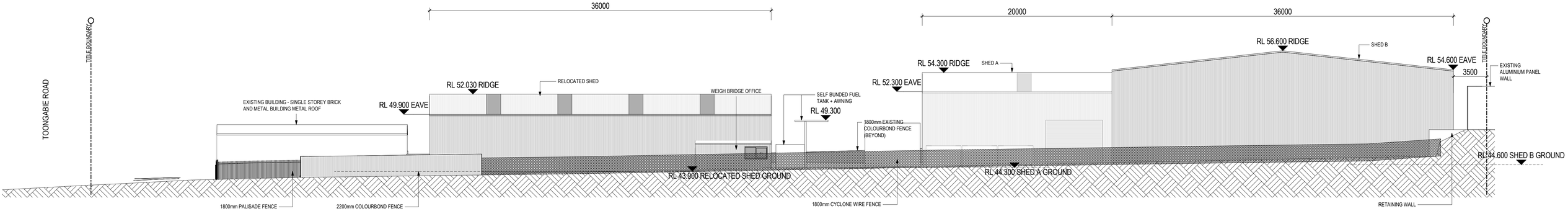

1 SK00.04 SCALE 1 : 200

SITE ELEVATION - SOUTHERN

2 SK00.04 SCALE 1 : 200

SITE ELEVATION - WESTERN

PRELIMINARY

Revisions

P1	25.07.19	FOR INFORMATION	JG
P2	30.07.19	FOR INFORMATION	JG

24/03/2020 12:52:10 PM

Project: **Toongabbie Road, Girraween**
224-232 Toongabbie Road, Girraween, NSW, 2145

Drawing: **Site Elevations**

Project No: **219034**

Date: **12.04.19**

Author: **JG**

Scale: @ A1 **1 : 200**

Drawing No.: **SK02.11 P2**

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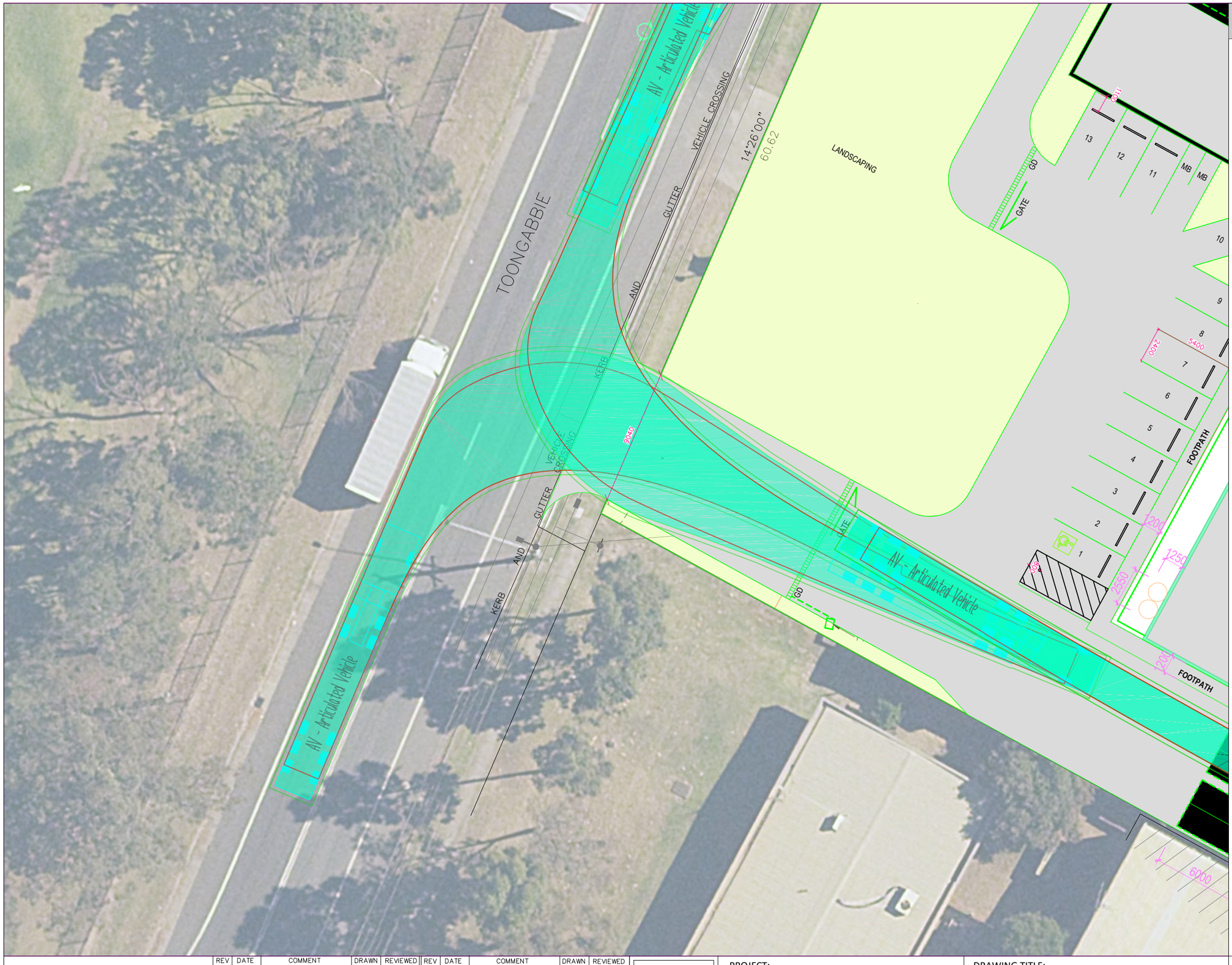
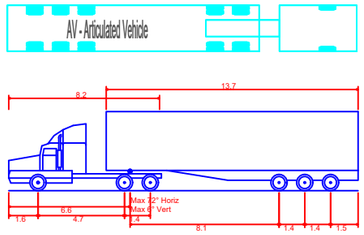
Appendix B

Swept path analysis



COMMENTS

A3



AV - Articulated Vehicle	
Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

EMM creating opportunities

SYDNEY | Suite 01
Ground Floor
20 Chandos Street,
St Leonards NSW 2065

Phone # 02 9493 9500

www.emmconsulting.com.au

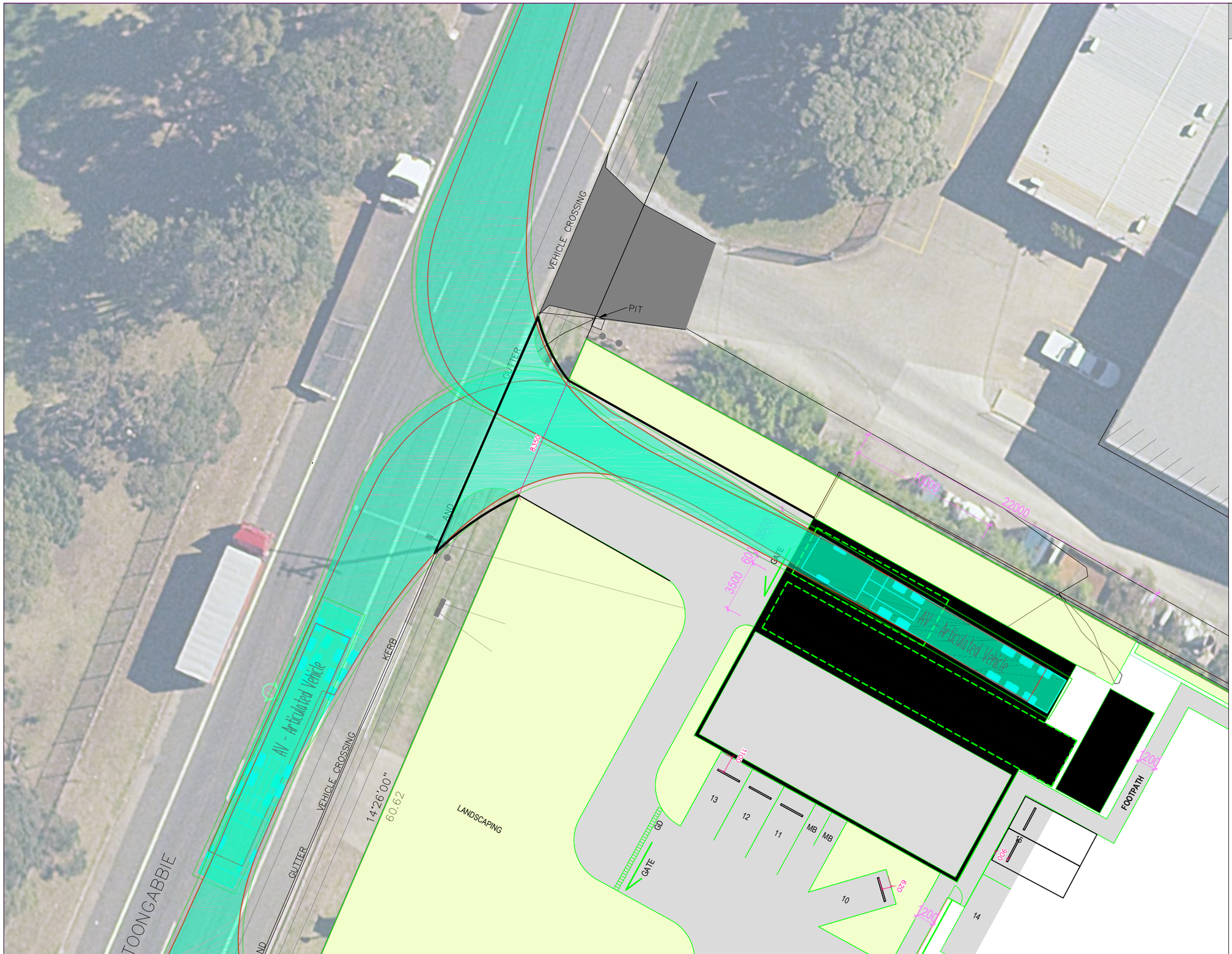
REV	DATE	COMMENT	DRAWN	REVIEWED
3	23/03/20	FOR INFORMATION	EL	AU
2	18/03/20	FOR INFORMATION	EL	AU
1	10/02/20	FOR INFORMATION	EL	AU

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Entry Driveway Swept Path

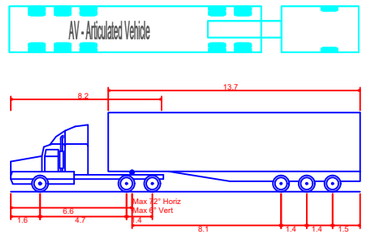
CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-001
PROJECT #:	J180524
SCALE:	1:250

REV: 3



COMMENTS

A3



AV - Articulated Vehicle	
Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

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1	10/02/20	FOR INFORMATION	EL	AU

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Exit Driveway Swept Path

CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-002
PROJECT #:	J180524
SCALE:	1:250

REV: 3

RELOCATED SHED
720.0 m²
RL 43.300

WEIGH BRIDGE OFFICE
15.2 m²

FHR

8000

2200

2210

20000

3500

4000

NEW SHED A
1587.6 m²
RL 44.300

ACCESS PATH

NEW SHED B
1026.0 m²
RL 44.600

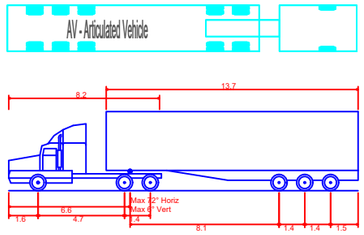
20000

36000

HIGH

COMMENTS

A3



AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

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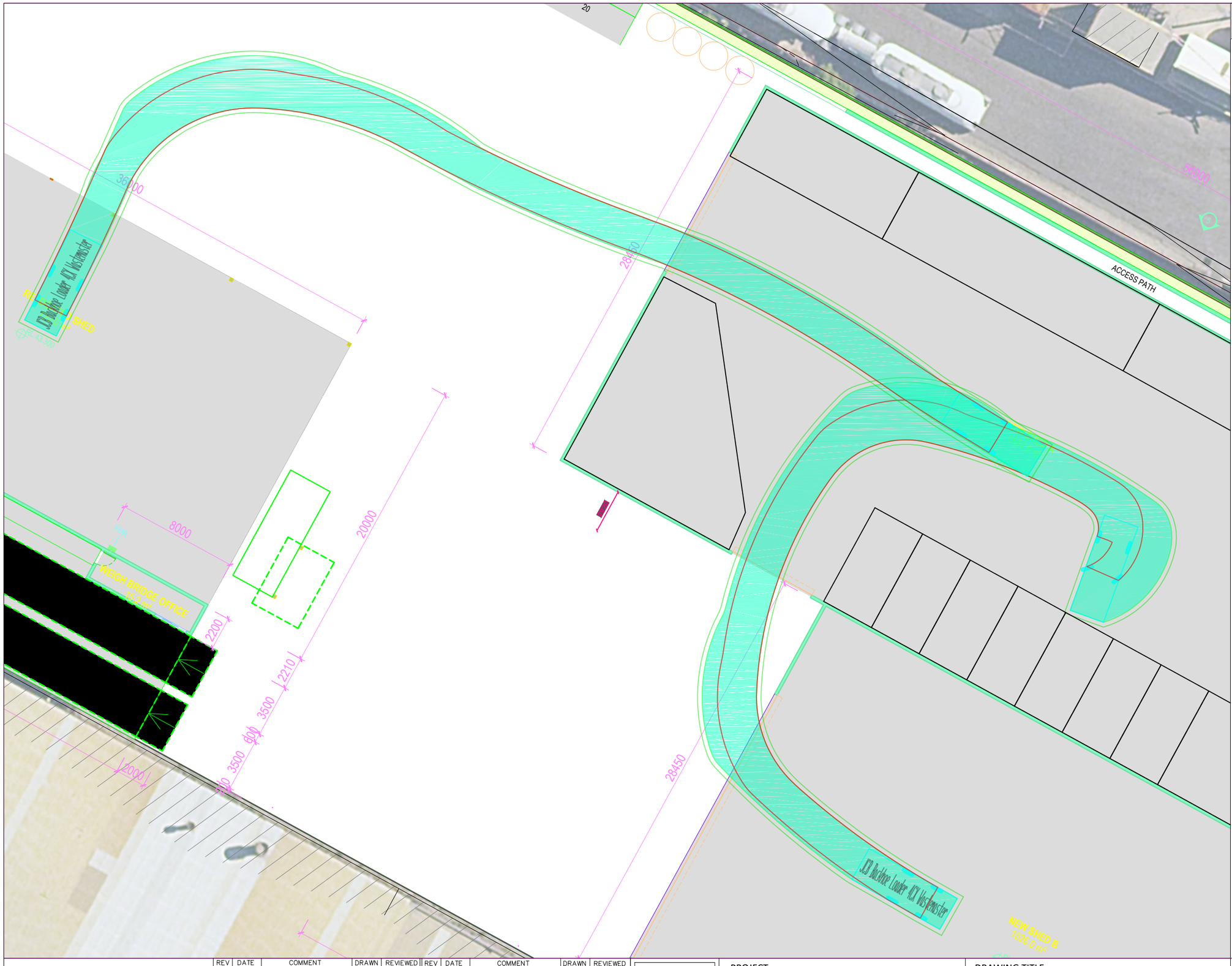
2	18/03/20	FOR INFORMATION	EL	AU
1	10/02/20	FOR INFORMATION	EL	AU

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Shed B - Inbound Swept Path

CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-003
PROJECT #:	J180524
SCALE:	1:250

REV: 3



COMMENTS

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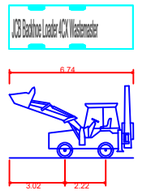

JCB Backhoe Loader 4CX Wastemaster	
Overall Length	6.740m
Overall Width	2.360m
Overall Body Height	3.917m
Min Body Ground Clearance	0.350m
Track Width	2.360m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	4.550m

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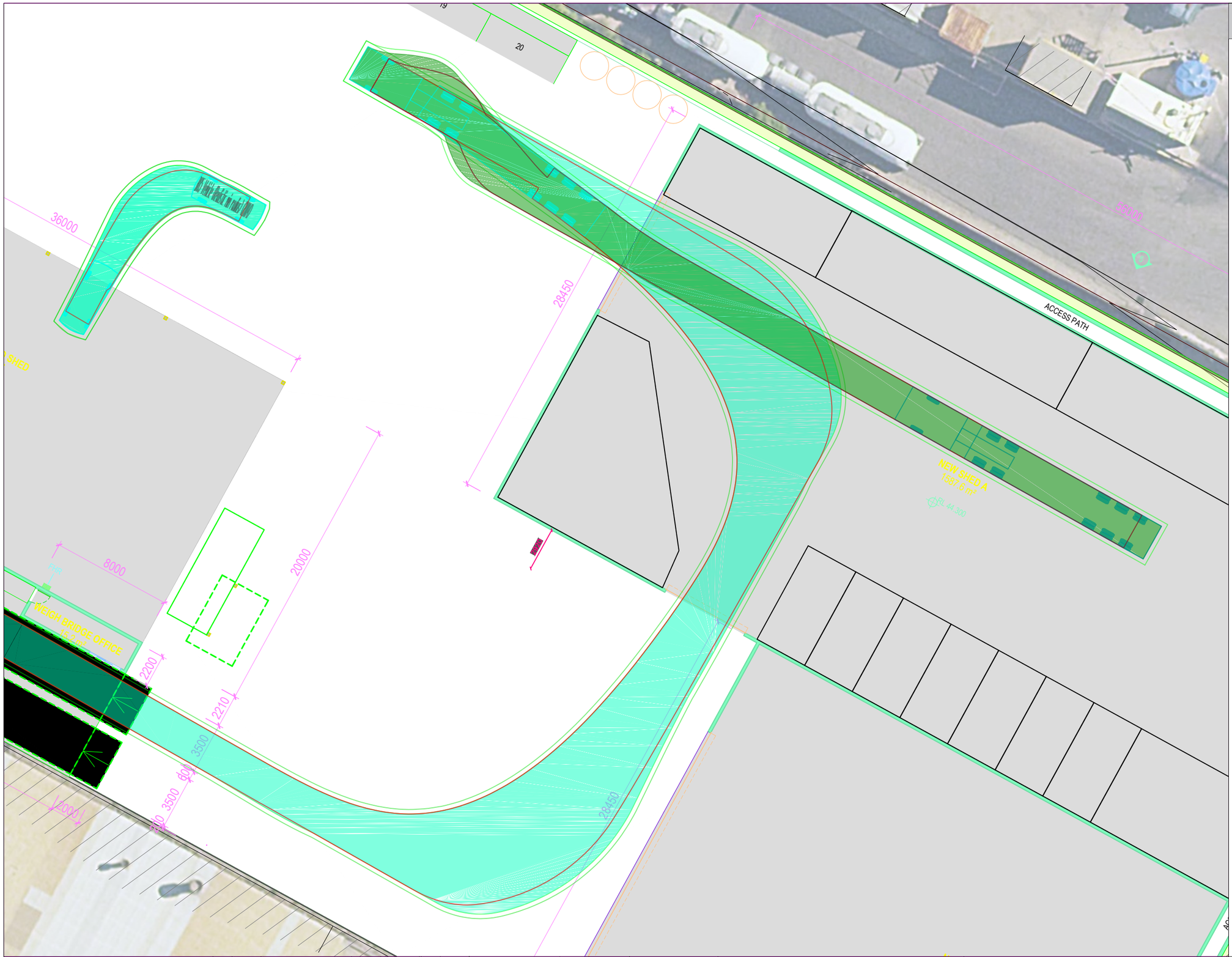
1	10/02/20	FOR INFORMATION	EL	AU

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Shed B - Front-end Loader Swept Path

CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-004
PROJECT #:	J180524
SCALE:	1:250

REV: 3



COMMENTS

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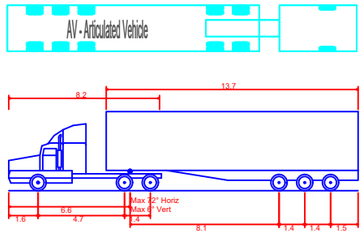
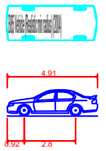


AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m



B85 Vehicle (Realistic min radius) (2004)

Overall Length	4.910m
Overall Width	1.870m
Overall Body Height	1.421m
Min Body Ground Clearance	0.159m
Track Width	1.770m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	5.750m

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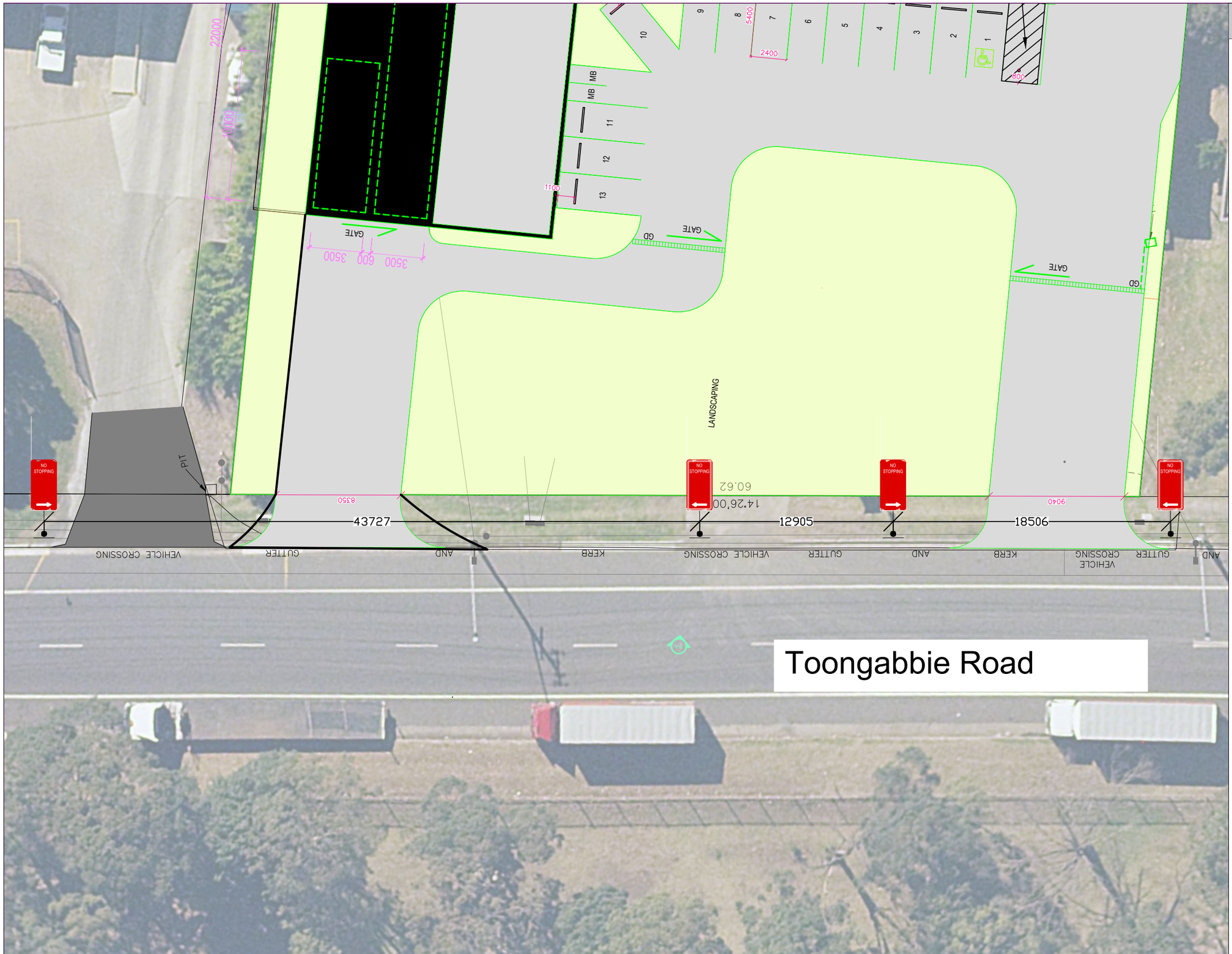
2	18/03/20	FOR INFORMATION	EL	AU
1	10/02/20	FOR INFORMATION	EL	AU

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Shed A - Inbound Swept Path

CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-005
PROJECT #:	J180524
SCALE:	1:250

REV: 3



COMMENTS

A3

Parking supply summary
Loss: 8
Gain: 1
Net loss of 7 parking spaces

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2	18/03/20	FOR INFORMATION	EL	AU
1	10/02/20	FOR INFORMATION	EL	AU

REV	DATE	COMMENT	DRAWN	REVIEWED

PROJECT:
Girraween Waste Recycling and Transfer Facility
224-232 Toongabbie Road, Girraween

DRAWING TITLE:
Signage Plan

CLIENT:	Benedict Recycling Pty Ltd
DRG. #:	EMM-101
PROJECT #:	J180524
SCALE:	1:250

REV: 3

Appendix C

Response to Cumberland Council's traffic matters

Memorandum

Ground floor, 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

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E info@emmconsulting.com.au

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10 February 2020

To: John Arnold - Assoicate Environmental Planner
From: Eric Lei, Traffic Engineer
Subject: 224-232 Toongabbie Road, Girraween - Dedicated Inbound Right Turn Lane Warrant Assessment

Dear Sirs,

This memo undertakes a warrant assessment for a dedicated right turn bay on Toongabbie Road at the entry driveway to the subject property. The proposed development will have separate entry and exit driveways on Toongabbie Road. This assessment aims to determine the potential for queuing and delay of northbound traffic on Toongabbie Road due to the hold up of entry vehicles waiting to turn right into the site.

1 Existing traffic

A traffic survey was conducted at the intersection of Toongabbie Road with Mandoon Road on Thursday 31 January 2019 for the following hours, as outlined in the Traffic Impact Assessment (TIA) report prepared by EMM Consulting in October 2019:

- 06:00-09:00
- 11:00-14:00
- 15:00-18:00

Given its proximity to the development site (230 m from Mandoon Road) with no alternative route, the traffic volume recorded at the intersection would represent the through traffic on Toongabbie Road at the proposed entry driveway. The relevant traffic volumes at the peak hours are extracted from the survey as follows:

Table 1.1 Existing traffic volumes

Toongabbie Road	AM (08:00-09:00)		MD (12:45-13:45)		PM (15:00-16:00)	
	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle
Northbound	538	34	307	34	397	31
Southbound	618	45	389	45	686	38

2 Proposed traffic

The peak hour traffic generation as a result of the proposed development was also discussed in the TIA and is presented as follows:

Table 2.1 Traffic generation

Turning Movement	08:00-09:00		12:45-13:45		15:00-16:00	
	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle	Light Vehicle	Heavy Vehicle
Inbound	6	7	12	11	9	6
Outbound	6	7	9	11	9	6

The following traffic distribution was considered in the TIA:

- 80% of all traffic travelling to and from the south
- 20% of all traffic travelling to and from the north

The corresponding estimated traffic at the entry driveway on Toongabbie Road is presented below:

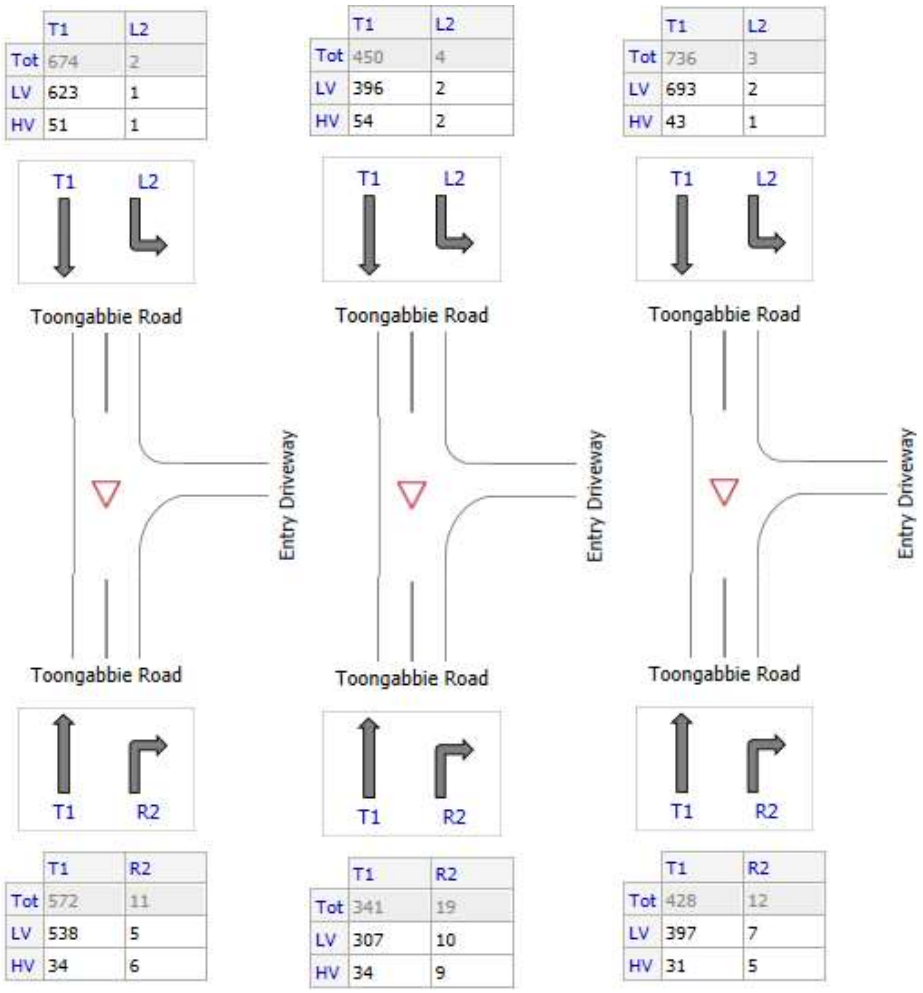


Figure 2.1 Traffic volumes (left: AM | middle: MD | right: PM)

3 Intersection analysis

The performance of the intersection at the three nominated peak hours is analysed using SIDRA 8 – an industry standard intersection analysis software. The results are presented in the following table:

Table 3.1 Intersection Performance

Turn	AM				MD				PM			
	DoS[1]	LoS[2]	DEL[3] (s)	QUE[4] (m)	DoS	LoS	DEL (s)	QUE (m)	DoS	LoS	DEL (s)	QUE (m)
Northbound												
Through	0.348	A	0.7	4.4	0.226	A	0.5	3.0	0.271	A	0.8	4.0
Right	0.348	B	16.2	4.4	0.226	A	9.5	3.0	0.271	B	15.2	4.0
Southbound												
Left	0.383	A	9.7	0.0	0.265	A	9.7	0.0	0.414	A	9.4	0.0
Through	0.383	A	0.0	0.0	0.265	A	0.0	0.0	0.414	A	0.0	0.0

[1] Degree of Saturation – the total usage of the intersection expressed as a factor of 1 with 1 representing 100% use/saturation (e.g. 0.8=80% saturation).

[2] Level of Service – this is a categorisation of average delay, intended for simple reference. For priority intersection, LoS A represents good operation while LoS B represents acceptable delays and spare capacity.

[3] Average Delay – the average delay encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay.

[4] 95th Percentile Queue Length – is defined to be the queue length that has only a 5-percent probability of being exceeded during the analysed time period. It transforms the average delay into measurable distance units.

The results show that all movements will have a LoS A or B with significant spare capacity during all the three peak hours. Particularly, the northbound through movement will have a LoS A with minimal average delays (0.8 seconds) and queuing (4.4 m maximum). Therefore, any dedicated right turn bay for the northbound traffic on Toongabbie Road at the entry driveway is not warranted.

4 Conclusion

In summary, the existing intersection configuration will accommodate forecast traffic generation to the site with minimal impact on the northbound through traffic on Toongabbie Road. Therefore, no dedicated right turn bay is required. This will allow retention of the existing kerbside parking spaces on the western side of Toongabbie Road, opposite to the entry driveway.

If you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Yours sincerely

Drafted by

Eric Lei
Traffic Engineer
elei@emmconsulting.com.au

Reviewed by

Abdullah Uddin
Associate Traffic Engineer
auddin@emmconsulting.com.au

Appendix A

SIDRA result

MOVEMENT SUMMARY

Site: 101 [Toongabbie Road/Entry Driveway AM]

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Toongabbie Road												
2	T1	602	5.9	0.348	0.7	LOS A	0.6	4.4	0.07	0.02	0.10	57.0
3	R2	12	54.5	0.348	16.2	LOS B	0.6	4.4	0.07	0.02	0.10	10.9
Approach		614	6.9	0.348	1.0	NA	0.6	4.4	0.07	0.02	0.10	49.4
North: Toongabbie Road												
7	L2	2	50.0	0.383	9.7	LOS A	0.0	0.0	0.00	0.00	0.00	52.4
8	T1	709	7.6	0.383	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		712	7.7	0.383	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1325	7.3	0.383	0.5	NA	0.6	4.4	0.03	0.01	0.04	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Toongabbie Road/Entry Driveway MD]

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Toongabbie Road												
2	T1	359	10.0	0.226	0.5	LOS A	0.4	3.0	0.10	0.05	0.10	57.2
3	R2	20	47.4	0.226	9.5	LOS A	0.4	3.0	0.10	0.05	0.10	10.9
Approach		379	11.9	0.226	0.9	NA	0.4	3.0	0.10	0.05	0.10	40.4
North: Toongabbie Road												
7	L2	4	50.0	0.265	9.7	LOS A	0.0	0.0	0.00	0.01	0.00	52.4
8	T1	474	12.0	0.265	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		478	12.3	0.265	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles		857	12.2	0.265	0.5	NA	0.4	3.0	0.05	0.03	0.05	49.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Toongabbie Road/Entry Driveway PM]

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Toongabbie Road												
2	T1	451	7.2	0.271	0.8	LOS A	0.5	4.0	0.10	0.03	0.11	56.1
3	R2	13	41.7	0.271	15.2	LOS B	0.5	4.0	0.10	0.03	0.11	10.8
Approach		463	8.2	0.271	1.2	NA	0.5	4.0	0.10	0.03	0.11	46.2
North: Toongabbie Road												
7	L2	3	33.3	0.414	9.4	LOS A	0.0	0.0	0.00	0.00	0.00	53.7
8	T1	775	5.8	0.414	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		778	6.0	0.414	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
All Vehicles		1241	6.8	0.414	0.5	NA	0.5	4.0	0.04	0.01	0.04	53.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix D

Details of gross pollutant trap

Product Evaluation

Removal Characteristics of the VortSentry® Model HS48 using the OK-110 Test Standard

Introduction

The VortSentry® Model HS (VSHS) is an offline treatment chamber that allows for the settling of solids and the separation of free oil and grease commonly found in stormwater runoff. As a newly introduced product, testing is required to develop an understanding of operating characteristics.

The performance characteristics of the VSHS were assessed under controlled, laboratory conditions. Multiple simulations were performed using OK-110, a commercially available sand product as the test material for solids removal. This study yielded a removal performance characteristic that is statistically significant ($P<0.0001$) and facilitates the integration of the product into various stormwater treatment system designs based upon specific solids removal requirements. The study also assessed the head loss across the system at different flow rates.

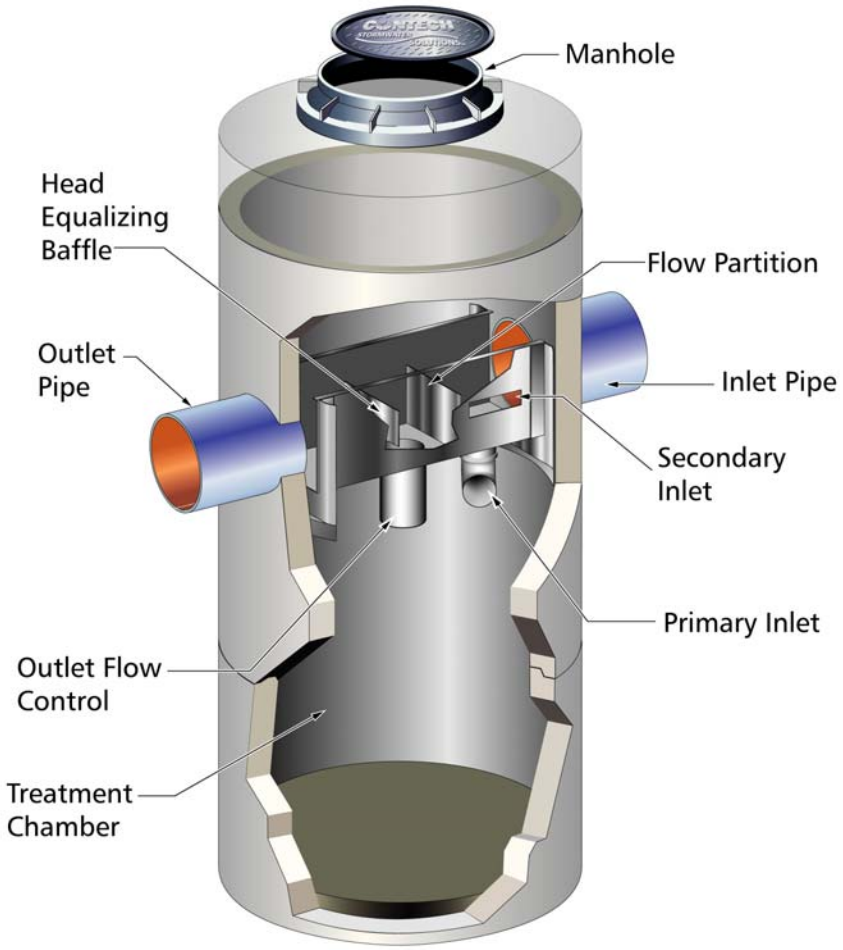


Figure 1. Design and construction of the VortSentry® Model HS.

Procedure

Contaminant

A commercial sand product, OK-110, is specified by the State of Maine Department of Environmental Protection as a standard for solids removal testing (MEDEP, n.d.). This product is manufactured by the US Silica Company* and the materials used for testing originated from the Mill Creek, OK plant. OK-110 is a natural silica sand product (SG=2.65) consisting of unground sand that has been processed to produce a distribution of particles between 50-um and 200-um with a d50 of approximately 105-um. A particle size distribution for OK-110 is shown in Figure 2, revealing a texture (USDA scale) consisting of 100% sand, 0% silt, and 0% clay-sized particles.

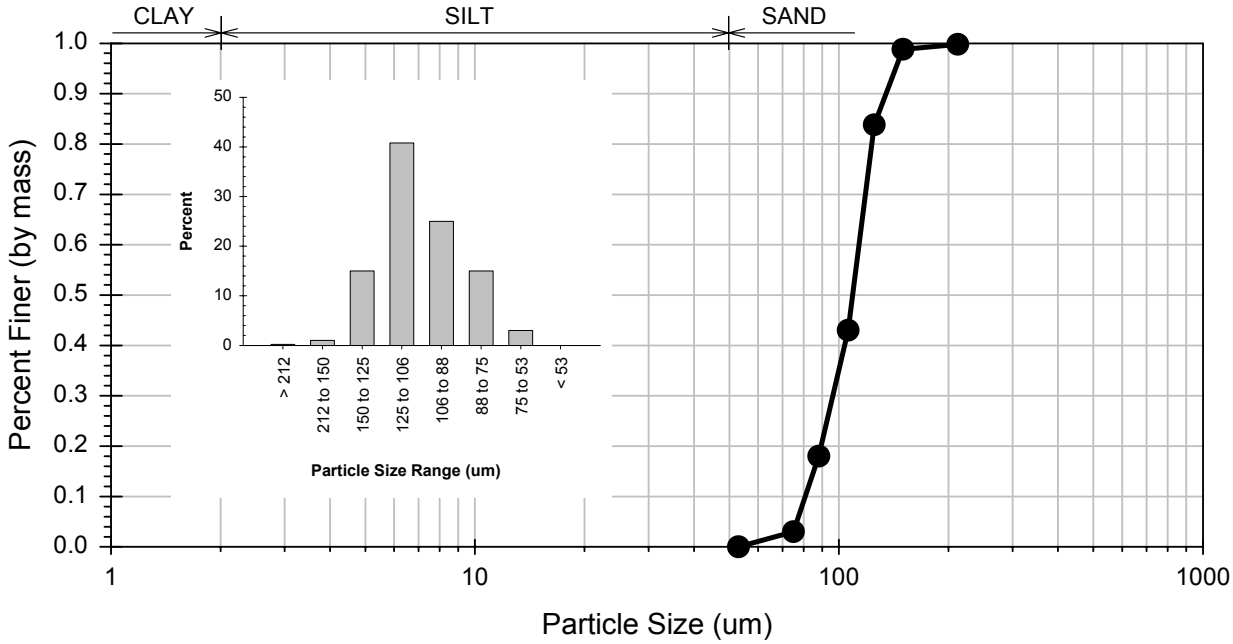


Figure 2. Particle size distribution of OK-110 based upon manufacturer specifications (U. S. Silica, ND).

Test Apparatus

The typical VSHS consists of an inline flow control structure and a treatment chamber and is shown in Figure 1. As water enters the flow control structure through the inlet pipe, the water quality design flow is directed into the treatment chamber by the flow partition. Upon entering the treatment chamber, the flow is directed in a tangential direction, which promotes a helical flow regime. The centrally-located outlet flow control is used to additionally promote a helical flow regime and direct treated water to the outlet pipe.

In the VSHS treatment chamber, heavier solids settle to the bottom, while floatables and free oil and grease rise to the top. The use of a helical flow path ensures a controlled, extended flow regime and is the primary factor behind its effectiveness. When a storm exceeds the design flow capacity of the VSHS, the high flow is routed over the flow partition, bypassing the treatment chamber.

A VortSentry Model HS48 was used for testing. This unit consisted of a 1.2-m (4-ft) diameter, welded aluminum structure with a maximum depth of 2.0-m (6.5-ft) between the floor of the treatment chamber and the invert of the inlet pipe. The diameter of the inlet and outlet pipes of the test system were 305-mm (12-in) and entered and exited the test system as shown in Figure 1. The flow partition was set at the maximum elevation of 597-mm (23.5-in) to prevent bypass and thereby facilitate the evaluation of the treatment chamber under a wide range of flows.

As shown in Figure 3, the VSHS test unit was tested using a recirculation system. Influent was stored in a 5,500 gallon HDPE tank and allowed to gravity-drain into the test unit. Effluent was

* U.S. Silica Company, P.O. Box 187, Berkeley Springs, WV 25411; (800) 243-7500; www.u-s-silica.com

captured in a 1.8-m x 3.7-m x 0.9-m (6.0-ft x 12.0-ft x 3.0-ft) (LxWxD) aluminum catch tank and returned to the influent tank via 152-mm (6-in) lines connected to two individual 10-hp submersible pumps. Flow was controlled by calibrated butterfly valves placed on the influent and return lines that were operated to produce a steady-state flow condition. Flow was measured with an area-velocity flow sensor (ISCO 4250). All piping was of PVC construction.

OK-110 was injected as concentrated slurry downward into the influent pipe via a slurry injection port located 5-ft upstream of the test unit, and kept from recirculating within the apparatus by filtering the effluent as it passed through the catch tank (Figure 3). The slurry injection system is detailed in Figure 4. Slurry was produced in a 1200-L (320-gal), conical bottom, polyethylene (PE) tank (Chem-Tainer). The conical bottom design ensured the continuous circulation of materials within the slurry tank. Suspension of solids within the slurry tank was maintained by a 1-hp, electric, mixer with dual 5-in propellers (INDCO Model CL1-T). The propeller design maximized the vertical circulation of solids within the tank and ensured the homogeneity of the mixture. Four, evenly spaced, vertically oriented baffles, measuring 107-cm x 7.6-cm x 1.3-cm (42-in x 3.0-in x 0.5-in) (LxWxThickness), affixed to the sidewalls of the slurry tank prevented mixer-induced vortexing. A peristaltic pump (Randolph Austin, 95 L/min (25gpm)) was used to inject slurry into the slurry injection port at a velocity of 1.2 m/s to 1.9 m/s (4.0 fps to 6.1 fps; flow of 10 gpm to 15 gpm) and circulate water through the underlying manifold of the slurry tank before injection so as to eliminate any possibility of sediment accumulation in the manifold. A 25-mm (1-in), three-way ball valve was used to divert the slurry recirculating through the slurry tank manifold to the injection port via an injection manifold consisting of 25-mm wire-reinforced PVC tubing and a vane-indicator flowmeter (ERDCO See-Flow 3222-03T0). The three-way valve allowed water to continuously circulate through the slurry tank manifold so as to eliminate the gradual settling of materials in the manifold or at the bottom of the tank prior to testing and during sampling.

The effluent filter consisted of a plate containing 12, 210-mm (8.5-in) dia. x 0.86-m (34-in), 50-um nominal-rated, polyester felt filter bags. Effluent from the VSHS outlet pipe freely discharged into the catch tank and was pumped back to the influent tank after passing through the filter bags.

To eliminate error due to the effects of water temperature on water viscosity and thus settling performance, a temperature control system was used to keep the system at a temperature between 23°C and 26°C (73°F and 79°F) as prescribed by the New Jersey Department of Environmental Protection (NJDEP, 2003) for lab testing of stormwater BMPs. This system consisted of an inline electric water heater with thermostat (Coates #32024CPH) and a circulation pump (Flotec 1/2-hp) that operated continuously throughout the study period. The slurry tank and slurry were not temperature controlled.

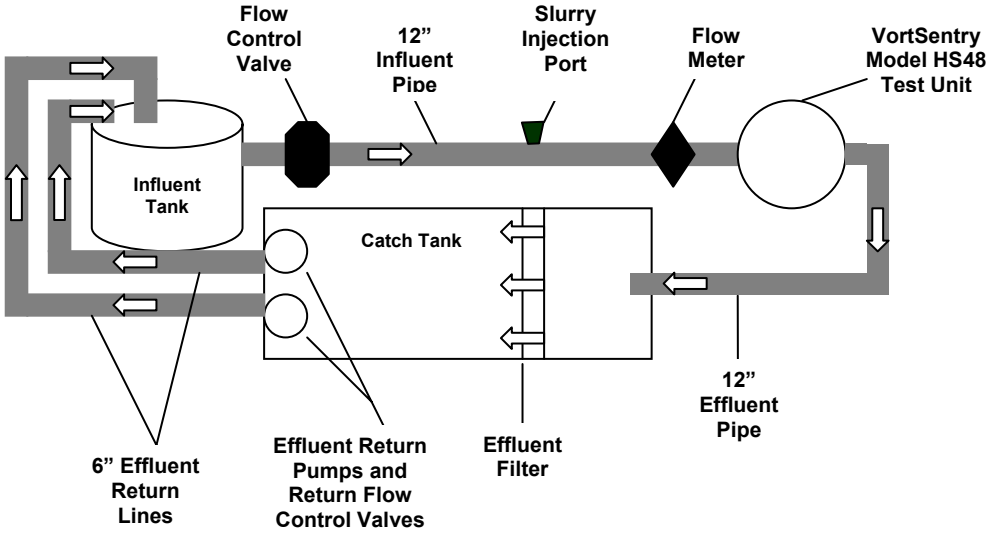


Figure 3. Schematic diagram of the VSHS test apparatus. Arrows indicate flow pathways.

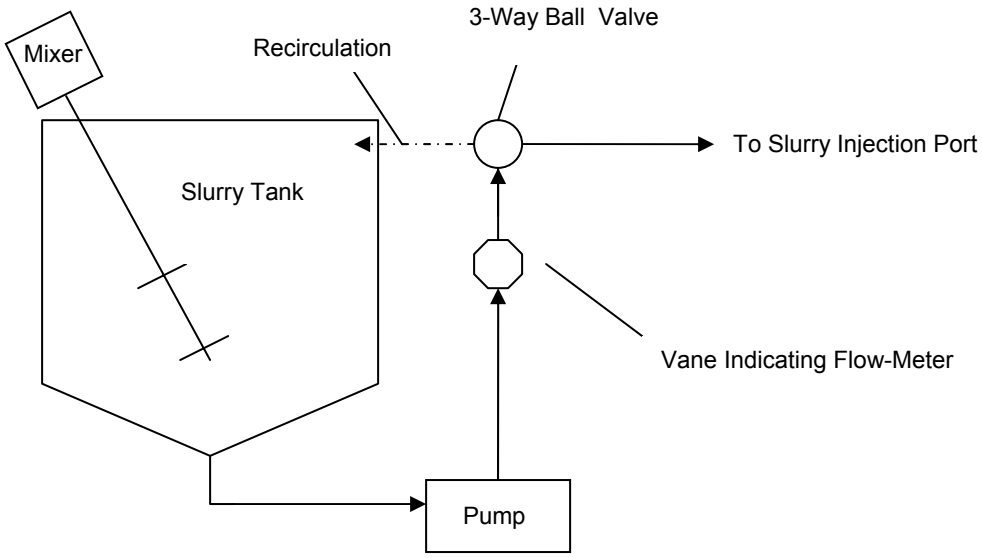


Figure 4. Schematic diagram of the slurry injection system. Arrows indicate flow pathways.

Operation

The operational procedure for performance evaluation consisted of performing multiple runoff simulations (sims). Prior to each sim, a new slurry solution was prepared by filling the drained and cleaned slurry tank with 1200-L of tap water, activating the pump and mixer, and adding the pre-determined quantity of OK-110 material. Slurry was allowed to mix and recirculate in the slurry tank for several minutes before use. Each sim was begun by commencing influent and effluent return flows at a predetermined flow rate. After attaining a steady-state flow condition, slurry injection was started at a predetermined flow rate and the temperature of water in the test apparatus was measured. The system was then given 3 residence times to equilibrate before the first set of corresponding background, slurry, and effluent samples were taken at 1-min intervals until a total of 6 sets had been collected. Following the collection of the last set of performance assessment samples, slurry injection and flow to the test unit were stopped. The test unit was drained and emptied of captured sediment between simulations.

Sampling

Discrete, influent, effluent, and background sample sets were collected for solids analysis. Sample analysis was performed in-house. For this document, a set is defined as a collection of background, influent, and effluent sample pairs corresponding to a specific sim.

Sample handling was performed in accordance with standard handling techniques. All samples to be tested for solids were promptly refrigerated and analyzed following collection. A trained CONTECH Technician performed analysis according to ASTM method D3977—essentially a “whole-sample” variation of EPA method 160.2.

Background, influent and effluent sampling points differed in complexity and use. Background samples were collected from the center of the influent reservoir using a GLI/Mannings Automatic Vacuum Sampler configured to automatically draw 450-mL samples in HDPE bottles at designated intervals during each sim. Due to the submerged inlet design of the VSHS and the potential for settling within the influent conveyance line, influent was sampled by sampling the slurry by momentarily putting the slurry tank in recirculation mode and then estimating influent solids concentration based upon the observed slurry concentration, known slurry injection rate, and known influent flow rate. Since the invert of the effluent pipe was several feet above the water surface elevation of the catch tank, effluent was sampled directly from the discharge of the effluent pipe.

Results

A total of seven simulations were performed at flow rates between 0.2 and 1.4 cfs. Results are shown in Table 1. Removal efficiencies were calculated by averaging the influent and effluent solids concentrations corresponding to a sim and applying the following standard formula: ((influent solids conc.) – (effluent solids conc.)) / (influent solids conc.). The results indicate a linear relationship between flow rate and removal efficiency that is significant at the 0.01% level (>99.99% probability that the regression explains the observations.) Seven background solids concentrations were measured and averaged 3 mg/L with a maximum of 5 mg/L and 47.6% of the observations returning non-detect at the 1 mg/L level, indicating a negligible level of background error such that performance observations could be left uncorrected for background concentrations. The performance curve based upon flow is shown in Figure 5 and demonstrates a gradual decrease in performance as flow increases to approximately 1.4 cfs. Head loss observations are also provided in Figure 5.

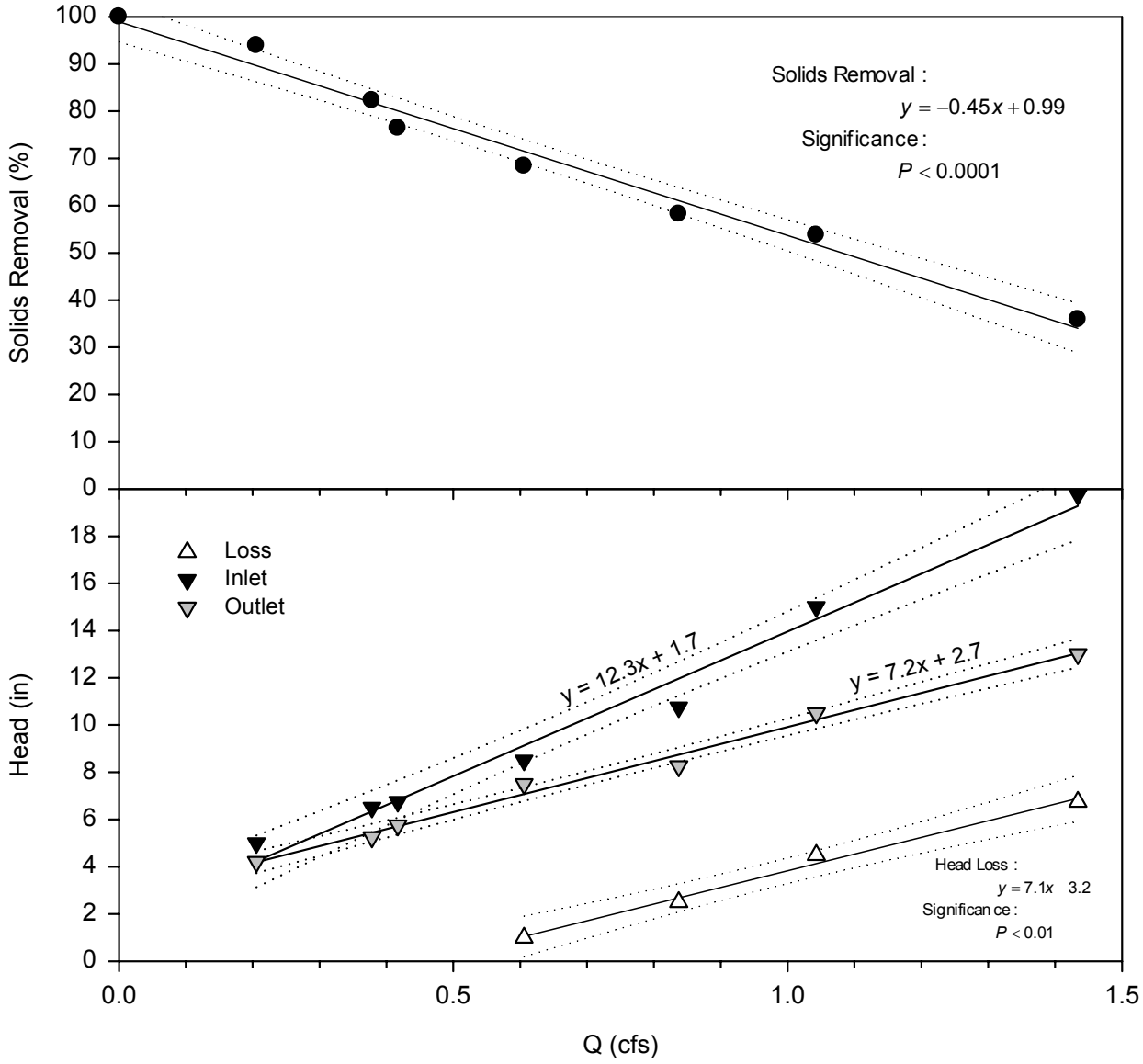


Figure 5. Removal performance relationship observed for the removal of OK-110 material by the VortSentry Model HS48 with disabled bypass under a "maintained" condition (sediment storage at 0% capacity), including head loss observations. Dotted lines indicate 95% confidence intervals.

Average Q (cfs)	0.21		0.38		0.42		0.61		0.84		1.04		1.43	
Sample Location	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.	Inf.	Eff.
Concentration (mg/L)	287	15	310	56	251	45	261	69	255	99	287	133	316	196
	278	14	330	56	253	58	271	94	252	110	294	117	308	224
	273	21	323	55	249	65	278	95	255	102	275	134	306	207
	267	18	321	58	249	46	273	90	255	101	280	141	299	177
	249	16	308	53	233	67	256	78	252	104	286	132	315	191
	230	13	304	57	223	64	251	76	252	119	282	132	302	189
Average (mg/L)	264	16	316	56	243	57	265	84	253	106	284	131	308	197
Efficiency (%)	94		82		76		68		58		54		36	

Table 1. Removal performance observations for the removal of OK-110 material by the VortSentry Model HS48 under a "maintained" condition (sediment storage at 0% capacity).

Discussion

The approach used in this study successfully allowed the measurement of VortSentry Model HS48 performance characteristics over a range of flows. The target influent solids concentration for each performance evaluation sim was 260 mg/L. The observed influent solids concentrations fluctuated between 223 mg/L and 330 mg/L over the course of the study with an average of 242 mg/L. While some manifestations of error are evident, the data is of sufficient quality to allow the development of a statistically significant (P<0.0001) equation that can be used to estimate the level of treatment provided by the treatment chamber at various flow settings within the range tested.

Before final removal performance curves can be generated, the optimal flow partition height must first be determined. Under bypass conditions, the VSHS design will continue to allow the maximum treatment flow to pass through the treatment chamber due to both the offline location of the treatment chamber with respect to bypass and the incorporation of a head equalization baffle. The elevation of the flow partition should be set so as to provide the best overall removal performance under a full range of flow conditions.

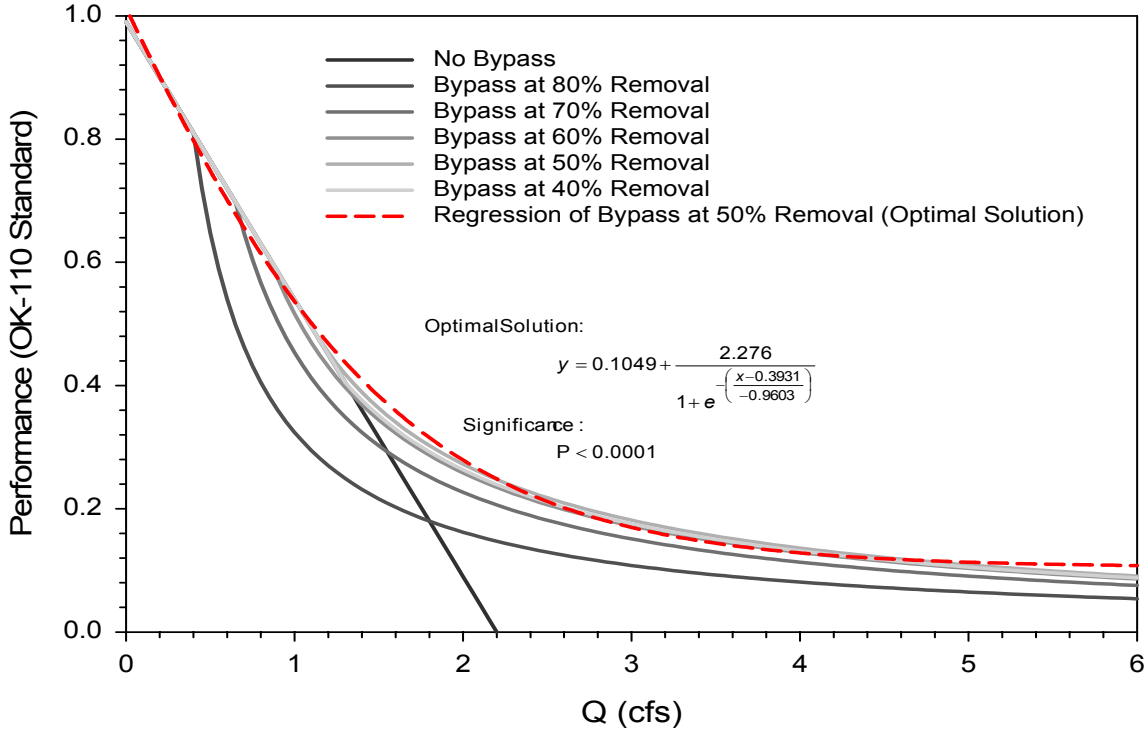


Figure 6. Performance curves for the removal of OK-110 material by the VortSentry Model HS48 under a "maintained" condition (sediment storage at 0% capacity) and at various bypass settings with respect to removal of the OK-110 standard.

The removal performance of a VSHS under a full range of flow conditions can be easily modeled for an offline system based upon the removal performance of the treatment chamber (removal performance relationship shown in Figure 5). By specifying maximum treatment flow and applying the assumption that additional flow will bypass and thus receive zero treatment, removal performance under a full range of flow conditions can be modeled and an removal performance curve can be generated.

Figure 6 shows the removal performance curves for a VSHS under a variety of maximum treatment flow conditions. Removal performance under overflow conditions was estimated by multiplying the level of treatment afforded the maximum treatment flow (according to the removal performance relationship) by the fraction of the total flow represented by the maximum treatment flow. The resulting curves indicate that given the performance characteristics of the VSHS design based upon the OK-110 test standard, the best overall system performance is afforded when the maximum treatment flow affords 50% removal, which corresponds to a flow rate of 1.1-cfs.

Conclusion

This experiment successfully identified the operating characteristics and optimal flow partition height of the VortSentry Model HS48 for flows up to 1.4 cfs. This information can now be used to appropriately match the VSHS to stormwater treatment applications. In Summary:

1. When operated in a “maintained” condition (sediment storage at 0% capacity), the VortSentry Model HS48 provides removal of solids (OK-110) according to the function defined in Figure 5, demonstrating >80% removal at flows below 0.42cfs;
2. Recommend flow partition height corresponds to a maximum treatment flow of 1.1-cfs (50% removal of OK-110), which was observed to be 15.1-in for the test system.

It is important to emphasize that these conclusions reflect laboratory-based testing performed under controlled conditions. Field conditions are notoriously variable with regard to solids characteristics and sampling methods, and comparison of this experiment to field-derived data will be accordingly affected. Laboratory studies are best suited for the evaluation of system performance potential as part of the product development or system comparison process.

References

Maine Department of Environmental Protection (MEDEP). (n.d.). Laboratory Testing Protocol for Manufactured Stormwater Treatment Systems. Portland, Maine: Author

New Jersey Department of Environmental Protection (NJDEP). (2003). Total Suspended Solids Laboratory Testing Procedure. Retrieved November 8, 2006 from: http://www.state.nj.us/dep/dsr/bscit/TestProcedure_Dec%2703_.pdf

U.S. Silica. (undated). Mill Creek Unground Silica. Retrieved December 11, 2006, from: http://www.u-s-silica.com/PDS/Mill%20Creek/MiCOK1102002.PDF

Revision History

PE-G180
Original.

VortSentry® HS

Technical Design Guide

Table of Contents

Rev: *1* ***Last Updated:*** *March 2019*

Introduction

The VortSentry® HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry® HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures.

Operational Overview

The internal flow controls of the VortSentry® HS are illustrated in Figure 1. Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

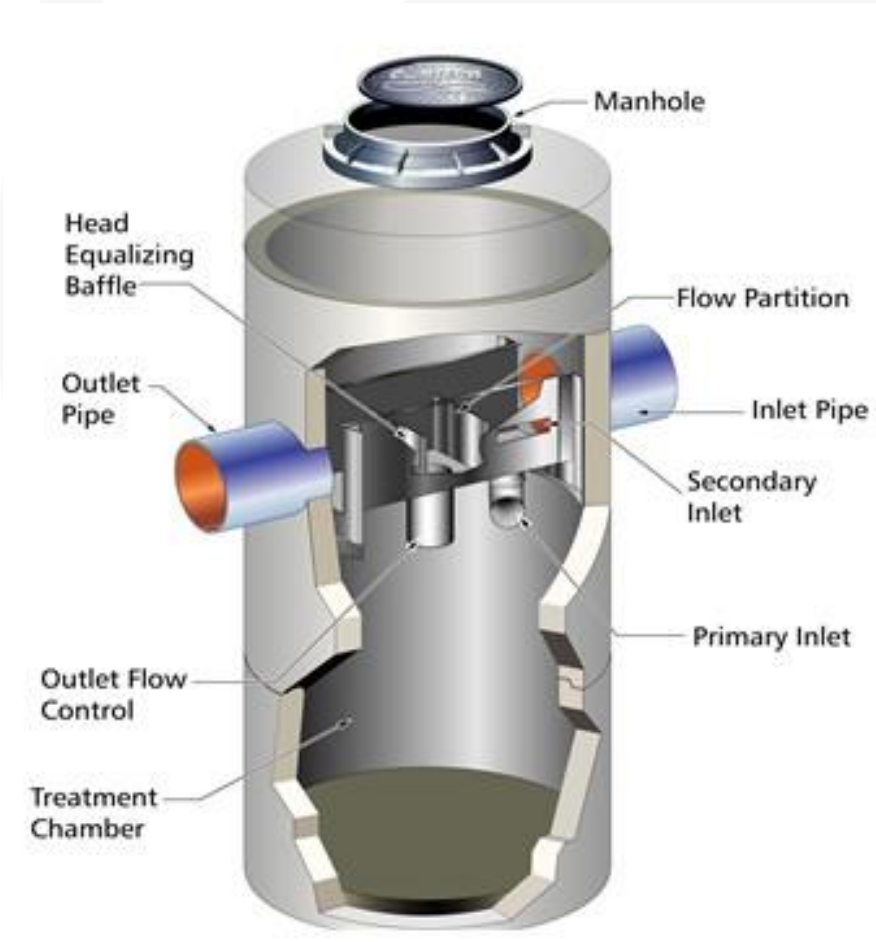


Figure 1: VortSentry HS components

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition.

During bypass, the head equalising baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.

Selection Process

For online installation the first step in the selection process is to determine the proposed pipe size at the GPT location and then to select a model from Table 1.

The pipe size for each model in Table 1, denotes the maximum hydraulic capacity that the VortSentry® can convey when in an online configuration.

When the VortSentry® is part of a treatment train the TFR can be selected to complement or match the flow of the other treatment systems. Modelling of the treatment system using MUSIC is often required to determine the overall performance of the treatment train.

If the listed pipe size for the selected HS model is not able to meet the sites hydraulic flow capacity then a larger model will need to be selected

Model	Treatable Flow Rate Range (L/s)	Max. Pipe Diameter (mm)	Diameter (m)	Sediment Storage Capacity (m^3)	Oil Storage Capacity (litre)	Typical Depth Below invert (m)
HS09	5.3 - 15.6	450	0.9	0.4	314	1.7
HS12	11.8 - 34.0	600	1.2	0.7	598	2.1
HS15	21.8 - 62.3	750	1.5	1.1	798	2.4
HS18	36 - 104.8	900	1.8	1.6	1409	2.8
HS21	55 - 158.6	1050	2.1	2.1	2458	3.2
HS24	79.4 - 229.4	1200	2.4	2.8	3199	3.5

Table 1: Available models

VortSentry® HS systems are designed to achieve an 80% Total Suspended Solids reduction at the Treatable Flow Rate (TFR) based on lab generated performance analysis for a particle gradation with an average particle size (d50) of 110-microns (µm).

The VortSentry® HS is designed to treat all flows up to the TFR. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the TFR is surpassed. At influent rates higher than the TFR, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as - *The rate at which the VortSentry® HS will remove a specific gradation of sediment at a specific removal efficiency.*

The TFR can be varied depending on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

Hydraulic Capacity up to peak flow

The VortSentry® HS has an open accessible centre trough that is designed to the suit the hydraulic capacity of the incoming pipe. The trough walls are sized to ensure that its crest is above the maximum Top Water Level (TWL) at the weir and also within the treatment chamber. This ensures that no captured floating pollutants is inadvertently lost during a larger event.

The open trough arrangement helps with visual inspection for blockages and access to all areas for maintenance.

Configurations

The VortSentry® has the inlet and outlet pipes at 180º to each other as per Figure 1.

Multiple pipe inlets directly into the HS is not practical. For multiple inlets pipes, bring these together with a junction pit and then locate the HS after the pit.

Mass load consideration

The VortSentry® HS is designed to capture and retain sediments and oils. The oils and litter that float and the material that settles into the sump of the VortSentry® HS needs to be periodically removed as per any other GPT. The sump sediment storage capacity of each VortSentry HS model is listed in Table 1. The frequency of maintenance depends on the amount of material generated within the contributing catchment and then mobilised in storm events.

The model selection process should consider the amount of anticipated pollution load and the subsequent frequency of maintenance. Annual sediment loads have been documented and can vary from 400 to 900 kg/ha/yr for Urban, Industrial and Commercial catchments. The density can also vary from 1.3 to 2.0 Tonne/m3 depending on the mix of organic, litter and sediment.

For assistance with selecting an appropriate VortSentry® for your project or for additional dimensional or hydraulic information please contact the engineering department of Ocean Protect.

Performance

Full Scale Laboratory Test Results

The VortSentry® Hydrodynamic Separator system has undergone extensive testing in Scarborough, Maine, USA. Testing was conducted on the 1200-mm diameter VortSentry® HS12. Test flow rates ranged from 5-L/s to 40-L/s, and removal efficiencies were calculated for all flows.

All VortSentry® HS models have the same aspect ratio regardless of system diameter.

For additional information on the testing please refer to the Performance Summary which is available for each product.

Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the VortSentry® HS.

	Description of Typical Activities	Frequency
Minor Service	Visual inspection of flow control trough Removal of larger pollutants in trough Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants	At 12 Months

For further information please refer to the VortSentry HS Operations and Maintenance Manual

Support

- Drawings and specifications are available at www.oceanprotect.com.au
- Site-specific design support is available from our engineers.

VortSentry® HS

Engineered performance and installation simplicity

The VortSentry HS system employs a helical flow pattern that enhances containment of pollutants and provides effective removal of settleable solids and floating contaminants from urban runoff.

With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The design of the VortSentry HS minimises adverse velocities and turbulence in the treatment chamber. This helps to prevent washout of captured pollutants even during peak conditions.

The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofits.

Features and Benefits

Helical flow pattern

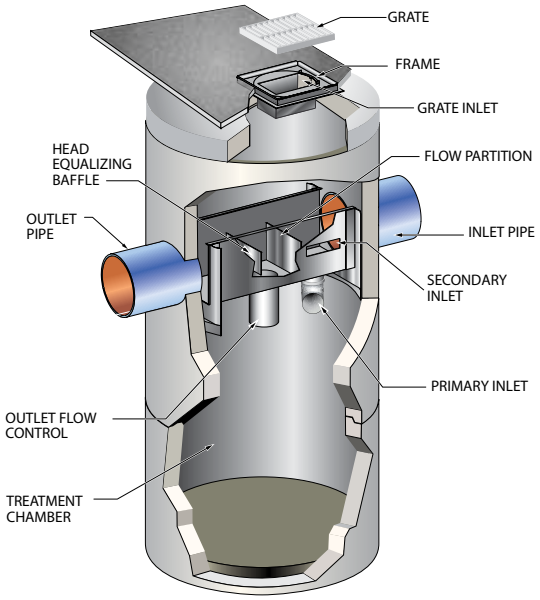
- Enhances trapping and containment of pollutants
- Provides effective removal of settleable solids and floating contaminants

Unique internal bypass

- Accepts a wide range of pipe sizes to treat and convey a wide range of flows
- Higher flows can be diverted without the use of external bypass structures
- Secondary inlet enhances floatable debris capture

Flexible, compact design

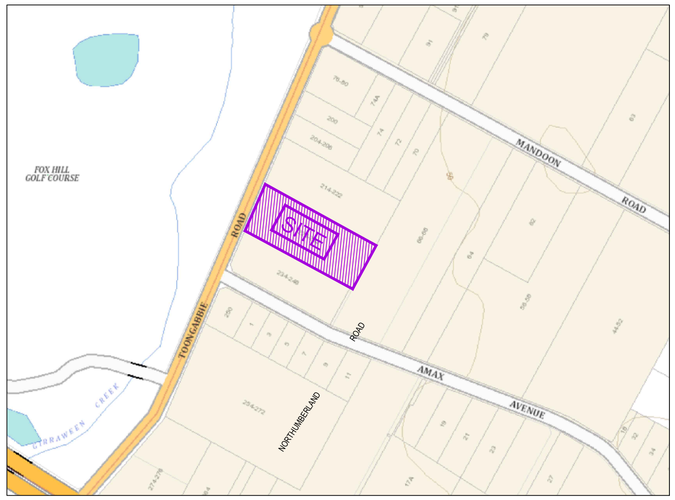
- Small manhole footprint
- Pipe Inlet and grated inlet configuration available
- Round, lightweight construction for easy installation



Appendix E

On-site stormwater detention design

224-232 Toongabbie Road, Giraween
Stage 2 On-Site Detention (OSD) Design
for
Benedict Recycling



LOCALITY PLAN
NTS

DRAWING LIST

DRAWING STATUS: TENDER

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY CIVIL CERTIFICATION AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE CIVIL CERTIFICATION DRG REGISTER/TRANSMITTAL

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53 Werona Avenue
Gordon NSW 2072

Client: **BENEDICT RECYCLING**

Project: **224 - 232 TOONGABBIE ROAD, GIRAWEEN**
STAGE 2 OSD DESIGN

Title: TITLE SHEET, LOCALITY PLAN & DRAWING LIST

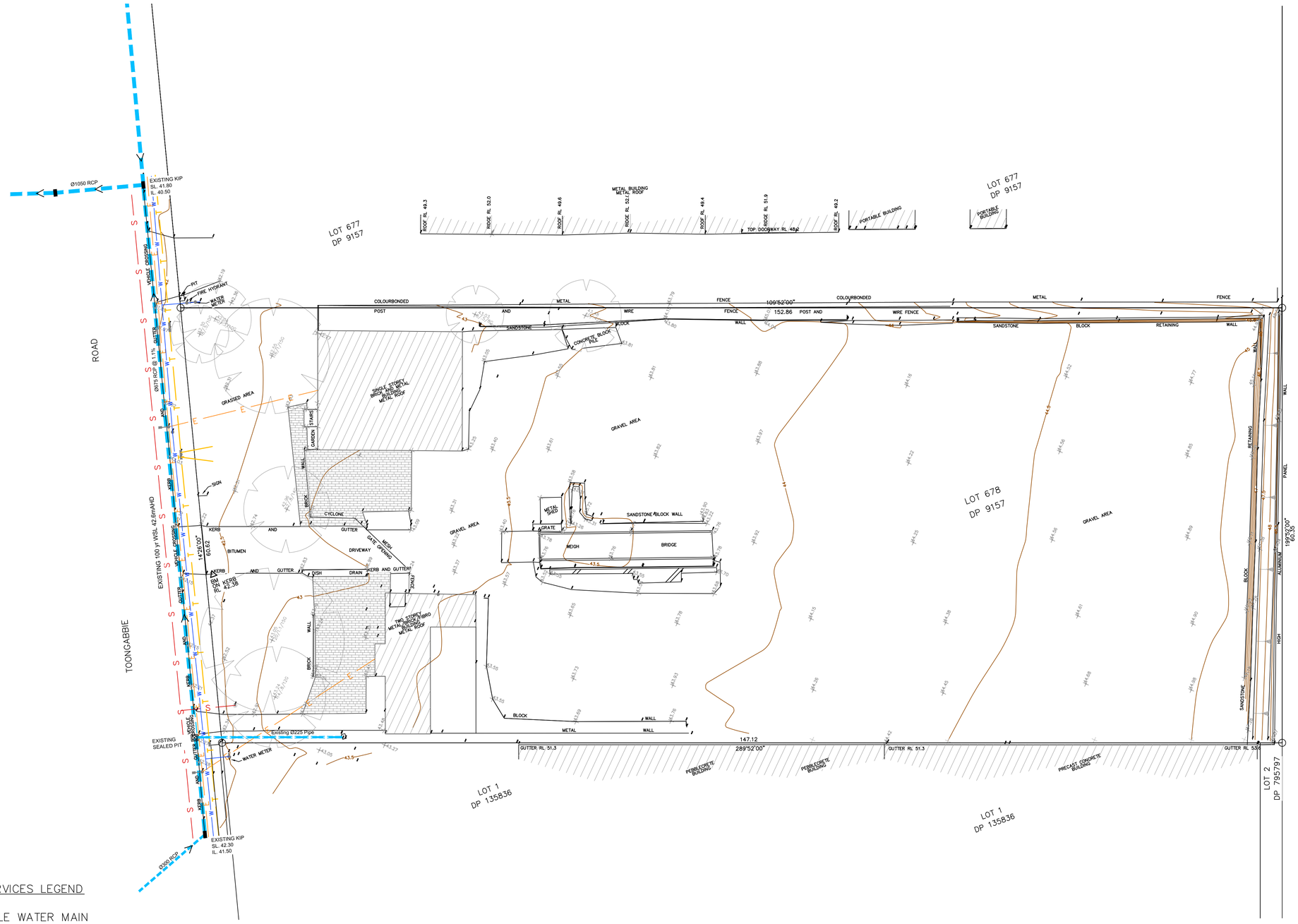
NOT TO SCALE

Drawing No. 01 of 11

Issue: Rev [00] 12.03.20

Cad File No. 335 - 01

A1



UNDERGROUND SERVICES LEGEND

- W — POTABLE WATER MAIN
- D — STORMWATER PIPE
- S — SEWER MAIN
- E — ELECTRICITY CABLES
- G — TELSTRA
- EXISTING STORMWATER DRAINAGE LINE & DIRECTION

SURVEY BY John M. Daly & Associates Pty Ltd
(REF 18214DS) DATED 17-12-2018

EXISTING DETAIL SURVEY

SCALE 1:300

6 0 6 12 18 24 30
DIMENSIONS ARE IN METRES

1:300 (A1)

DRAWING STATUS: TENDER

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20

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Gordon NSW 2072

Client: **BENEDICT RECYCLING**

Project: **224 - 232 TOONGABBIE ROAD, GIRAWEEN**
STAGE 2 OSD DESIGN

Title: EXISTING DETAIL SURVEY

SCALE 1:300

Drawing No. 04 of 11

Issue Rev [00] 12.03.20

Cad File No. 335 - 04

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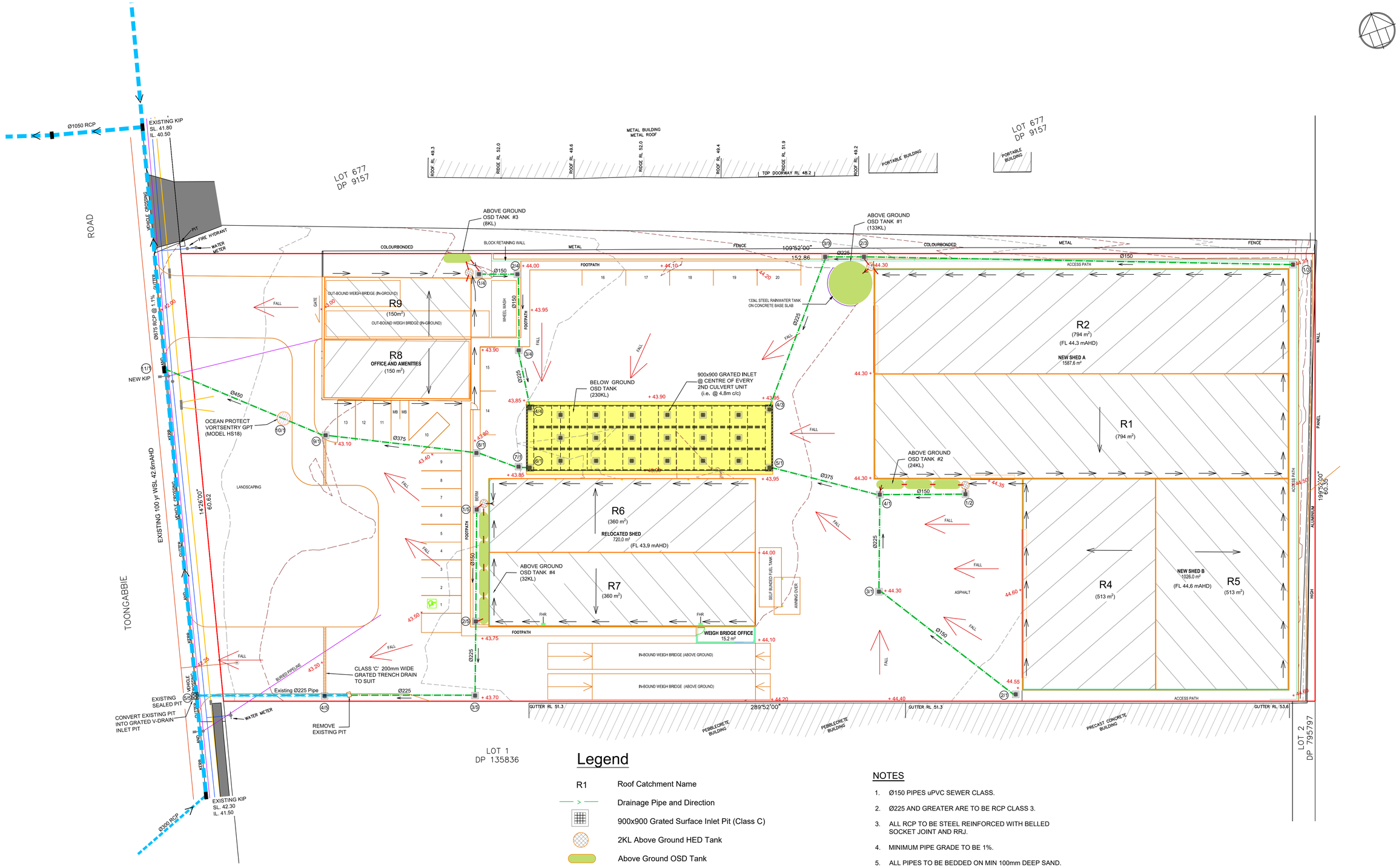

Legend

R1	Roof Catchment Name
	Drainage Pipe and Direction
	900x900 Grated Surface Inlet Pit (Class C)
	2KL Above Ground HED Tank
	Above Ground OSD Tank
	Below Ground OSD Tank
	100yr ARI Capacity Gutter & Pipes to convey Roof Runoff to Above Ground OSD Tanks

NOTES

1. Ø150 PIPES uPVC SEWER CLASS.
2. Ø225 AND GREATER ARE TO BE RCP CLASS 3.
3. ALL RCP TO BE STEEL REINFORCED WITH BELLED SOCKET JOINT AND RRJ.
4. MINIMUM PIPE GRADE TO BE 1%.
5. ALL PIPES TO BE BEDDED ON MIN 100mm DEEP SAND.

5 0 5 10 15 20 25 1:250 (A1)

DIMENSIONS ARE IN METRES

DRAWING STATUS: TENDER

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
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Gordon NSW 2072

Client: **BENEDICT RECYCLING**

Project: **224 - 232 TOONGABBIE ROAD, GIRAWEEN STAGE 2 OSD DESIGN**

Title: DRAINAGE PLAN

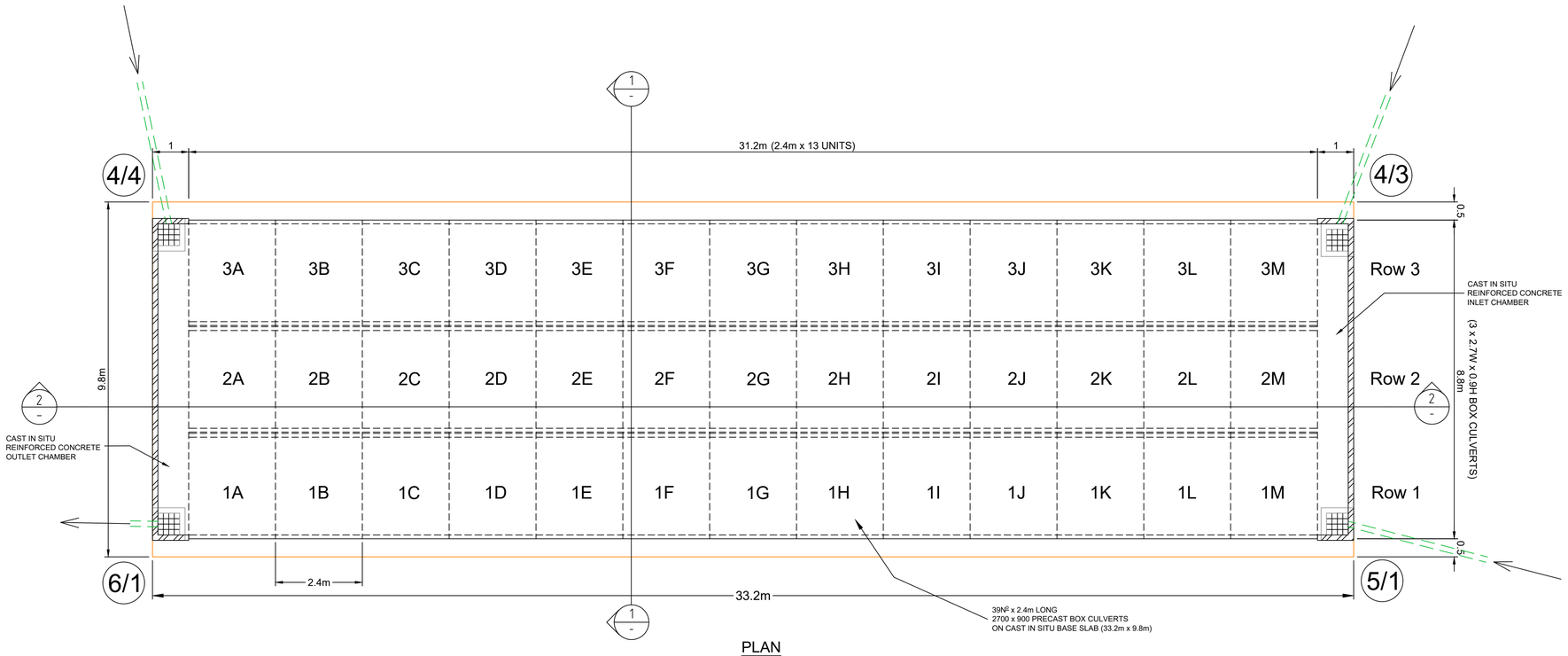
SCALE 1:250

Drawing No. 05 of 11

Issue: Rev [00] 12.03.20

Cad File No. 335 - 05

A1

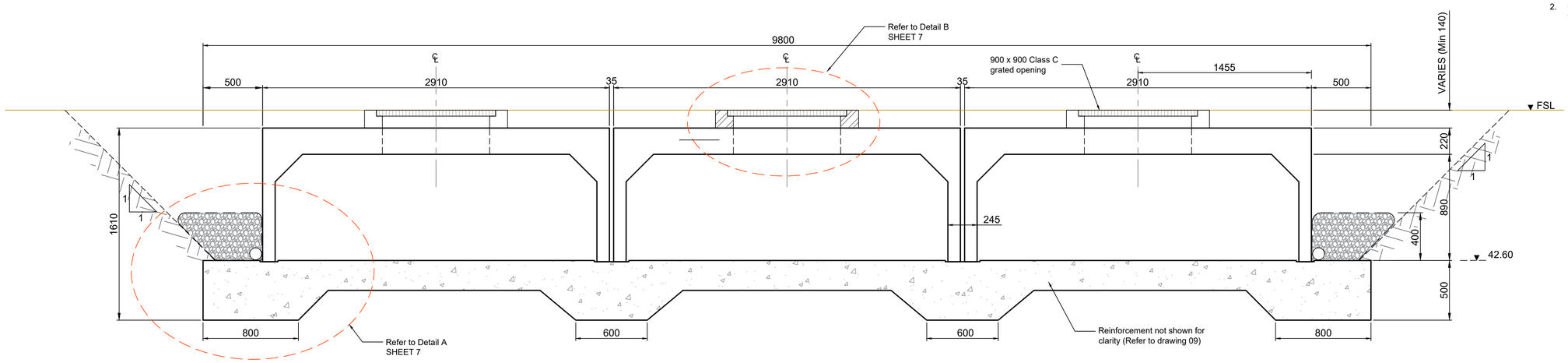


PLAN
BELOW GROUND OSD TANK
(VOLUME = 230m³)
SCALE 1:75

SCHEDULE OF PRECAST BOX CULVERTS				
No.	NAME	SIZE (ID) W X H	LENGTH	TYPE #
1	1A	2700 x 900	2400	STD
2	1B	2700 x 900	2400	OP
3	1C	2700 x 900	2400	STD
4	1D	2700 x 900	2400	OP
5	1E	2700 x 900	2400	STD
6	1F	2700 x 900	2400	OP
7	1G	2700 x 900	2400	STD
8	1H	2700 x 900	2400	OP
9	1I	2700 x 900	2400	STD
10	1J	2700 x 900	2400	OP
11	1K	2700 x 900	2400	STD
12	1L	2700 x 900	2400	OP
13	1M	2700 x 900	2400	STD
14	2A	2700 x 900	2400	STD
15	2B	2700 x 900	2400	OP
16	2C	2700 x 900	2400	STD
17	2D	2700 x 900	2400	OP
18	2E	2700 x 900	2400	STD
19	2F	2700 x 900	2400	OP
20	2G	2700 x 900	2400	STD
21	2H	2700 x 900	2400	OP
22	2I	2700 x 900	2400	STD
23	2J	2700 x 900	2400	OP
24	2K	2700 x 900	2400	STD
25	2L	2700 x 900	2400	OP
26	2M	2700 x 900	2400	STD
27	3A	2700 x 900	2400	STD
28	3B	2700 x 900	2400	OP
29	3C	2700 x 900	2400	STD
30	3D	2700 x 900	2400	OP
31	3E	2700 x 900	2400	STD
32	3F	2700 x 900	2400	OP
33	3G	2700 x 900	2400	STD
34	3H	2700 x 900	2400	OP
35	3I	2700 x 900	2400	STD
36	3J	2700 x 900	2400	OP
37	3K	2700 x 900	2400	STD
38	3L	2700 x 900	2400	OP
39	3M	2700 x 900	2400	STD

1. STD = STANDARD PRECAST CULVERT

2. OP = PRECAST CULVERT INCORPORATING 900x900 OPENING IN TOP OF UNIT (CENTRAL)



SECTION 1
BELOW GROUND OSD TANK
SCALE 1:20

0.4 0 0.4 0.8 1.2 1.6 2 1:20 (A1)
DIMENSIONS ARE IN METRES

15 0 15 30 45 60 75 1:750 (A1)
DIMENSIONS ARE IN METRES

DRAWING STATUS: TENDER

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY CIVIL CERTIFICATION AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE CIVIL CERTIFICATION DRG REGISTER/TRANSMITTAL

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Client
BENEDICT RECYCLING

Project
224 - 232 TOONGABBIE ROAD, GIRAWEEN
STAGE 2 OSD DESIGN

Title
OSD TANK GENERAL DETAILS
SHEET 1 OF 2

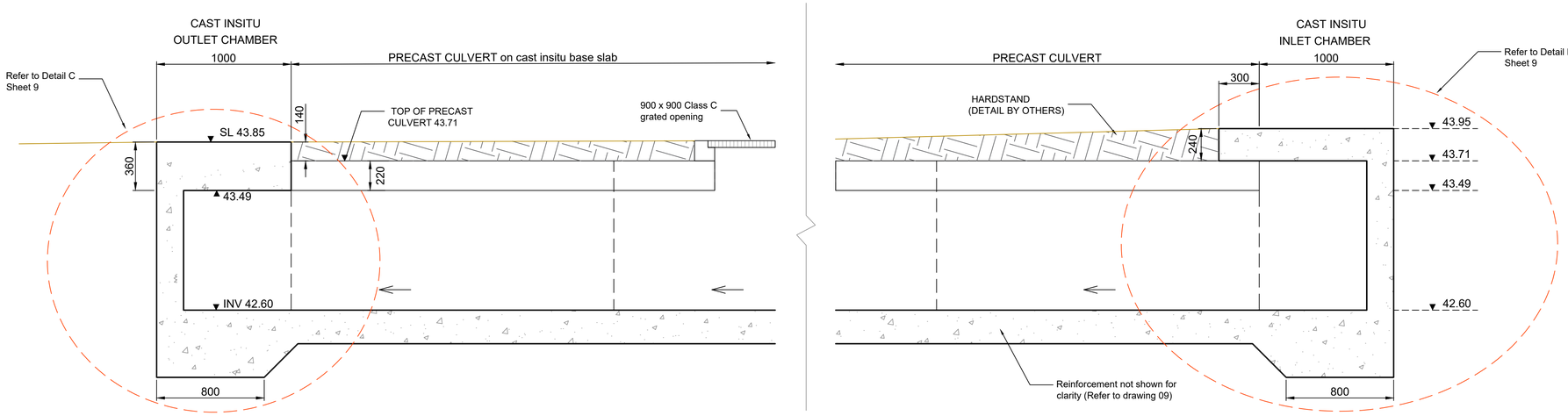
PLAN SCALE 1:100
SECTION SCALE 1:20

Drawing No.
06 of 11

Issue
Rev [00] 12.03.20

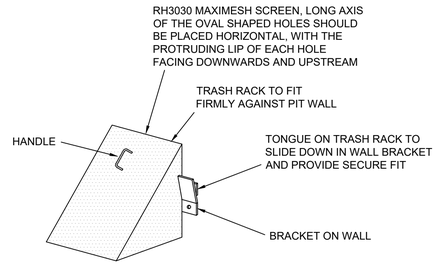
Cad File No.
335 - 06

A1



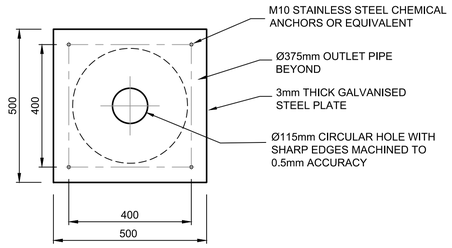
SECTION 2
BELOW GROUND OSD TANK

SCALE 1:20



TRASH SCREEN (PIT 7/1)

NOT TO SCALE



ORIFICE PLATE DETAIL (PIT 7/1)

NOT TO SCALE

NOTES:

A. A CONFINED SPACE DANGER SIGN SHALL BE POSITIONED IN A LOCATION SUCH THAT IT IS CLEARLY VISIBLE TO PERSONS PROPOSING TO ENTER THE BELOW GROUND TANK/S CONFINED SPACE.

B. MINIMUM DIMENSIONS OF THE SIGN - 250mm X 180mm (SMALL ENTRIES SUCH AS GRATES & MANHOLES)

C. THE SIGN SHALL BE MANUFACTURED FROM COLOUR BOND ALUMINIUM OR POLYPROPYLENE

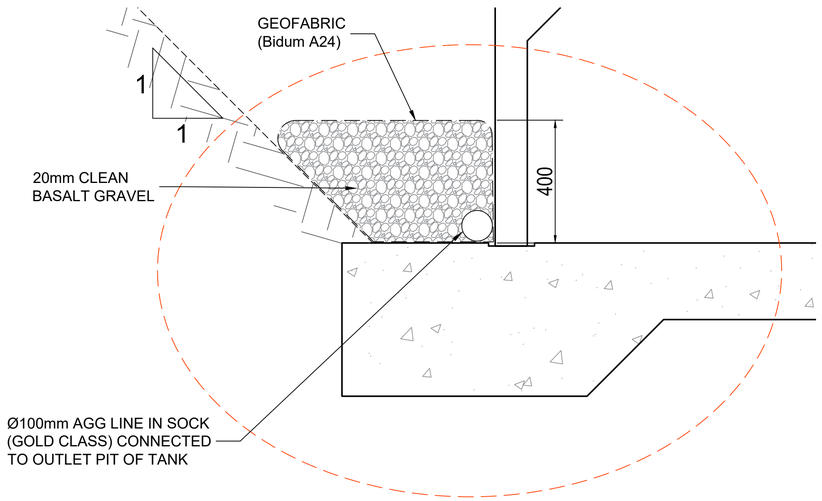
D. SIGN SHALL BE AFFIXED USING SCREWS AT EACH END CORNER OF THE SIGN AND/OR SUITABLE EPOXY GLUE/CEMENT.

NOTES

1. FIRST RUNG 150mm DOWN FROM TOP THEN SPACED AT 300 CENTRES
2. STEP IRON MATERIAL, 20mm DIAMETER MILD STEEL, HEAVY GALVANISED

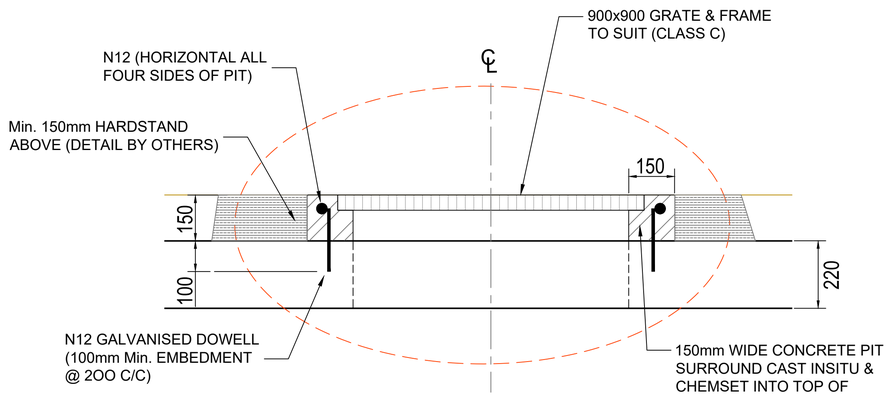
STEP IRONS FOR DRAINAGE PITS

1:10



DETAIL A/06

SCALE 1:10



DETAIL B/06

SCALE 1:10

0.4 0 0.4 0.8 1.2 1.6 2 1:20 (A1)
DIMENSIONS ARE IN METRES

0.2 0 0.2 0.4 0.6 0.8 1.0 1:10 (A1)
DIMENSIONS ARE IN METRES

DRAWING STATUS: TENDER

00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20
Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date

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Client
BENEDICT RECYCLING

Project
224 - 232 TOONGABBIE ROAD, GIRAWEEN
STAGE 2 OSD DESIGN

Title
OSD TANK GENERAL DETAILS
SHEET 2 OF 2

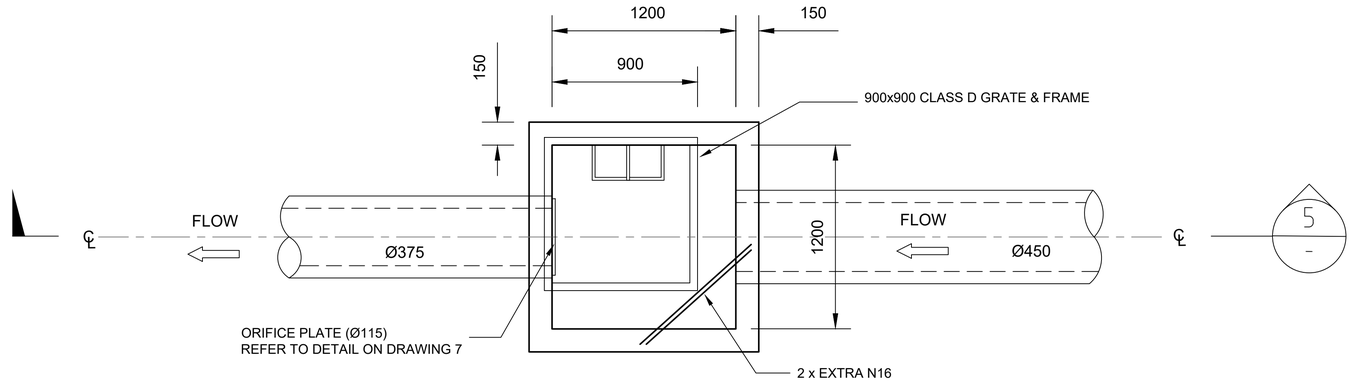
SCALE 1:10, 1:20

Drawing No.
07 of 11

Issue
Rev [00] 12.03.20

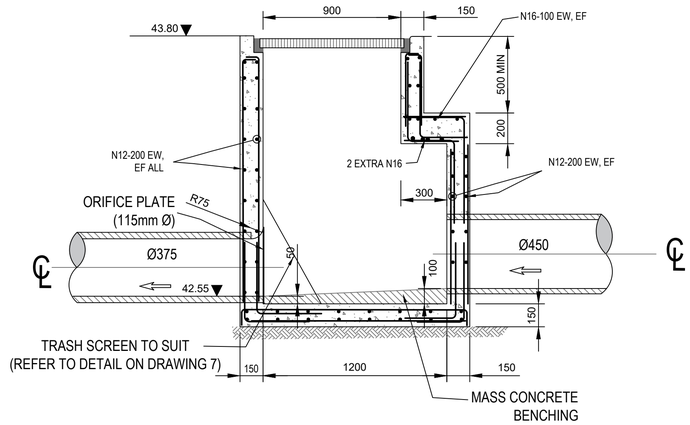
Cad File No.
335 - 07

A1



OSD TANK OUTLET PIT 7/1

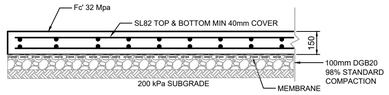
SCALE 1:20



SECTION 5

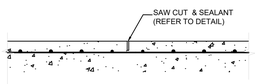
SCALE 1:20

Above Ground OSD Tank Base Slab Details					
Tank No.	**Slab Width(mm)**	**Slab Length(mm)**	**SC spacing (mm)**	**No. SC's on W**	**No. SC's on L**
1	8,000	8,000	4,000	1	1
2	2,000	12,000	3,000	4	0
3	3,000	5,000	0	0	0
4	2,000	16,000	4,000	4	0
Notes.					
1. Tank base slabs to extend a minimum of 150mm outside of tank wall - all sides.					
2. Slab foundations to be prepared to achieve a minimum 200kpa bearing capacity.					
3. All above ground tanks (including HED tank) to be placed on level concrete slab.					
4. 200mm dia steel bollards to be installed to prevent vehicles accidently damaging tanks and associated pipework.					



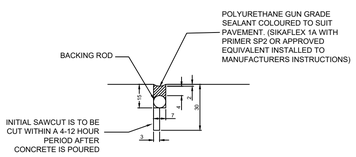
TYPICAL ABOVE GROUND OSD
TANK BASE SLAB SECTION

SCALE 1:20



SAW CUT JOINT DETAIL (SC)

NTS



SEALANT DETAIL

SCALE 1:20

0.4 0 0.4 0.8 1.2 1.6 2 1:20 (A1)

DIMENSIONS ARE IN METRES

15 0 15 30 45 60 75 1:750 (A1)

DIMENSIONS ARE IN METRES

DRAWING STATUS: TENDER

00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20
Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date

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BENEDICT RECYCLING

Project

224 - 232 TOONGABBIE ROAD, GIRAWEEN
STAGE 2 OSD DESIGN

Title

STRUCTURAL DETAILS
SHEET 1 OF 2

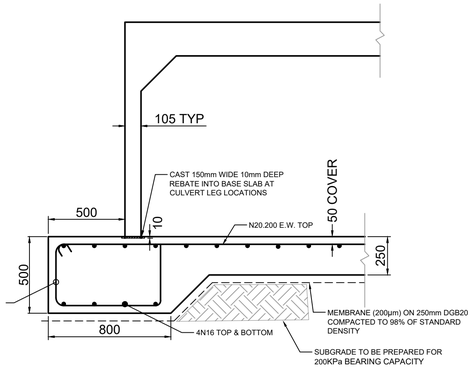
SCALE 1:75 PLAN
1:20 SECTION & DETAIL

Drawing No. 08 of 11

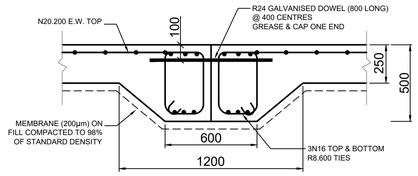
Issue Rev [00] 12.03.20

Cad File No. 335 - 08

A1



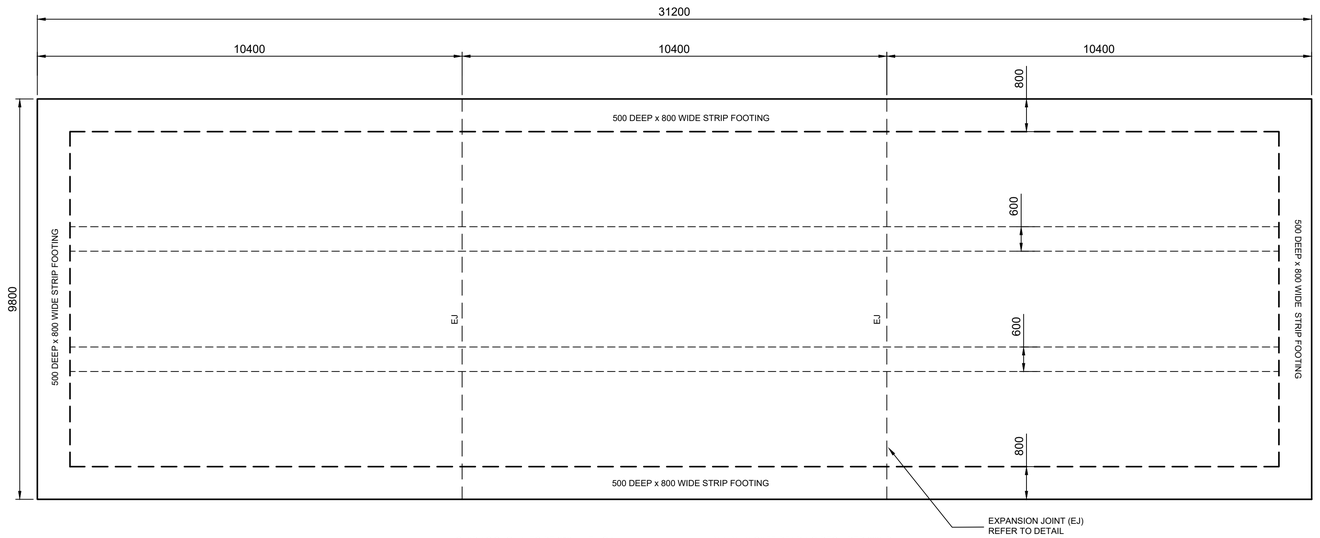
BELOW GROUND OSD BASE SLAB
SECTION
SCALE 1:20



BELOW GROUND OSD TANK
EJ DETAIL
SCALE 1:20

CONCRETE NOTES

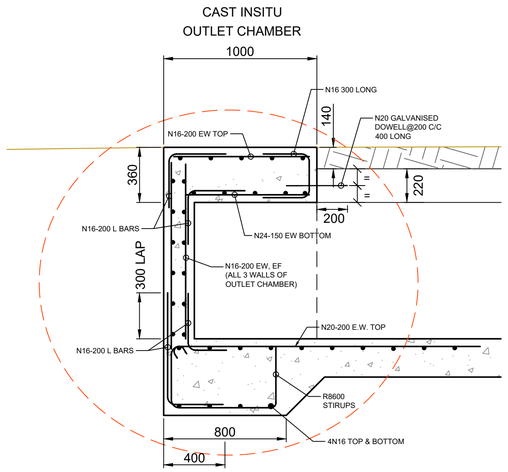
1. Fc' = 40Mpa
2. Minimum Cover 50mm



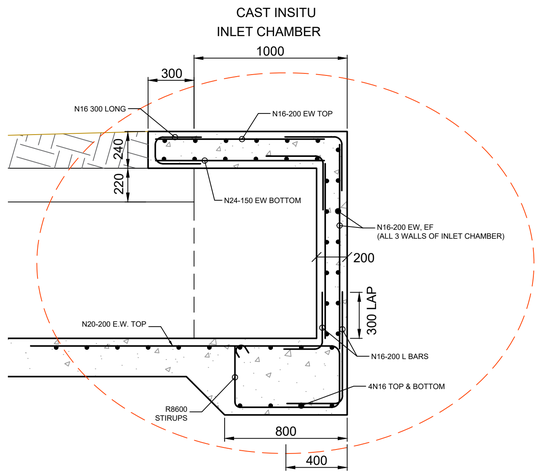
SLAB AS SHOWN TO BE 250mm THICK
REINFORCED WITH N20.200 E.W. TOP COVER 50mm

MINIMUM SAFE BEARING REQUIRED 200kPa
(GEOTECHNICAL ENGINEER TO CONFIRM)

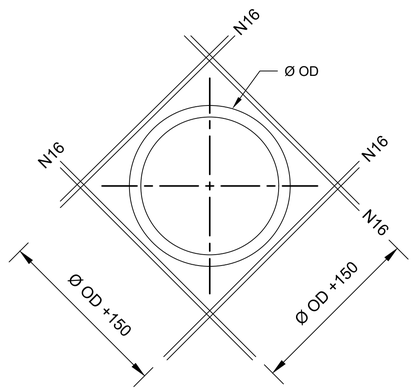
BELOW GROUND OSD TANK
BASE SLAB PLAN
SCALE 1:75



DETAIL C
SCALE 1:20



DETAIL D
SCALE 1:20



TYPICAL TRIMMER BAR DETAIL
AT OPENING TO PIT/CHAMBER
NTS

0.4 0 0.4 0.8 1.2 1.6 2
DIMENSIONS ARE IN METRES

1:20 (A1)

DRAWING STATUS: TENDER

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BENEDICT RECYCLING

Project
224 - 232 TOONGABBIE ROAD, GIRAWEEN
STAGE 2 OSD DESIGN

Title
STRUCTURAL DETAILS
SHEET 2 OF 2

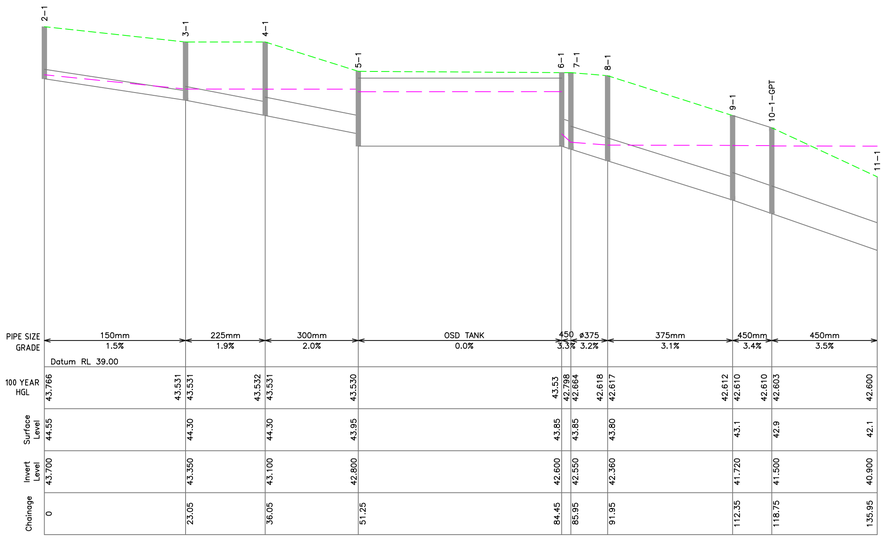
SCALE 1:20 SECTION

Drawing No.
09 of 11

Issue
Rev [00] 12.03.20

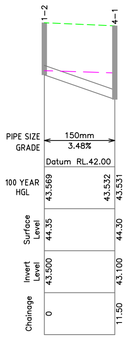
Cad File No.
335 - 09

A1



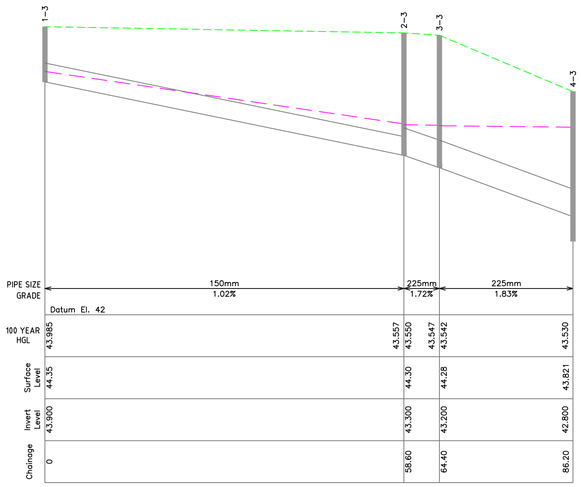
LINE 1

SCALES: HORIZONTAL 1:500 VERTICAL 1:50



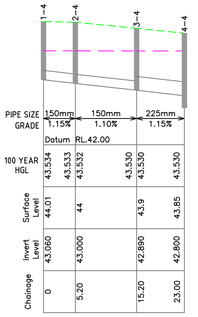
LINE 2

SCALES: HORIZONTAL 1:500 VERTICAL 1:50



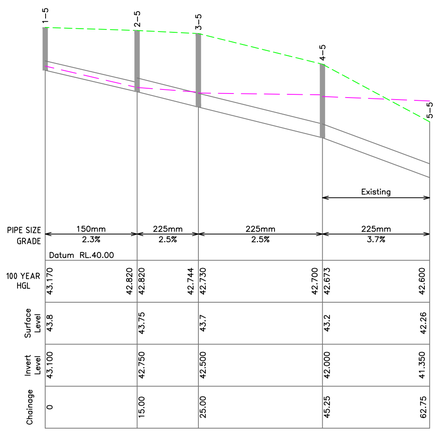
LINE 3

SCALES: HORIZONTAL 1:500 VERTICAL 1:50



LINE 4

SCALES: HORIZONTAL 1:500 VERTICAL 1:50



LINE 5

SCALES: HORIZONTAL 1:500 VERTICAL 1:50

PIT SCHEDULE

PIT NAME	SIZE (ID)	LID TYPE	CLASS	INV(mAHD)	SL(mAHD)	DEPTH(mm)	TYPE
2/1	900X900	GRATE	D	43.70	44.55	850	SI -PRECAST TO SUIT
3/1	900X900	GRATE	D	43.35	44.30	950	SI -PRECAST TO SUIT
4/1	900X900	GRATE	D	43.10	44.30	1200	SI -PRECAST TO SUIT
5/1	900X900	GRATE	D	42.80	43.95	1150	CAST INSITU - REFER DWGS
6/1	900X900	GRATE	D	42.60	43.85	1250	CAST INSITU - REFER DWGS
7/1	1200x1200	GRATE	D	42.55	43.85	1300	CAST INSITU - REFER DWGS
8/1	900X900	GRATE	D	42.36	43.80	1440	SI -PRECAST TO SUIT
9/1	900X900	GRATE	D	41.72	43.10	1380	SI -PRECAST TO SUIT
10/1	900X900	GRATE	D	41.50	42.90	1400	GPT-VORTSENTRYHS18
11/1	900X900	GRATE	D	40.90	42.10	1200	CAST INSITU - KIP, 2.4M LINTEL-REFER TO COUNCIL STD DWG
1/2	900X900	GRATE	D	43.50	44.35	850	SI -PRECAST TO SUIT
1/3	900X900	GRATE	D	43.90	44.35	450	SI -PRECAST TO SUIT
2/3	900X900	GRATE	D	43.30	44.30	1000	SI -PRECAST TO SUIT
3/3	900X900	GRATE	D	43.20	44.28	1080	SI -PRECAST TO SUIT
4/3	900X900	GRATE	D	42.80	43.95	1150	CAST INSITU - REFER DWGS
1/4	900X900	GRATE	D	43.06	44.01	950	SI -PRECAST TO SUIT
2/4	900X900	GRATE	D	43.00	44.00	1000	SI -PRECAST TO SUIT
3/4	900X900	GRATE	D	42.89	43.90	1010	SI -PRECAST TO SUIT
4/4	900X900	GRATE	D	42.80	43.85	1050	CAST INSITU - REFER DWGS
1/5	900X900	GRATE	D	43.10	43.80	700	SI -PRECAST TO SUIT
2/5	900X900	GRATE	D	42.75	43.75	1000	SI -PRECAST TO SUIT
3/5	900X900	GRATE	D	42.50	43.70	1200	SI -PRECAST TO SUIT
4/5	900X900	GRATE	D	42.00	43.20	1200	SI -PRECAST TO SUIT
5/5	900X900	GRATE	D	41.35	42.26	910	CAST INSITU V DRAIN GRATE -REFER TO COUNCIL STD DWG
BELOW GROUND OSD TANK INLET PITS	900X900	GRATE	D	42.60	VARIES	VARIES	CAST INSITU - REFER DWGS
DRIVEWAY GRATED TRENCH DRAINS	200MM WIDE	GRATE	D	VARIES	VARIES	VARIES	PRECAST TO SUIT (MIN 100MM DEEP TROUGH), 0.5% FALL TO OUTLET END
NOTE:							
SI=SURFACE INLET							
KIP=KERB INLET PIT WITH LINTEL							

1 0 1 2 3 4 5 1:50 (A1)

DIMENSIONS ARE IN METRES

10 0 10 20 30 40 50 1:500 (A1)

DIMENSIONS ARE IN METRES

DRAWING STATUS: TENDER

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Client: **BENEDICT RECYCLING**

Project: **224 - 232 TOONGABBIE ROAD, GIRAWEEN**
STAGE 2 OSD DESIGN

Title: DRAINAGE LONG SECTIONS & PIT SCHEDULE

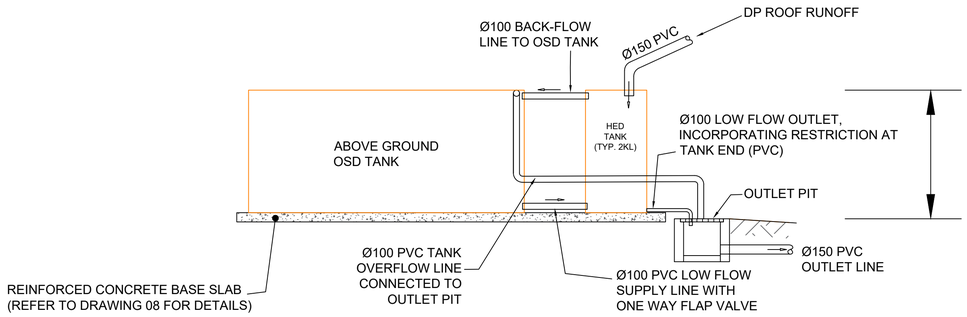
SCALE HORIZ -1:500 VERT - 1:50

Drawing No. 10 of 11

Issue Rev [00] 12.03.20

Cad File No. 335 - 10

A1



TYPICAL SECTION THROUGH ABOVE GROUND OSD TANK

(NTS - CONFIGURATION ONLY)

ABOVE GROUND OSD TANK DETAILS			
TANK #	VOLUME KL	RESTRICTED OUTLET Ø (mm)	ROOF CATCHMENT
1	133	48	R1, R2, R5
2	24	40	R4
3	8	35	R8, R9
4	32	45	R6, R7

NOTES

1. HED TANK HEIGHT TO MATCH MAIN TANK HEIGHT
2. IF MULTIPLE TANKS USED, EACH TANK TO BE LINKED BY 2 x Ø100mm PVC PIPES (TOP AND BOTTOM).

DRAWING STATUS: TENDER

Issue	Details of Issue	Des'd	Drn	Chk'd	Approved	Date
00	TENDER	AD	AD	MS	MIKE SHAW	12.3.20

INITIALS SHOWN IN THE ADJACENT ISSUE RECORDS INDICATE THE STAGES UNDERTAKEN IN THE DRAWING APPROVAL PROCESS. DRAWINGS ARE ONLY TO BE USED WHEN APPROVED BY CIVIL CERTIFICATION AND THEN ONLY AS NOTED FOR DRG STATUS. THE ORIGINAL SIGNATURES CAN BE FOUND ON THE REVERSE SIDE OF THE ORIGINAL OF THE CIVIL CERTIFICATION DRG REGISTER/TRANSMITTAL

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Client: **BENEDICT RECYCLING**

Project: **224 - 232 TOONGABBIE ROAD, GIRAWEEN**
STAGE 2 OSD DESIGN

Title: TYPICAL ABOVE GROUND OSD TANK DETAILS

Drawing No. 11 of 11

Issue Rev [00] 12.03.20

Cad File No. 335 - 11

A1

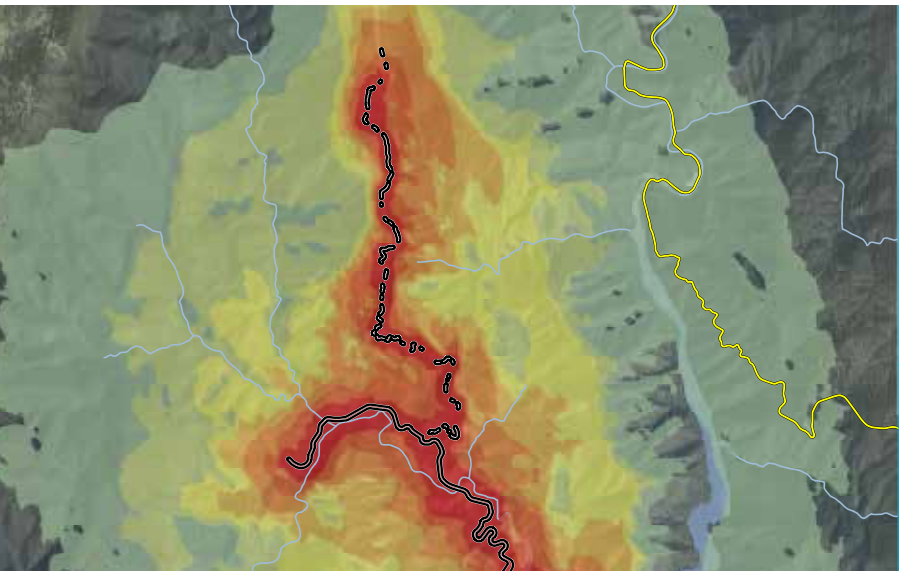
Appendix F

Noise and vibration impact assessment

Girraween Waste Recycling and Transfer Facility

Noise and vibration impact assessment

Prepared for Benedict Recycling Pty Ltd
March 2020



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Girraween Waste Recycling and Transfer Facility

Noise and vibration impact assessment

Report Number

J180524 RP1

Client

Benedict Recycling Pty Ltd

Date

25 March 2020

Version

Final

Prepared by

Teanuanua Villierme
Senior Acoustic Consultant
25 March 2020

Approved by

Najah Ishac
Director/Acoustics Technical Leader
25 March 2020

Table of Contents

Appendices

Tables

Figures

1 Introduction

Benedict Recycling Pty Ltd (Benedict Recycling) proposes to construct and operate the Girraween Waste Recycling and Transfer Facility (the facility or the project) on land that it owns at 224-232 Toongabbie Road, Girraween (the site). The facility will process up to 220,000 tonnes per annum (tpa) of general solid waste (non-putrescible) including building and demolition waste, selected commercial and industrial waste, uncontaminated soils, vegetation, excavated natural materials (ENM), metals, rail ballast and spoil.

This noise and vibration impact assessment (NVIA) accompanies an environmental impact statement (EIS) and development application under Part 4 of the NSW *Environmental Planning and Assessment Act 1979.* The facility is classified as State significant development (SSD) (SSD 9766) under the *State Environmental Planning Policy (State and Regional Development) 2011.* The NSW Department of Planning, Industry and Environment issued Planning Secretary's environmental assessment requirements (SEARs) on 20 December 2018. A copy of the SEARs is included in Appendix B of the EIS.

This assessment addresses the SEARs in relation to noise and vibration. The NSW Environment Protection Authority (EPA) has also provided details of key issues requiring assessment for the project. Table 1.1 provides the relevant assessment requirements and the section of the NVIA report relevant to the specific requirement.

Pursuant to the requirements of the SEARs and the requests of the EPA, the NVIA has been completed with reference to the following guidelines and policies:

- NSW Department of Environment and Conservation (DEC), Assessing Vibration: a technical guideline 2006;
- NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline 2009;
- NSW Department of Environment and Climate Change and Water (DECCW), Road Noise Policy 2011; and
- NSW Environment Protection Authority, Noise Policy for Industry 2017.

Table 1.1 Secretary's environmental assessment requirements

Relevant authority and assessment requirement	Relevant section of NVIA report
Noise and vibration	
• a quantitative assessment of potential demolition, construction, operational and transport noise and vibration impacts in accordance with relevant Environment Protection Authority guidelines. This is to include the identification of existing and potential future sensitive receivers and consideration of approved and/or proposed developments in the vicinity;	Sections 6.2, 6.3, 6.4, 6.5, 6.6
• details and justification of the proposed noise mitigation and monitoring measures; and	Section 7
• specify the times of operation for all phases of the development and for all noise producing activities.	Section 3.3.1
EPA	
The EIS must:	
• provide details of the facility's operating hours and types of plant and equipment intended to be used during operations;	Sections 3.3.1, 6.4.1
• include details of the predicted increase in traffic created by the operation as well as the likely routes to be taken to and from the facility to the main thoroughfares;	Section 5.5
• include details of any sensitive receptors likely to be affected by the activities of the facility;	Section 4.1
• determine the existing amenity noise levels in accordance with the EPA *Noise Policy for Industry (2017);*	Section 5.3.2
• provide project specific noise levels for the facility at potentially affected receivers in accordance with the EPA *Noise Policy for Industry (2017);*	Section 5.3.3
• provide an assessment of the potential noise from the construction and operation of the facility to impact the surrounding community and any sensitive receivers. The assessment should be prepared in accordance with: a. the Interim Construction Noise Guidelines (2009) b. the Noise Policy for Industry (2017) c. the Assessing Vibration: a technical guideline (2006)	Sections 6.2, 6.3, 6.4, 6.5, 6.6

2 Glossary of acoustics terms

A number of technical terms are required for the discussion of acoustics. These are explained in Table 2.1.

Table 2.1 Glossary of acoustic terms

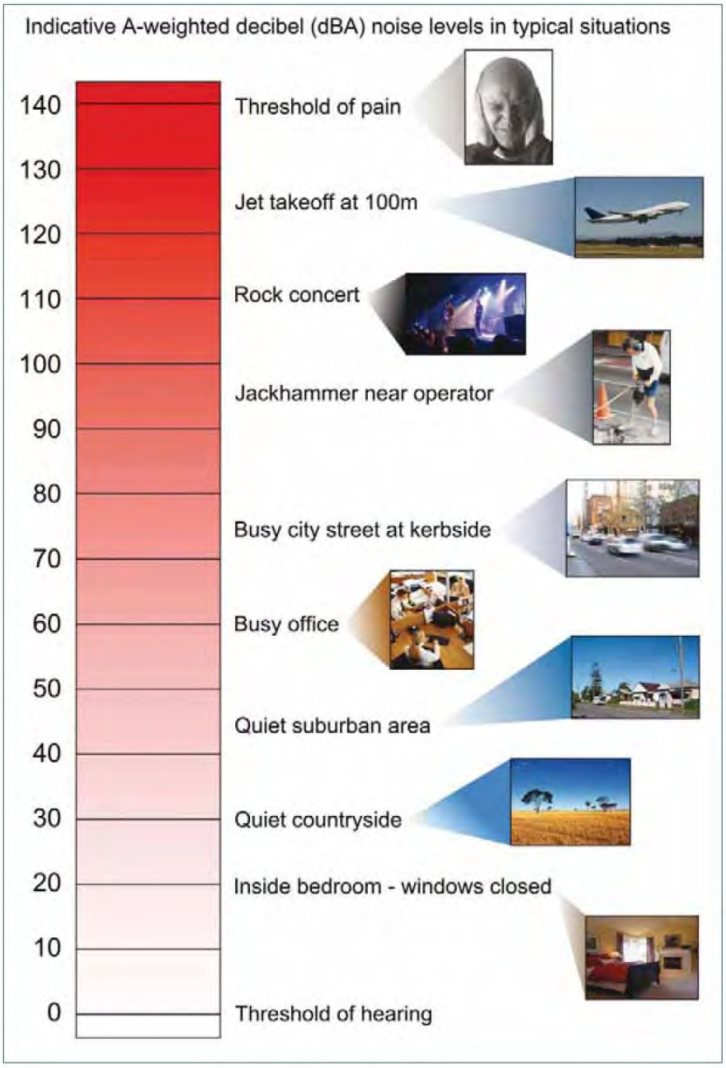
Term	Description
dB	Noise is measured in units called decibels (dB).
A-weighting	There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
L_{A1}	The A-weighted noise level exceeded for 1% of a measurement period.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is approximately equivalent to the average of maximum noise levels.
L_{A90}	Commonly referred to as the background noise, this is the A-weighted level exceeded 90% of the time.
L_{Aeq}	The A-weighted energy average noise from a source and is the equivalent continuous sound pressure level over a given period. The $L_{Aeq,15min}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
L_{Amax}	The maximum root mean squared A-weighted sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period.
Sound power level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A positive temperature gradient. A meteorological condition where atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibel, the unit of noise measurement. Table 2.2 gives an indication as to what an average person perceives about changes in noise levels:

Table 2.2 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud

Examples of common noise levels are provided in Figure 2.1.



Source: Road Noise Policy (DECCW 2011).

Figure 2.1 Common noise levels

3 Project and site description

3.1 Site location and background

The site is located at 224-232 Toongabbie Road, Girraween and is legally described as Lot 678 in DP 9157. The site area is approximately 9,000 m^2, generally flat (approximately 44-48 m Australian Height Datum (AHD)), and clear of vegetation in planned operational areas.

The site is zoned IN1 General Industrial under the *Holroyd Local Environmental Plan 2013* and is within an existing industrial estate. The site is 400 m north of the Great Western Highway and can be accessed via Toongabbie Road, Girraween Road, Amax Avenue and Mandoon Road. The M4 Motorway can be readily accessed from the site via the Great Western Highway.

There are industrial buildings to the east, north and south of the site and Fox Hills Golf Course is to the west of the site, on the opposite side of Toongabbie Road.

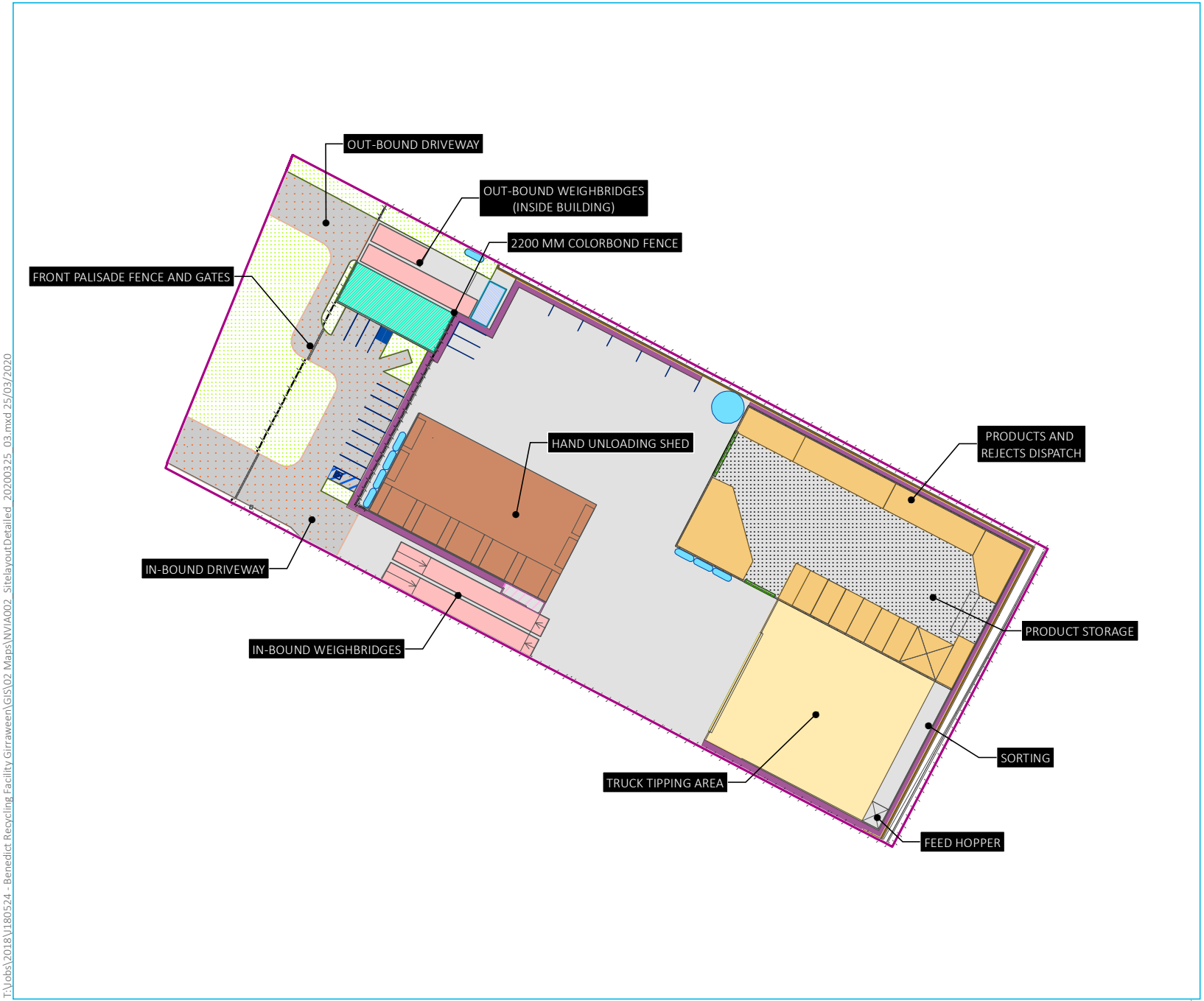
3.2 Site layout

As shown in Figure 3.1, the facility will include the following components:

- removing/demolishing:
  - the existing driveway in the middle of the site;
  - the existing office building on the south-western site boundary of the site; and
  - the existing weighbridge and associated weighbridge office;
- constructing:
  - a 7 m wide in-bound driveway on the southern side of the site's frontage by widening the existing driveway;
  - a new 7 m wide out-bound driveway on the northern side of the site's frontage;
  - a parking area with 13 car spaces and 2 motorcycle spaces at the front of the site (5 car spaces will also be provided along the northern boundary of the site and 2 spaces adjacent to the rear of the office and amenities building);
  - a separate hand unloading shed within the operational area of the site to the east of the parking area;
  - a main waste acceptance and storage shed (the main shed) at the rear of the site;
  - office and amenity facilities within the existing shed in the northern area of the site;
  - sealed working surfaces (concrete or asphalt); and
  - surface water controls, including a suitably sized gross pollutant trap.

- installing:
    - two in-bound (above ground) weighbridges;
    - two out-bound (in-ground) weighbridges within the existing shed as well as a wheel wash in the northern area of the site;
    - waste, product and rejects bays within the main waste acceptance and storage shed;
    - marked traffic and pedestrian areas;
    - palisade fencing at the front of the site;
    - fire safety systems such as thermal imaging cameras controlling an automatic fire suppression system within the main shed; and
    - tanks to store and reuse rainwater from shed roofs.
- re-landscaping the front of the site; and
- modifying Toongabbie Road and installing no parking signs on the western side of the road to allow a second northbound lane (a bypass lane) to be constructed so that northbound through vehicles can pass trucks turning right into the site.

Reticulated water, sewer, electricity and telecommunications are available to the site.



KEY

- Subject site
- Storm water flow

Site features

- Access path
- Driveway and car park
- Weighbridge
- Landscaping
- Shared/disabled parking space
- Motorbike parking
- Shed door
- Office and amenites
- Incoming weighbridge office
- Wheel wash
- Hand-unloading shed
- Waste acceptance
- Product storage and dispatch area
- Stockpile
- Rainwater tank
- Stormwater pit

Site features

- Block retaining wall
- Fence
- Gate
- Car park
- Other site feature
- Asphalt/concrete

DRAFT

Proposed site layout

Source: EMM (2020)

0 25 50 m

GDA 1994 MGA Zone 56

N

Girraween Waste Recycling and Transfer Facility
Noise and vibration impact assesment
Figure 3.1

EMM creating opportunities

T:\Jobs\2018\J180524 - Benedict Recycling Facility Girraween\GIS\02 Maps\NVIA002_SitelayoutDetailed_20200325_03.mxd 25/03/2020

3.3 Site operations

3.3.1 Proposed operating hours

Proposed operating hours of the facility are provided in Table 3.1.

Table 3.1 Operating hours

Period	Waste deliveries accepted	Processing	Materials dispatch
Monday–Friday			
6 am – 10 pm	Yes	7 am – 10 pm	Yes
10 pm – 6 am	Yes[1]	No	Yes
Saturday			
6 am – 5 pm	Yes	7 am – 5 pm	Yes
5 pm – 6 am (Sunday)	Yes[1]	No	No
Sunday[2]			
8 am – 5 pm	Yes	No	Yes
5 pm – 6 am (Monday)	Yes[1]	No	No

Notes: 1. There will be a maximum of 10 truck movements per hour over the eight-hour overnight period (10 pm to 6 am), in addition to employee movements.
2. Operating hours on a public holiday will be the same as on a Sunday.

It is common practice for building sites to fill trucks with waste at the end of the working day for overnight storage at the building site or a builder's depot. The 6 am to 7 am delivery window will allow the facility to accept the waste, allowing empty trucks to arrive at building sites, which normally open at 7 am.

Benedict Recycling is applying for 24 hour opening hours to allow it to accept waste from civil construction and maintenance projects on occasion in the evening and to facilitate the servicing of night-time infrastructure works.

Waste processing will not be permitted during the EPA's defined night-time. There will be a maximum of 10 truck movements per hour over the eight-hour overnight period (10 pm to 6 am), in addition to employee movements.

3.3.2 Waste receival

Approval is sought for the facility to accept a total of up to 220,000 tpa of general solid waste (non-putrescible), as summarised below:

- Mixed waste (recyclable) – including building and demolition waste, soils, excavated materials and construction spoils.
- Mixed waste (non-recyclable) – including a mixture of general solid waste.
- Masonry waste – including building and demolition waste and associated materials from non-building and demolition activities (eg bricks, concrete, tiles, and similar masonry materials).
- Vegetation waste – including garden waste, wood waste and non-putrescible vegetative waste.
- Timber and wood waste – including wood associated with manufacturing of timbers and timber products, both treated and untreated, and timbers emanating from building and demolition waste.

- Metals – including metals from building and demolition waste.
- Cardboard – including paper and cardboard.
- Excavated natural materials.

The following waste will not be accepted:

- special waste (including clinical and related waste; asbestos waste; whole loads of waste tyres; or anything classified as special waste under an EPA gazettal notice) as defined in EPA (2014) Step 1;
- liquid waste as defined in EPA (2014) Step 2;
- general solid waste (putrescible) as defined in EPA (2014) Step 3;
- waste possessing hazards as defined in EPA (2014) Step 4; or
- waste that requires chemical assessment to determine its classification as defined in EPA (2014) Step 5.

No odorous waste will be accepted by the facility.

Vegetation waste will not be allowed to compost on site. Waste will be delivered to site by a variety of vehicles including:

- light vehicles such as cars with box trailers and utilities;
- single, dual, and triple axle 'rigid' heavy vehicles such as skip-bin trucks; and
- multiple axle combination heavy vehicles.

Vehicles delivering waste will be directed to the incoming weighbridge where the load will be inspected for potential contaminants in accordance with the incoming waste quality management plan (see Section 2.2.5 of the EIS) and classified. Loads will be issued a ticket and the driver will be instructed where to deliver the waste within the site. The driver will then deliver the waste to the appropriate area where it will be tipped, spread, turned over, and inspected for a second time prior to the waste being formally accepted and the empty vehicle being directed to the exit weighbridge. Any incoming waste loads that are suspected to contain contaminants will be rejected, reloaded (if it has been tipped off) and the customer will be required to take the contaminated load out of the facility immediately.

Generally, trucks will be directed to the truck tipping area, with segregated loads (eg only bricks) directed to the appropriate stockpile area. Light vehicles will be directed to the designated hand unloading area so that they can be spread and inspected, and manually unloaded safely in a location that is away from trucks, heavy machinery and mobile plant.

Any rejected loads will be immediately reloaded for removal from the site and recorded in a 'rejected load' register. Generally, vehicles will be re-weighed as they leave the site to determine the mass of the load delivered or to check reported tare weights.

3.3.3 Waste processing

Waste recycling and transfer facility processing will include the following steps:

1. Waste will be inspected prior to being accepted on site and any loads suspected to contain non-conforming/unacceptable material that cannot be accepted by the site (or are odorous) will be rejected.

2. Segregated wastes will be unloaded, spread, turned over and inspected close to the bays between the waste receivable area and the dispatch area.

3. Co-mingled waste will be unloaded at the truck tipping area and hand unloading area. Waste will be stored in the tipping area prior to sorting.

4. Waste deposited in the hand unloading area will be collected at the end of each day and taken to the main waste acceptance and storage shed to be sorted.

5. Waste will be sorted at the truck tipping area and screened within the main shed. There will be no shredding or crushing on site.

6. Some mixed waste will be feed into the hopper in the southern corner of the main shed by mobile plant for sorting using a variety of methods such as screening, air separation, picking, magnetics and eddy currents.

7. Screening within the main shed will be performed by a range of screening and separating equipment.

8. Sorted aggregates, oversized materials, wastes, and screened fines feedstock will be deposited directly into stockpiles within designated bays.

3.3.4 Plant and equipment

Indicative plant and equipment to be used at the facility are listed in Table 3.2. Plant and equipment (or equivalent) listed in Table 3.2 have been used in this assessment. Actual plant or equipment used may vary, but total overall noise emission levels will be no more than that adopted in this assessment.

Table 3.2 Indicative equipment and activities

Plant and equipment (or equivalent)	Quantity[1]	Typical activities
Equipment used across the site		
Skip bin truck	1	Moving material from hand unload area to the main waste acceptance and processing shed
Trucks (customers)	4-5	Delivering waste and dispatching products. Returning to/leaving the site
Yard sweeper	1	Sweep yard.
Equipment used in main waste acceptance and processing shed		
Front-end loader (eg Volvo L190E or equivalent)	2	One for waste handling in receival area/removing of rejected loads. One for waste handling/loading out in dispatch area.
14 tonne excavator	2	Sorting/handling waste in receival area using a variety of excavator attachments.

Table 3.2 Indicative equipment and activities

Plant and equipment (or equivalent)	Quantity[1]	Typical activities
Screening and sorting plant	1	Sorting co-mingled waste into recyclable fractions.

Notes: 1. Within a representative 15-minute NPfI assessment period.

3.4 Site surroundings

The site is located on Toongabbie Road, 400 m north of the Great Western Highway. The site is in an industrial estate, which can be accessed via Toongabbie Road, Girraween Road, Amax Avenue and Mandoon Road. The M4 Motorway can also be readily accessed from the site via the Great Western Highway.

There are industrial buildings to the east, north and south of the site. Fox Hills Golf Course is to the west of the site, on the opposite side of Toongabbie Road.

The site's IN1 zoning extends to the east and north, with land to the west of the industrial estate (the golf course) zoned RE2 Private Recreation.

The nearest residences are at least 400 m from the site as follows:

- a potential single residence approximately 400 m south of the site located on the far side of the Great Western Highway on IN1 General Industrial land (between the highway and the M4 Motorway immediately to the south);
- residences on Akron Place, Boston Place and Oakwood Road approximately 400 m west of the site located on the far side of the golf course;
- residences along Mandoon Road approximately 470 m east of the site located on the far side of the industrial area;
- residences along Nicholls Way approximately 500 m south of the site located on the far side of the Great Western Highway and the M4 Motorway; and
- residences along Girraween Road approximately 500 m east of the site located on the far side of the industrial area.

3.5 Key issues

The broad potential noise issues for the project are as follows:

- noise and vibration associated with construction;
- noise associated with the main operations; and
- noise associated with the increased traffic to/from the site during operation.

The noise assessment has focussed on these potential issues. Its preparation included noise measurements, establishment of suitable criteria in accordance with the ICNG and NPfI, and comparison of predicted noise levels to appropriate noise criteria.

4 Existing environment

4.1 Assessment locations

The site is located within an industrial zone and is surrounded by other industrial premises to the north, east and south. The site is also located immediately to the east of the Fox Hill Golf Course (active recreation, zoned RE2 – Private Recreation). The nearest residences are situated approximately 400 m to the west of the site on the opposite (west) side of the golf course. Other potentially most affected residences are located to the north and south of the golf course (zoned IN2 – Light Industrial or R2 – Low Density Residential). Ebenezer Christian College is located approximately 700 m west of the site off Blacktown Road (zoned SP2 – Infrastructure – Educational Establishment). Otherwise surrounding land uses are industrial (zoned IN1 – General Industrial).

It is considered that if the noise trigger levels (refer to Section 5) can be satisfied at the assessment locations, which are potentially most affected by the project, then noise trigger levels will be satisfied at noise-sensitive locations that are more distant from the site.

Nearest representative noise sensitive locations to the site have been identified and are provided in Table 4.1, hereafter referred to in this report as assessment locations. The assessment locations are shown in Figure 4.1.

Table 4.1 Assessment locations

ID	Receiver type[1]	Land use zoning	Address or description
R1	Industrial	General Industrial	214 Toongabbie Rd (south boundary neighbour)
R2	Industrial	General Industrial	234 Toongabbie Rd (north boundary neighbour)
R3	Industrial	General Industrial	14 Amax Av (east boundary neighbour)
R4	Active recreation	Private Recreation	Fox Hill Golf Course
R5	Place of worship	Infrastructure – Place of Public Worship	Toongabbie Baptist Church
R6	Residence	Suburban	48 Oklahoma Avenue, Toongabbie
R7	Residence	Suburban	8 Buffalo Place, Toongabbie
R8	Residence	Suburban	228 Metella Road, Toongabbie
R9	Residence	Suburban	9 Akron Place, Toongabbie
R10	Residence	Suburban	29 Oakwood Road, Toongabbie
R11	School	Infrastructure – Educational Establishment	Ebenezer Christian College
R12	Residence	Suburban	47 Fox Hills Crescent, Toongabbie
R13	Commercial	Private Recreation	Fox Hill Golf Club
R14	Residence[2]	Light Industrial	613 Great Western Highway, Greystanes
R15	Residence[2]	Light Industrial	611 Great Western Highway, Greystanes
R16	Residence	Suburban	25 Nicholls Way, Pemulwuy
R17	Residence	Suburban	1 Greystanes Road, Greystanes
R18	Residence	Suburban	226 Girraween Road, Girraween
R19	Residence	Suburban	47 Mandoon Road, Girraween

Notes: 1. As defined in the NPfI (EPA 2017).
2. Assessed as 'isolated' residences within an industrial zone in accordance with Section 2.4 of the NPfI (EPA 2017).

The assessment locations represent those most likely to be affected by the project. Adherence with the noise trigger levels at these locations will indicate that trigger levels will be met at other surrounding noise-sensitive locations.

4.2 Existing noise levels

A key element in assessing environmental noise impact from industry is to quantify the existing ambient acoustic environment. To establish the ambient noise levels in the area, both unattended and short-term operator-attended noise surveys were conducted at representative monitoring locations in general accordance with the procedures described in Australian Standard 'AS 1055-1997 - Acoustics - Description and Measurement of Environmental Noise'. Monitoring results are provided in the following sections.

The locations of background and ambient noise monitoring used in this assessment are shown in Figure 4.1.

4.2.1 Unattended noise monitoring

Unattended noise monitoring using noise loggers was completed at representative residential properties potentially affected by site noise. The noise monitoring locations were also selected after a desktop review and inspection of the area surrounding the site, giving due consideration to other noise sources which may influence the readings (eg domestic air conditioning units), the proximity of assessment locations to the site, security issues for the noise loggers and gaining permission to access properties from the residents or landowners. Three noise loggers were deployed as follows:

- Logger 1 was placed at 32 Oakwood Road in Toongabbie (L1);
- Logger 2 was placed at 220 Metella Road in Toongabbie (L2);
- Logger 3 was placed at 10 Buffalo Place, Toongabbie (L3).

The unattended measurements were carried out using Acoustic Research Laboratories (ARL) EL-316 (s/n 16207005), Ngara (s/n 878113) and Svantek 979 (s/n 21095) noise loggers. The loggers were in place between 4 and 15 February 2019 (12 consecutive days).

The noise loggers were programmed to record statistical noise level indices continuously in 15-minute intervals, including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA calibration certificates.

Weather data for the survey period was obtained from the Bureau of Meteorology automatic weather station (BoM AWS) located at the Horsley Park Equestrian Centre (Station ID 067119). Wind speed and the rainfall data were used to exclude noise data during periods when the average wind speed was in excess of 5 m/s and/or during rainfall events in accordance with NPfI methods.

A summary of existing Rating Background Levels (RBL) and ambient L_{Aeq} noise levels is given in Table 4.2. Results are also provided graphically for each day in Appendix A.

Table 4.2 Summary of existing background and ambient noise levels

Monitoring location	Assessment period[1]	RBL[2], dB	Measured $L_{Aeq,period}$ noise level[3], dB
L1 – 32 Oakwood Road, Toongabbie	Day	43	51
	Evening	43	52
	Night	40	48
L2 – 220 Metella Road, Toongabbie	Day	43	61
	Evening	42	61
	Night	39	56
L3 – 10 Buffalo Place, Toongabbie	Day	40	56
	Evening	39	53
	Night	37	48

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.
2. The RBL is an NPfI term and is used represent the background noise level.
3. The energy averaged noise level over the measurement period and representative of general ambient noise.

4.2.2 Attended noise monitoring

EMM completed 15-minute attended noise measurements on 15 February 2019 at five locations, including at each logger location (L1, L2 and L3) and at two additional locations (A1 and A2) (Figure 4.1), to identify noise sources contributing to the ambient noise environment.

Operator attended measurements were conducted using a Brüel & Kjær (B&K) 2250 integrating sound level meter (serial number 3008201) to both quantify and qualify the existing noise sources. Field calibration of the instrument was completed using a B&K 4230 calibrator. Attended measurements were undertaken in accordance with AS 1055-1997 'Description and Measurement of Environmental Noise'. Meteorological conditions throughout the survey period were relatively calm with no winds above 5 m/s and no rain.

A summary of results of the attended noise monitoring is provided in Table 4.3.

Table 4.3 Summary of attended noise measurements

Monitoring location	Date	Start time	Measured noise levels (15-minute), dB			Comments
			L_{A90}	L_{Aeq}	L_{Amax}	
L1	15/2/19	13:30	44	50	70	Insect and bird noise. Road traffic and industrial noise frequently audible. Aircraft and helicopter noise occasionally audible.
L2	15/2/19	13:00	41	59	74	Insect and bird noise. Road traffic noise frequently audible. Industrial noise inaudible.
L3	15/2/19	11:30	39	48	72	Insect and bird noise. Road traffic noise frequently audible. Aircraft and helicopter noise occasionally audible. Industrial noise inaudible.

Table 4.3 Summary of attended noise measurements

Monitoring location	Date	Start time	Measured noise levels (15-minute), dB			Comments
			L_{A90}	L_{Aeq}	L_{Amax}	
A1[1] – 9 Akron Pl, Toongabbie	15/2/19	12:30	41	47	66	Insect and bird noise. Road traffic noise and aircraft noise occasionally audible. Industrial noise inaudible.
A2[2] – 38 Oklahoma Av, Toongabbie	15/2/19	12:00	42	50	63	Insect and bird noise. Road traffic noise frequently audible. Aircraft noise occasionally audible. Industrial noise inaudible.

Notes: 1. Additional attended noise monitoring location near R9 and between L1 and L2.
2. Additional attended noise monitoring location near R6 and to the east of L3.

The ambient noise environment was found to be dominated by insect and bird noise, with local and distant road traffic as well as occasional aircraft noise. Road traffic noise was observed to be more influential to the ambient noise environment at L1 or in areas closer to the Great Western Highway and M4 Western Motorway to the south. Additional attended noise monitoring at locations A1 and A2 showed that the ambient noise environment was dominated by insect noise and road traffic noise and that industrial noise was inaudible in these areas.

Source: EMM (2019); DFSI (2017)

\\emmsvr1\EMM\Jobs\2018\J180524- Benedict Recycling Facility Girraween\GIS\02 Maps\NVIA001_NoiseMonitoringLocation_20190816_02.mxd 16/08/2019

Noise monitoring and assessment locations

Girraween Waste Recycling and Transfer Facility
Noise and vibration impact assessment
Figure 4.1

EMM
creating opportunities

4.3 Meteorology

Noise propagation over distance can be significantly affected by meteorological conditions. Of most interest are source-to-receiver winds, the presence of temperature inversions and drainage flow (katabatic winds), as these conditions can enhance received noise levels. To account for these phenomena, the NPfI specifies two options in regard to meteorological data analysis procedures to determine the presence of significant meteorological conditions, as follows:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night; or

2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the NPfI provisions. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

4.3.1 Winds

The NPfI recommends consideration of wind effects if they are “significant”. The NPfI defines “significant” as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed up to 3 m/s, which is considered to prevail for at least 30% of the time.

An analysis of the vector components of hourly wind data recorded by the NSW Office of Environment and Heritage (OEH) weather station located in Prospect was undertaken for 2018 (calendar year). Winds for certain directions were identified to trigger the NPfI 30% threshold and hence noise-enhancing winds were considered for the purpose of this assessment.

4.3.2 Temperature inversions

The NPfI states that the assessment of noise impact with influence from temperature inversions (F or G stability class) be confined to the night-time assessment period when they typically occur.

The frequency of temperature inversions was determined based on sigma-theta data obtained from the OEH weather station located in Prospect. It was found from the analysis of the data that F stability class temperature inversions did occur for 30% or greater of the night period, and hence has been adopted in the noise modelling and assessment of noise emissions for the night and morning shoulder periods.

4.3.3 Drainage winds

The NPfI states that a default drainage wind value should be applied where noise sources from the development are at significantly higher altitude than the assessment location(s) and no intervening topography is present. All assessment locations are at a similar or higher elevation than the subject site and therefore drainage winds were found not to be relevant to this assessment.

4.3.4 Modelled meteorological conditions

Winds and F stability class temperature inversions were identified applicable to the project area. As a conservative approach, this assessment has adopted standard (ie calm) and noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes, in accordance with the NPfI (option 1 approach). Noise levels from the site have been predicted at all assessment locations based on the meteorological parameters shown in Table 4.4.

Table 4.4 Meteorological parameters adopted for the noise modelling

Assessment Period[1]	Meteorological condition	Air temperature	Relative humidity	Wind speed	Wind direction	Stability category
Day	Standard - Calm	20°C	70%	0 m/s	Nil	D class
	Noise enhancing - Wind	20°C	70%	3 m/s	All	D class
Evening	Standard - Calm	10°C	90%	0 m/s	Nil	D class
	Noise enhancing - Wind	10°C	90%	3 m/s	All	D class
Night	Standard - Calm	10°C	90%	0 m/s	Nil	D class
	Noise enhancing - Wind	10°C	90%	3 m/s	All	D class
	Noise enhancing - Temperature inversion	10°C	90%	2 m/s	All	F class
Morning shoulder	Standard - Calm	10°C	90%	0 m/s	Nil	D class
	Noise enhancing - Wind	10°C	90%	3 m/s	All	D class
	Noise enhancing - Temperature inversion	10°C	90%	2 m/s	All	F class

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.

5 Criteria

5.1 Construction noise criteria

5.1.1 Interim Construction Noise Guideline

The assessment of noise from construction works has been completed using the Interim Construction Noise Guideline (ICNG), which provides two methods for the assessment of construction noise emissions:

- quantitative: suited to major construction projects with typical durations of three weeks or more; and
- qualitative: suited to short-term infrastructure maintenance of less than three weeks.

The method for a quantitative assessment requires a more complex approach, involving noise predictions from construction activities to the nearest sensitive receivers, whilst the qualitative assessment methodology is a more simplified approach that relies primarily on noise management strategies. Due to the type of construction works proposed and anticipated duration, this assessment has adopted a quantitative assessment approach.

The ICNG recommends standard hours for normal construction work which are Monday to Friday from 7 am to 6 pm, Saturdays from 8 am to 1 pm, and no work on Sundays or public holidays. The proposed construction works will only occur during the ICNG standard hours.

Where predicted noise levels from construction works during standard hours are above the noise affected level at a sensitive receiver, feasible and reasonable mitigation measures should be considered and where appropriate, adopted.

5.1.2 Noise management levels

Table 2 of the ICNG provides guidance on establishing noise management levels (NML) for residential receivers during standard hours and has been reproduced in Table 5.1.

Table 5.1 ICNG residential NMLs

Time of day	NML $L_{Aeq,15min}$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to	Highly noise affected 75 dB	The highly noise affected level represents the point above which there may be strong community reaction to noise.

Table 5.1 ICNG residential NMLs

Time of day	NML $L_{Aeq,15min}$	How to apply
1 pm No work on Sundays or public holidays		Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Source: ICNG (DECC 2009).

Further, the ICNG provides NMLs for other sensitive land uses (non-residential receivers) for standard hours. These are shown in Table 5.2.

Table 5.2 ICNG NMLs for other sensitive land uses

Land use	NML, $L_{Aeq,15min}$ (applies when property is in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB
Places of worship	Internal noise level 45 dB
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB

Source: ICNG (DECC 2009).

The ICNG also provides NMLs for commercial and industrial land uses for standard hours. These are shown in Table 5.3.

Table 5.3 ICNG NMLs for commercial and industrial land uses

Land use	NML, $L_{Aeq,15min}$
Industrial premises	External noise level 75 dB (when in use)
Offices, retail outlets	External noise level 70 dB (when in use)

Source: ICNG (DECC 2009).

5.1.3 Project construction NMLs

The construction NMLs for residential assessment locations have been based on the RBLs provided in Table 4.2. The NMLs for standard construction hours adopted for this assessment were derived in accordance with the ICNG for all assessment locations and are presented in Table 5.4.

Table 5.4 Construction NMLs for standard hours

Assessment location	Representative logging location	RBL, dB(A)	NML, $L_{Aeq,15min}$, dB
R1, R2, R3 – Industrial premises[1]	N/A	N/A	75
R4 – Active recreation[1]	N/A	N/A	65
R5 – Place of worship[1]	N/A	N/A	45 (internal) 55 (external)[2]
R6, R7 – Residences	L3	40[3]	50
R8, R9 – Residences	L2	43[3]	53
R10, R12, R16, R17, R18, R19 – Residences	L1	43[3]	53
R11 – School[1]	N/A	N/A	45 (internal) 55 (external)[2]
R13 – Commercial premises[1]	N/A	N/A	70
R14, R15 – Isolated residences within an industrial zone[1]	N/A	N/A	75

Notes: 1. Determination of the NML for these types of receivers are not dependent on existing background noise levels and are based on the recommended NML for the land use type.
2. External level based on an external-to-internal noise reduction of 10 dB.
3. Based on the day period RBL.

5.2 Construction vibration

5.2.1 Human comfort

i General discussion on human perception of vibration

Vibration levels which are well below those causing any risk of damage to a building or its contents can be felt by humans. The actual perception of motion or vibration may not, in itself be disturbing or annoying. An individual's response to that perception, and whether the vibration is "normal" or "abnormal", 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.

Human tactile perception of random motion, as distinct from human comfort considerations, was investigated by Diekmann and subsequently updated in German Standard DIN 4150 Part 2-1975 'Vibrations in buildings – Part 2: Effects on persons in buildings'. On this basis, the resulting degrees of perception for humans are suggested by the vibration level categories given in Table 5.5.

Table 5.5 Peak vibration levels and human perception of motion

Approximate vibration level	Degree of perception
0.10 mm/s	Not felt
0.15 mm/s	Threshold of perception
0.35 mm/s	Barely noticeable
1.0 mm/s	Noticeable
2.2 mm/s	Easily noticeable
6.0 mm/s	Strongly noticeable
14.0 mm/s	Very strongly noticeable

Notes: These approximate vibration levels (in floors of building) are for vibration having a frequency content in the range of 8 Hz to 80 Hz.

Table 5.5 suggests that people can barely start to feel floor vibration at levels as low as 0.15 mm/s and that the motion becomes "noticeable" at a level of approximately 1.0 mm/s.

ii Assessing vibration: a technical guideline

The guideline *Environmental Noise Management – Assessing Vibration: a technical guideline* (the guideline) (DEC 2006) is based on guidelines contained in British Standards BS 6472-2008 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

The guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. At vibration values below the preferred values, there is a low probability of adverse comment or disturbance to building occupants. Where all feasible and reasonable mitigation measures have been applied and vibration values are still beyond the maximum value, it is recommended the operator negotiate directly with the affected community.

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the guideline provides examples of the three vibration types and has been reproduced in Table 5.6.

Table 5.6 Types of vibration

Continuous vibration	Impulsive vibration	Intermittent vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, eg occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990).	Trains, intermittent nearby construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer these will be assessed against impulsive vibration criteria.

The type of vibration of relevance to the project is intermittent vibration. Continuous and impulsive vibration are not expected from construction works and hence have not been discussed further.

Intermittent vibration (as defined in Section 2.1 of the guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time. Intermittent vibration is representative of activities such as impact hammering, rolling or general excavation work (such as an excavator tracking).

Section 2.4 of the guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted root mean square (rms) acceleration levels over the frequency range 1 Hz to 80 Hz. To calculate the VDV, the following formula is used (refer to Section 2.4.1 of the guideline):

$$VDV = \left[\int_0^T a^4(t)dt\right]^{0.25}$$

Where VDV is the vibration dose value in $m/s^{1.75}$, *a (t)* is the frequency-weighted rms of acceleration in m/s^2 and *T* is the total period of the day (in seconds) during which vibration may occur.

The acceptable VDV for intermittent vibration are reproduced in Table 5.7. There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Adverse comment or complaints may be expected if vibration values approach the maximum values. The guideline states that activities should be designed to meet the preferred values where an area is not already exposed to vibration.

Table 5.7 Acceptable VDVs for intermittent vibration

Location	Daytime		Night-time	
	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$
Critical Areas	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

Notes: 1. Daytime is 7 am to 10 pm and night-time is 10 pm to 7 am.
2. These criteria are indicative only, and there may be a need to assess intermittent values against continuous or impulsive criteria for critical areas.

5.2.2 Structural vibration criteria

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks and are set well below the levels that have potential to cause damage to the main structure.

In terms of the most recent relevant vibration damage criteria, Australian Standard AS 2187.2-2006 'Explosives - Storage and Use - Use of Explosives' recommends the frequency dependent guideline values and assessment methods given in British Standards BS 7385 Part 2-1993 'Evaluation and measurement for vibration in buildings Part 2' be used as they are considered "applicable to Australian conditions".

The standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and commercial/industrial buildings are presented numerically in Table 5.8 and graphically in Figure 5.1.

Table 5.8 Transient vibration guide values - minimal risk of cosmetic damage

Line	Type of building	Peak component particle velocity in frequency Range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The standard states that the guide values in Table 5.8 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

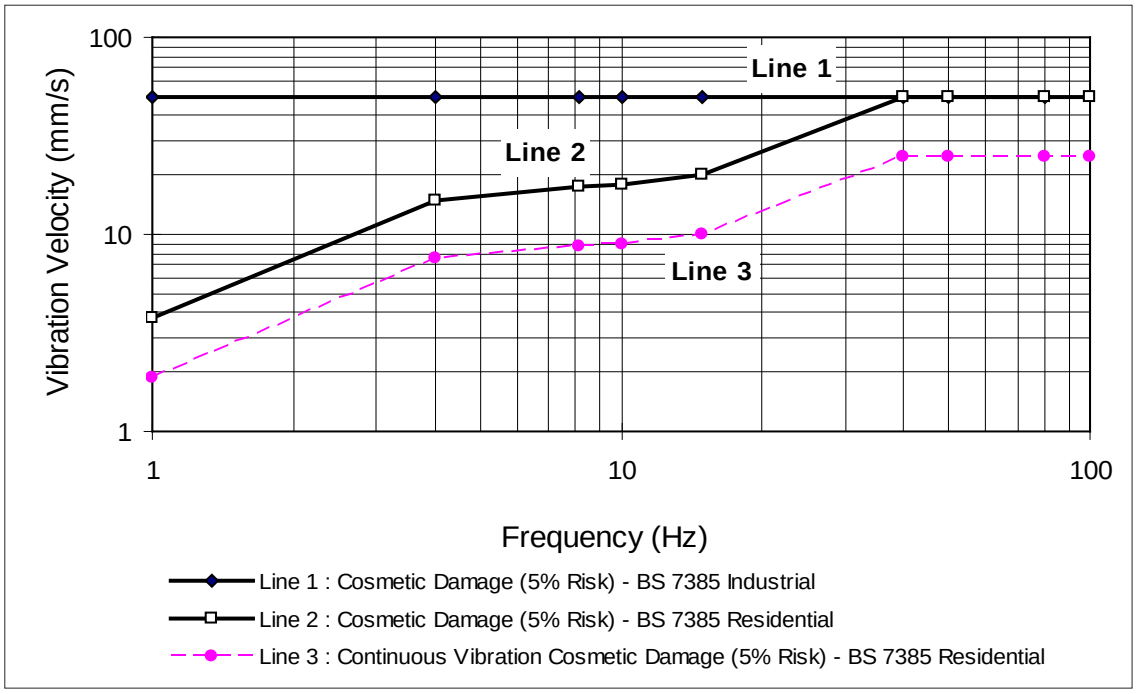


Figure 5.1 Graph of transient vibration guide values for cosmetic damage

In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for building types corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 5.8, and major damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 5.8 should not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS 2187.2-2006 specifies that vibration should be measured at the base of the building and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) should be compared with the criteria curves presented in Table 5.8.

It is noteworthy that extra to the guide values nominated in Table 5.8, the standard states that:

> Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK.

The standard also states that:

> A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

5.3 Operational noise

Noise from industrial sites or processes (eg onsite truck movements or material processing etc.) in NSW is regulated by the local council, DPIE and/or the EPA, and generally have a licence and/or development consent conditions stipulating noise limits. These limits are generally derived from project specific trigger or operational noise levels predicted at assessment locations. They are based on EPA guidelines (ie NPfI or previous Industrial Noise Policy) or noise levels that can be achieved by a specific site following the application of all reasonable and feasible noise mitigation.

The objectives of noise trigger levels for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location.

To ensure these objectives are met, the EPA provides project specific noise trigger levels, namely intrusiveness and amenity.

5.3.1 Intrusiveness noise levels

The intrusiveness noise levels require that $L_{Aeq,15min}$ noise levels from the site during the relevant operational periods do not exceed the RBL by more than 5 dB.

Table 5.9 presents the intrusiveness noise levels determined for the site based on the adopted RBLs. Where assessment locations have been grouped together in the following tables, it has been assumed that the ambient noise environment at these assessment locations is similar. It is noted that intrusiveness noise levels are only applicable at residential assessment locations.

Table 5.9 Project intrusiveness noise levels

Assessment location[1]	Assessment period[2]	Adopted RBL, dB(A)	Project intrusiveness noise level (RBL + 5 dB), $L_{Aeq,15min}$, dB
R6, R7 (L3)	Day	40	45
	Evening	39	44
	Night	37	42
	Morning shoulder	40[3]	45
R8, R9 (L2)	Day	43	48
	Evening	42	47
	Night	39	44
	Morning shoulder	43[3]	48
R10, R12, R16, R17, R18, R19 (L1)	Day	43	48
	Evening	43	48
	Night	40	45
	Morning shoulder	43[3]	48

Notes: 1. Residential assessment locations only.
2. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.
3. The day period RBL was conservatively used given the calculated morning shoulder period RBL was higher as per NPfI.

5.3.2 Project amenity noise levels

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail traffic noise. Where the measured existing industrial noise approaches recommended amenity noise levels, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for a new industrial development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. It is noted that this approach is based on a receiver being impacted by three of four individual industrial sites (or noise sources).

Nearest residential assessment locations to the north-west and west of the site have been categorised in the NPfI Suburban amenity category. As per the definitions provided in the NPfI, "suburban" residential assessment locations are defined as "*an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry".*

The corresponding project amenity noise levels for the project are given in Table 5.10.

Table 5.10 Project amenity noise levels

Assessment location	Indicative area	Time period[1]	Project amenity noise level dB, $L_{Aeq,period}$ (Recommended amenity noise level minus 5 dB)
All residential areas	Suburban	Day	50
		Evening	40
		Night	35
Place of worship	All	When in use	35 (internal)
Active recreation (ie golf course)	All	When in use	50
Commercial	All	When in use	60
Industrial	All	When in use	65
School	All	When in use	30 $L_{Aeq,1hour}$ (internal)

Source: NPfI (EPA 2017).

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.

5.3.3 Project noise trigger level

The project noise trigger level (PNTL) is the lower of the calculated intrusiveness or amenity noise level and are provided in Table 5.11 for all assessment locations.

To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI assumes that the $L_{Aeq,15min}$ is equivalent to the $L_{Aeq,period}$ + 3 dB, unless robust evidence is provided for an alternative approach for the particular project being considered.

Table 5.11 Project noise trigger levels

Assessment location	Assessment period[1]	Intrusiveness noise level, $L_{Aeq,15min}$, dB	Amenity noise level[2], $L_{Aeq,15min}$, dB	PNTL[3], $L_{Aeq,15min}$, dB
R1, R2, R3, R14, R15 (Industrial)	When in use	N/A	68	68
R4 (Active recreation)	When in use	N/A	53	53
R5 (Place of worship)	When in use	N/A	38 (internal)	48 (external)[4]
R6, R7 (Residential)	Day	45	53	45
	Evening	44	43	43
	Night	42	38	38
	Morning shoulder	45	N/A	45
R8, R9 (Residential)	Day	48	53	48
	Evening	47	43	43
	Night	44	38	38
	Morning shoulder	48	N/A	48

Table 5.11 Project noise trigger levels

Assessment location	Assessment period[1]	Intrusiveness noise level, $L_{Aeq,15min}$, dB	Amenity noise level[2], $L_{Aeq,15min}$, dB	PNTL[3], $L_{Aeq,15min}$, dB
R10, R12, R16, R17, R18, R19 (Residential)	Day	48	53	48
	Evening	48	43	43
	Night	45	38	38
	Morning shoulder	48	N/A	48
R11 (School)	When in use	N/A	33 (internal)	43 (external)[4]
R13 (Commercial)	When in use	N/A	63	63

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.
2. Project amenity $L_{Aeq,15min}$ noise level is the recommended amenity noise level $L_{Aeq,period}$ +3 dB as per the NPfI.
3. PNTL is the lower of the calculated intrusiveness or amenity noise levels.
4. External level based on an external-to-internal noise reduction of 10 dB, in accordance with the NPfI.

5.4 Sleep disturbance

The project will operate during the night-time period (10 pm to 7 am) and therefore, in accordance with the NPfI, the potential for sleep disturbance has been assessed.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where the development/premises night-time noise levels at a residential location exceed:

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

The sleep disturbance noise trigger levels for all residential assessment locations are provided in Table 5.12.

Table 5.12 Maximum noise level event trigger levels

Residential assessment location	Assessment period[1]	Adopted RBL, dB(A)	Maximum noise level event trigger levels, dB	
			RBL +5 dB or standard[2]	RBL +15 dB or standard[2]
			$L_{Aeq,15min}$	L_{Amax}
R6, R7	Night	37	42	52
	Morning shoulder	40[3]	45	55
R8, R9	Night	39	44	54
	Morning shoulder	43[3]	48	58
R10, R12, R16, R17, R18, R19	Night	40	45	55
	Morning shoulder	43[3]	48	58

Notes: 1. Morning shoulder: 6 am to 7 am; Night: 10 pm to 7 am Monday to Saturday, 10 pm to 8 am Sundays and public holidays, and excludes the morning shoulder period.
2. Whichever is greater.
3. The day period RBL was conservatively used given the calculated morning shoulder period RBL was higher as per NPfI.

5.5 Road traffic noise

The potential noise impacts resulting from operational related traffic on public roads are assessed against criteria defined in the RNP. The application of appropriate road traffic noise criteria for the facility has followed the two-step process identifying the assessment and relative increase criteria as outlined in Section 3.4.1 of the RNP.

The majority of site related traffic (approximately 80%) will be using the Great Western Highway and Toongabbie Road (section south of the site) to access or leave the facility. There are no residential receivers on these roads and hence future additional traffic operations on these roads will not create an impact. Signage will be erected within the facility requesting that vehicles access the site from Great Western Highway and Toongabbie Road so that return customers (as will be the majority of customers) will use this route.

Some site related traffic during the day period are likely to travel on Mandoon Road, Girraween Road and Toongabbie Road (section north of the site) when accessing or leaving the facility. The nearest residential facades potentially affected by an increase in road traffic volumes on these roads are located approximately 9 m to 15 m from the nearside carriageway. These roads are frequently used by nearby commercial and industrial sites and connect to other major roads (eg Great Western Highway and Toongabbie Road).

To assess road traffic noise appropriately, the road category for roads being used by a given development creating additional traffic needs to be determined as per the definitions of the RNP (ie in noise terms as opposed to traffic planning or engineering terms). The 'local' roads category as defined in the RNP does not describe Girraween Road or Mandoon Road. We understand that Girraween Road is described as a 'regional' road according to the traffic specialists. These roads are designated for use by industry and hence behave like collector roads or principle haulage roads for industry and would normally be listed as 'classified' roads by Council. In these circumstances, we would assess them against the sub-arterial noise targets. That is different to categorising them as sub-arterial roads in accordance with traffic guidelines based on volumes. The RNP categorises them as 'sub-arterial' by virtue of them being 'collector' roads, a term used in the EPA's previous guideline Environmental Criteria for Road Traffic Noise (1999), as referenced in the RNP. The definition provided in Table 2 of the RNP for sub-arterial (and collector) roads is as follows:

> Provide connection between arterial roads and local roads.
>
> May support arterial roads during peak periods.
>
> May have been designed as local streets but can serve major traffic-generating developments or support non-local traffic.

This RNP definition for sub-arterial roads is aligned with how Mandoon Road and Girraween Road are operating and being used. Hence, these roads are assessed against the sub-arterial road noise targets of the RNP. Importantly, the road category is inconsequential to the noise assessment given that the level of existing traffic noise on these roads exceeds the RNP targets, as will be shown later.

Table 5.13 presents the road noise assessment criteria for residential land uses, reproduced from Table 3 of the RNP.

Table 5.13 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB	
		Day (7 am–10 pm)	Night (10 pm–7 am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors. Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)
Local roads	Provide vehicular access to abutting property and surrounding streets. Provide a network for the movement of pedestrians and cyclists, and enable social interaction in a neighbourhood. Should connect, where practicable, only to sub-arterial roads.	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hour}$ 50 (external)

Table 5.14 was reproduced from the RNP and provides relevant noise management levels for other land uses.

Table 5.14 Road traffic noise assessment criteria for non-residential land uses

Existing sensitive land use	Assessment criteria, dB		Additional considerations
	Day (7 am–10 pm)	Night (10 pm–7 am)	
School Classrooms	$L_{Aeq,1hour}$ 40 (internal) when in use	-	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
Open space (active use)	$L_{Aeq,15hour}$ 60 (external)	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (eg playing chess, reading). In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
Open space (passive use)	$L_{Aeq,15hour}$ 60 (external)	-	

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB where all feasible and reasonable noise mitigation is considered.

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers due to a development must be considered. Receivers experiencing increases in total traffic noise levels above those presented in Table 5.15 should be considered for mitigation.

Table 5.15 Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase, dB	
		Day (7 am–10 pm)	Night (10 pm–7 am)
Freeway/arterial/ sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq,15hour}$ +12 dB (external)	Existing traffic $L_{Aeq,9hour}$ +12 dB (external)

6 Modelling and assessment

6.1 Noise modelling method

This section presents the methods and assumptions used to model noise emissions from the project.

Noise modelling was based on three-dimensional digitised ground contours of the surrounding land. Noise predictions were carried out using Brüel & Kjær Predictor noise prediction software. 'Predictor' calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources. The model has considered factors such as:

- the lateral and vertical location of plant;
- source to assessment location distances;
- ground effects;
- atmospheric absorption;
- topography of the project site and surrounding area; and
- applicable meteorological conditions.

6.2 Construction noise

Construction works on-site will initially comprise the removal or demolition of existing on-site infrastructure such as the weighbridge, office building and main (north) driveway. This will be followed by the construction or erection of new project facilities including two driveways and weighbridges (in-bound and out-bound), employee and visitor carpark, hand-unloading shed, acceptance and processing waste shed, office and amenities, sealed working surfaces (concrete or asphalt), fencing and landscaped areas.

Plant and equipment were modelled at locations and heights representing activities during the construction phase of the project using representative equipment sound power levels and quantities shown in Table 6.1. The sound power levels adopted for the assessment have been taken from published equipment specifications or an EMM database of measurements from similar projects. Noise modelling has conservatively assumed that all plant and equipment operates simultaneously and at full power. While this may occur at times, the use of individual plant generally will be intermittent during operations.

Table 6.1 Construction plant and equipment sound power levels and quantities

Plant and equipment	Quantity[1]	Sound power level (L_w), dB(A)
Franna Crane	1	106
Hand tools	2	97
Bobcat	1	104
Concrete truck (pouring)	1	113
Road truck	1	103
Water cart	1	103

Notes: 1. Within a representative 15-minute ICNG assessment period.

Construction noise emissions have been predicted at all assessment locations with respect to construction activity and modelling results are shown in Table 6.2. The predicted noise levels have been assessed against the relevant ICNG NMLs for standard construction hours, which are during the day period between the hours of 7 am and 6 pm Monday to Friday, and 8 am to 1 pm Saturday.

Construction noise levels are predicted to satisfy the relevant NMLs at all assessment locations during standard construction hours. Given that the predictions assume plant and equipment are operating simultaneously and at full power, it is likely that actual construction noise levels will be less than those predicted for the majority of the construction phase of the project.

Table 6.2 Construction noise modelling results (standard hours only)

Assessment location (Type)	Predicted construction $L_{Aeq,15min}$ noise levels, dB		NML, $L_{Aeq,15min}$, dB
	Calm	Noise-enhancing[1]	
R1 (Industrial)	72	72	75
R2 (Industrial)	59	59	75
R3 (Industrial)	58	58	75
R4 (Active recreation)	64	64	65
R5 (Place of worship)	39	41	55 (external)
R6 (Residential)	41	43	50
R7 (Residential)	42	45	50
R8 (Residential)	46	48	53
R9 (Residential)	46	49	53
R10 (Residential)	44	46	52
R11 (School)	35	38	55 (external)
R12 (Residential)	42	45	52
R13 (Commercial)	44	46	70
R14 (Industrial)	42	44	75
R15 (Industrial)	40	43	75
R16 (Residential)	39	41	52
R17 (Residential)	39	41	52
R18 (Residential)	37	40	52
R19 (Residential)	38	40	52

Notes: 1. Worst case source-to-receiver winds up to 3 m/s.

6.3 Construction vibration

As a guide, minimum working distances for typical items of vibration intensive plant are listed in Table 6.3. The minimum working distances are quoted for both “Cosmetic Damage” (refer to BS 7385) and “Human Comfort” (refer to the DEC’s vibration guideline).

Table 6.3 Recommended minimum working distances for vibration intensive plant from sensitive receivers

Plant item	Rating/Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (DEC's vibration guideline)
Vibratory Roller	<50 kN (Typically 1-2 tonnes)	5 m	15 to 20 m
	<100 kN (Typically 2-4 tonnes)	6 m	20 m
	<200 kN (Typically 4-6 tonnes)	12 m	40 m
	<300 kN (Typically 7-13 tonnes)	15 m	100 m
	>300 kN (Typically 13-18 tonnes)	20 m	100 m
	>300 kN (>18 tonnes)	25 m	100 m
Small hydraulic hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg - 12 to 18t excavator)	7 m	23 m
Large hydraulic hammer	(1600 kg - 18 to 34t excavator)	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand-held	1 m (nominal)	2 m

Source: NSW Roads and Maritime Services Construction Noise and Vibration Guideline (2016).

The minimum working distances presented in Table 6.3 are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

In relation to human comfort (response), the minimum working distances in Table 6.3 relate to continuous vibration and apply to residential receivers. For most construction activities, vibration emissions are intermittent in nature and hence higher vibration levels occurring over shorter periods are allowed, in accordance with the DEC's vibration guideline.

The proposed construction activities are not expected to include any vibration intensive plant. Therefore, given the nature of the proposed construction activities and distances to the nearest residences (ie >400 m), intermittent vibration levels are unlikely to cause adverse human response or cosmetic damage to residences.

6.4 Operational noise

6.4.1 Modelling assumptions

Plant and equipment were modelled at locations and heights representing activities during the operational stage of the project and using representative plant and equipment sound power levels and quantities provided in Table 6.4.

The list of operational plant and equipment items adopted in this assessment was provided by Benedict Recycling. The sound power levels adopted have been taken from published equipment specifications or an EMM measurement database of equipment for similar projects. Noise modelling has conservatively assumed that all plant and equipment operate simultaneously and at full power. Handling and processing plant and equipment were assumed to be operating during the day period only and inside the main shed (enclosed), as noted in Table 6.4.

Table 6.4 Operational plant and equipment sound power levels and quantity

Plant and equipment	Quantity[1]	Sound power level (Lw), dB(A)
Excavator (14 t)[2]	2	104
Screen[2]	1	101
Picking line[2]	1	88
Front-end loader (FEL)[2]	2	108
Road truck	5	103-105
Skip-bin truck	1	103-105
Yard sweeper	1	104

Notes: 1. Within a representative 15-minute NPfI assessment period per unit.
2. Inside the main shed and only operate from 7 am to 10 pm Monday to Friday and 7 am to 5 pm on Saturdays, excluding public holidays.

6.4.2 Noise modelling results and discussion

Noise modelling was completed for the day, evening, night and morning shoulder periods for the meteorological scenarios presented in Table 4.4. Noise modelling results are provided in Table 6.5.

The noise modelling results show that the NPfI PNTLs will be satisfied at all assessment locations for calm and noise enhancing meteorological conditions during all proposed operational periods.

Table 6.5 Operational noise modelling results

Assessment location (Type)	Assessment period[1]	Predicted noise levels, $L_{Aeq,15min}$, dB		PNTL, $L_{Aeq,15min}$, dB
		Calm	Noise enhancing[2]	
R1 (Industrial)	Day	56	56	68
	Evening	56	56	68
	Night	56	56	68
	Morning shoulder	56	56	68
R2 (Industrial)	Day	46	46	68
	Evening	46	46	68
	Night	43	43	68
	Morning shoulder	43	43	68
R3 (Industrial)	Day	41	41	68
	Evening	41	41	68
	Night	<35	<35	68
	Morning shoulder	<35	<35	68
R4 (Active recreation)	Day	53	53	53
	Evening	53	53	53
	Night	47	47	53
	Morning shoulder	47	47	53
R5 (Place of worship)	Day	<40	<40	48
	Evening	<35	<35	48
	Night	<35	<35	48
	Morning shoulder	<35	<35	48

Table 6.5 Operational noise modelling results

Assessment location (Type)	Assessment period[1]	Predicted noise levels, $L_{Aeq,15min}$, dB		PNTL, $L_{Aeq,15min}$, dB
		Calm	Noise enhancing[2]	
R6 (Residential)	Day	<40	<40	45
	Evening	<35	36	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	45
R7 (Residential)	Day	<40	<40	45
	Evening	36	38	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	45
R8 (Residential)	Day	<40	41	48
	Evening	38	41	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R9 (Residential)	Day	<40	41	48
	Evening	38	41	43
	Night	<35	36	38
	Morning shoulder	<35	36	48
R10 (Residential)	Day	<40	<40	48
	Evening	37	40	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R11 (School)	When in use[3]	<40	<40	43
R12 (Residential)	Day	<40	40	48
	Evening	38	40	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R13 (Commercial)	Day	<40	<40	63
	Evening	37	39	63
	Night	<35	<35	63
	Morning shoulder	<35	<35	63
R14 (Industrial)	Day	<40	<40	68
	Evening	<35	37	68
	Night	<35	<35	68
	Morning shoulder	<35	<35	68
R15 (Industrial)	Day	<40	<40	68
	Evening	<35	36	68
	Night	<35	<35	68
	Morning shoulder	<35	<35	68
R16 (Residential)	Day	<40	<40	48
	Evening	<35	35	43

Table 6.5 Operational noise modelling results

Assessment location (Type)	Assessment period[1]	Predicted noise levels, $L_{Aeq,15min}$, dB		PNTL, $L_{Aeq,15min}$, dB
		Calm	Noise enhancing[2]	
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R17 (Residential)	Day	<40	<40	48
	Evening	<35	36	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R18 (Residential)	Day	<40	<40	48
	Evening	<35	<35	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48
R19 (Residential)	Day	<40	<40	48
	Evening	<35	<35	43
	Night	<35	<35	38
	Morning shoulder	<35	<35	48

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.

2. Worst case source-to-receiver winds up to 3 m/s and/or F stability category temperature inversion conditions with source-to-receiver winds up to 2 m/s for the night and morning shoulder period.

3. Day period only.

6.5 Sleep disturbance assessment

Maximum noise levels from the project during the night and morning shoulder periods with the potential to cause sleep disturbance at nearby residences have been assessed in accordance with the NPfI. Predicted $L_{Aeq,15min}$ noise levels for the night and morning shoulder periods were taken from Table 6.5 and compared against the relevant sleep disturbance trigger levels.

Truck deliveries during the night and morning shoulder periods have also been assessed. Maximum noise events could include truck airbrakes, reversing alarms and impact noise associated with delivery activities. A worst-case maximum sound power level of L_{Amax} 120 dB was adopted to cover any of these possible events in the prediction of sleep disturbance impacts at residential assessment locations during calm and noise-enhancing meteorological conditions. Results are provided in Table 6.6.

Noise modelling results show that maximum L_{Aeq} and L_{Amax} noise levels are predicted to satisfy the screening criteria for sleep disturbance at all residential assessment locations during calm and noise-enhancing meteorological conditions. Therefore, it is unlikely that the project will cause sleep disturbance at any residential receivers.

Table 6.6 Predicted maximum noise levels at residential assessment locations

Assessment location	Assessment period[1]	Predicted maximum noise levels, dB				Screening criteria, dB	
		$L_{Aeq,15min}$		L_{Amax}		$L_{Aeq,15min}$	L_{Amax}
		Calm	Noise-enhancing	Calm	Noise-enhancing		
R6	Night	<35	<35	43	45	42	52
	Morning shoulder	<35	<35	43	45	45	55
R7	Night	<35	<35	48	51	42	52
	Morning shoulder	<35	<35	48	51	45	55
R8	Night	<35	<35	48	51	44	54
	Morning shoulder	<35	<35	48	51	48	58
R9	Night	<35	36	49	52	44	54
	Morning shoulder	<35	36	49	52	48	58
R10	Night	<35	<35	49	52	45	55
	Morning shoulder	<35	<35	49	52	48	58
R12	Night	<35	<35	49	52	45	55
	Morning shoulder	<35	<35	49	52	48	58
R16	Night	<35	<35	43	46	45	55
	Morning shoulder	<35	<35	43	46	48	58
R17	Night	<35	<35	48	51	45	55
	Morning shoulder	<35	<35	48	51	48	58
R18	Night	<35	<35	45	48	45	55
	Morning shoulder	<35	<35	45	48	48	58
R19	Night	<35	<35	38	40	45	55
	Morning shoulder	<35	<35	38	40	48	58

Notes: 1. Morning shoulder: 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: 10 pm to 7 am Monday to Saturday, 10 pm to 8 am Sundays and public holidays, excluding the morning shoulder.

6.6 Road traffic noise

Traffic generation predictions for the site are provided in the Traffic Impact Assessment (TIA) for the project (EMM 2019). The TIA estimated that approximately 10% of site related traffic would travel north of site on Toongabbie Road (north of Mandoon Road) and 10% of site related traffic would travel on Mandoon Road (east of Toongabbie Road) and Girraween Road (with 5% travelling north and 5% traveling south at the Mandoon Road intersection). However, the proponent will implement the following measures to minimise or eliminate traffic noise increases from site related traffic:

- During the day and evening time (up to 10 pm), deliveries will be made to the facility by businesses (generally heavy vehicles) and members of the public (generally light vehicles). The majority (80%) are expected to access the site from the Great Western Highway and Toongabbie Road with a far lesser number coming from the north. Signage will be erected within the facility requesting that vehicles access the site from the Great Western Highway and Toongabbie Road so that return customers (as will be the majority of customers) will use this route.

- At night (10 pm to 6 am), waste deliveries will be made by contractors working on civil night works. These deliveries will need to be booked in advance – otherwise the facility will be unstaffed and closed. When

site staff take the delivery booking, contractors will be instructed to use the Great Western Highway and the south of Toongabbie Road to access and leave the site.

- Products and unrecyclable materials generally will be dispatched from the facility by trucks owned or contracted by the proponent. The proponent will have control over the routes that these trucks use. Truck drivers with laden trucks will be instructed to turn south on Toongabbie Road and proceed to the Great Western Highway, and to access the site with empty trucks using the same route. Truck drivers will be instructed not to use any smaller roads, including Mandoon Road, Girraween Road and Magowar Road.

- These measures to minimise the use of local roads will be documented in the operational traffic management plan that will be part of the facility's operational environmental management plan (see EIS Section 2.8.3).

Existing average daily traffic volumes were counted during a 2019 RMS survey, with 10,620 movements on Toongabbie Road (north on Mandoon Road) and 2,447 movements on Mandoon Road (east of Toongabbie Road). No traffic survey data was available for Girraween Road, however, existing daily traffic volumes on Girraween Road are expected to be similar or higher than for Mandoon Road.

Based on existing surveyed traffic numbers and percentage of site related traffic on Toongabbie Road (north on Mandoon Road), Mandoon Road (east of Toongabbie Road) and Girraween Road (north and south), the worst-case road section for an increase in road traffic noise as a result of the project is Mandoon Road (immediately west of the Mandoon Road and Girraween Road intersection) where the most affected facades are located approximately 9 m from the nearside carriageway.

The increase in traffic volumes on Mandoon Road as a result of the project during the RNP defined daytime period (7 am-10 pm) is predicted to be marginal and hence will lead to a negligible increase (<0.5 dB) in road traffic noise. However, site related road traffic during the night period (10 pm-7 am) requires detailed analysis given lower existing road traffic movements during this time. Existing traffic volumes for Mandoon Road (east of Toongabbie Road) were referenced from the TIA, with 2,447 daily traffic movements calculated for Mandoon Road (East of Toongabbie Road) based on the 2019 intersection survey results. For the purpose of this assessment, it was assumed that 85% and 15% of all existing traffic volume on Mandoon Road occur during the RNP day and night periods, respectively. This results in an existing road traffic volume of 367 movements during the night period on Mandoon Road. The percentage of heavy vehicles on Mandoon Road during the night period was not available from the survey and hence was conservatively assumed to be the lowest value recorded during all three daytime peak hour surveys (westbound and eastbound combined) on Mandoon Road, that is 3.4%. In industrial areas, night-time heavy vehicle traffic composition is typically higher than daytime peak periods where light vehicles are more prevalent.

For site related traffic during the night period, there will be a maximum of 10 truck movements per hour over the eight-hour overnight period between 10 pm to 6 am, in addition to six heavy vehicle movements (deliveries and dispatch combined) between 6 am and 7 am and five light vehicle employee movements.

As described earlier, night-time waste deliveries (after 10 pm) will be made by contractors, booked in advance, and drivers will be instructed not to use Mandoon Road and Girraween Road. This assessment of future road traffic noise (from existing and site related traffic) is therefore considered worst-case.

The Federal Highway Traffic Noise Model (FHWA) (US Department of Transportation) method was used to predict road traffic noise levels along Mandoon Road. This prediction method considers traffic flow volume, average speed, percentage of heavy vehicles and road gradient to establish noise source strength, and includes attenuation due to distance, ground absorption and screening from buildings or barriers.

Road traffic noise levels predicted at the nearest receivers (facades facing the road) to Mandoon Road during the RNP night period are shown in Table 6.7. Both the $L_{Aeq,period}$ and $L_{Aeq,1hour}$ noise levels are shown. Given the road traffic volumes adopted for the assessment are average number of movements, the $L_{Aeq,period}$ and $L_{Aeq,1hour}$ noise levels are consistent.

Table 6.7 Road traffic noise results

Road	Road section	Distance from road[1]	Calculated existing (2019) noise level $L_{Aeq,Night}$, dB	Predicted future[2] noise level $L_{Aeq,Night}$, dB	Criterion $L_{Aeq,Night}$, dB	Increase between existing and future, dB
Mandoon Road	West of Girraween Road	9 m	57 (or 57 $L_{Aeq,1hour}$)	58 (or 58 $L_{Aeq,1hour}$)	55 (or 50 $L_{Aeq,1hour}$)	1.7

Notes: 1. Distance from the nearest residential facade to the edge of the nearest lane.
2. Includes site related traffic.

The results show that the existing (2019) level of road traffic noise calculated for the night period at the nearest residential facade along Mandoon Road currently exceeds the relevant criterion. Future (with project related traffic) road traffic noise level at the nearest residential facade along Mandoon Road is predicted to negligibly increase (by 1.7 dB) during the night period and therefore satisfies the RNP 2 dB allowance increase criterion. It is important to highlight that the existing road traffic $L_{Aeq,1hour}$ noise level is significantly above the RNP target for a local road (ie 50 dB), reaffirming that Mandoon Road at this location does not match the RNP definition for a local road.

The predicted future noise level for the night period also satisfies the RNP road traffic relative increase criterion ($L_{Aeq,period}$ + 12 dB) for residential land uses and overall road traffic noise levels.

Furthermore, future road traffic noise levels are not expected to cause an impact at any other residential receivers along the transport route. Therefore, the impact of road traffic noise as a result of the project is predicted to be negligible at the nearest residential receivers and within the 2 dB allowable increase criterion for land use developments in accordance with the RNP.

7 Noise management

Residual noise impacts, that is, noise emission levels above the PNTLs, are not predicted for the project. Hence, additional specific noise mitigation and management measures have not been considered for the project. Notwithstanding, the following 'standard' noise management measures will be considered for implementation during construction and operations to minimise the potential for noise impacts:

- plant and equipment will be regularly maintained and serviced;
- broadband reversing alarms (growlers) will be exclusively used on all site equipment;
- a site layout that minimises the need for mobile plant to reverse will be adopted;
- plant and equipment will be switched off when not in use;
- material drop heights will be minimised and dragging materials along the ground will be minimised;
- site contact details will be provided on a board at the front of the site;
- any noise-related complaints will be handled promptly; and
- a complaints register will be maintained.

It is recommended that noise management is described in the site's Operational Environment Management Plan (OEMP).

8 Conclusion

EMM completed a noise and vibration impact assessment for the proposed Girraween Recycling Facility. The assessment considered the potential for noise and vibration impacts of the project and has been prepared in accordance with the methodologies outlined in the ICNG, NPfI and RNP, as well as other relevant guidelines and standards.

Noise management and trigger levels for the construction and operation of the project have been established based on the results of ambient noise monitoring and methodology provided in the ICNG and NPfI.

Construction and operational activities were conservatively modelled at all assessment locations for calm and worst-case noise-enhancing meteorological conditions. Modelled constructions activities comprised the removal or demolition of existing on-site infrastructure and the construction or erection of new project facilities. Main operational activities modelled included deliveries (by light and heavy vehicle), handling, processing and truck dispatch. Handling and processing plant and equipment were assumed to be operating inside the main shed (enclosed) and during the day period only.

Findings of the assessment are summarised as follows:

- Construction noise levels were assessed for standard hours (daytime period) for standard (calm) and noise-enhancing meteorological conditions. Predictions satisfied the relevant NMLs at all assessment locations and hence proposed construction activities are unlikely to cause noise impacts at any sensitive receivers.

- Construction activities for the project are not expected to include any vibration intensive plant. Therefore, given the nature of the proposed construction activities and the distances to the nearest residences (ie >400 m) and other building structures, intermittent vibration levels are unlikely to cause adverse human response or cosmetic damage.

- Operational noise levels were assessed for the day, evening, night and morning shoulder periods for standard (calm) and noise-enhancing meteorological conditions. The assessment found that noise levels during operation are predicted to satisfy the relevant PNTLs at all assessment locations and hence impacts from the project are unlikely.

- The sleep disturbance assessment demonstrated that night-time maximum noise levels are predicted to satisfy the relevant screening criteria at all residential assessment locations and hence sleep disturbance impacts from the operation of the project during the night and morning shoulder periods are unlikely.

- The project will result in additional road traffic movements during the project operation, however, the increase during the day period is considered to be insignificant in comparison to existing traffic volumes on the relevant roads. Further, the overall increase in average road traffic noise at nearest residential facades is predicted to satisfy relevant RNP criteria during both the day and night periods. Therefore, noise impacts from road traffic noise associated with the project is shown to be unlikely.

Recommendations have been provided herein regarding work practices to be considered to minimise the potential impacts of noise during the project construction and operation.

References

NSW Environmental Protection Authority 2017, *Noise Policy for Industry.*

NSW Department of Environment and Climate Change, 2009, *Interim Construction Noise Guideline.*

NSW Department of Environment and Conservation 2006, *Assessing Vibration: A Technical Guideline.*

NSW Department of Environment, Climate Change and Water 2011, *Road Noise Policy*.

NSW Roads and Maritime Services 2016, *Construction Noise and Vibration Guideline.*

Australian Standard AS 1055-1997, *Acoustics - Description and Measurement of Environmental Noise*.

Australian Standard AS 2436-2010, *Guide to Noise Control on Construction, Maintenance and Demolition Sites.*

Appendix A

Noise logging summary and charts

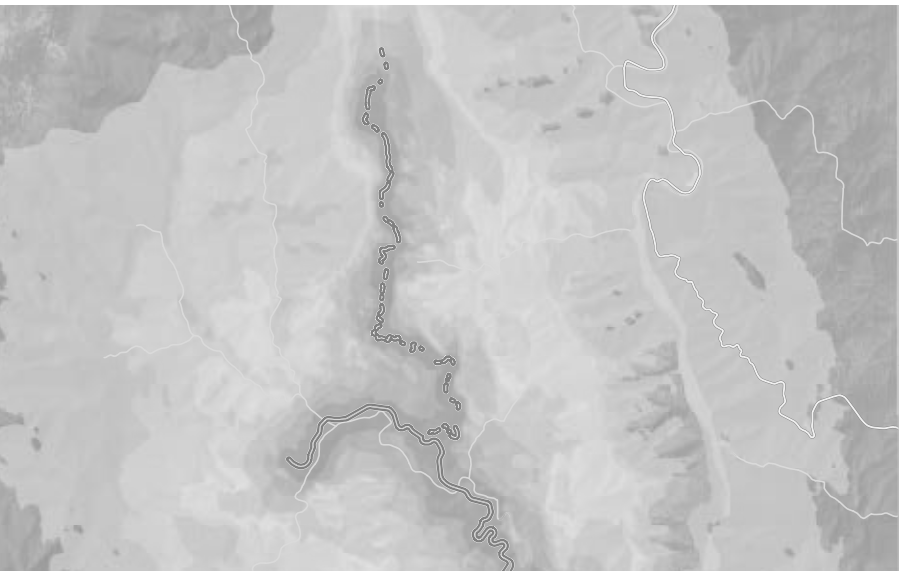
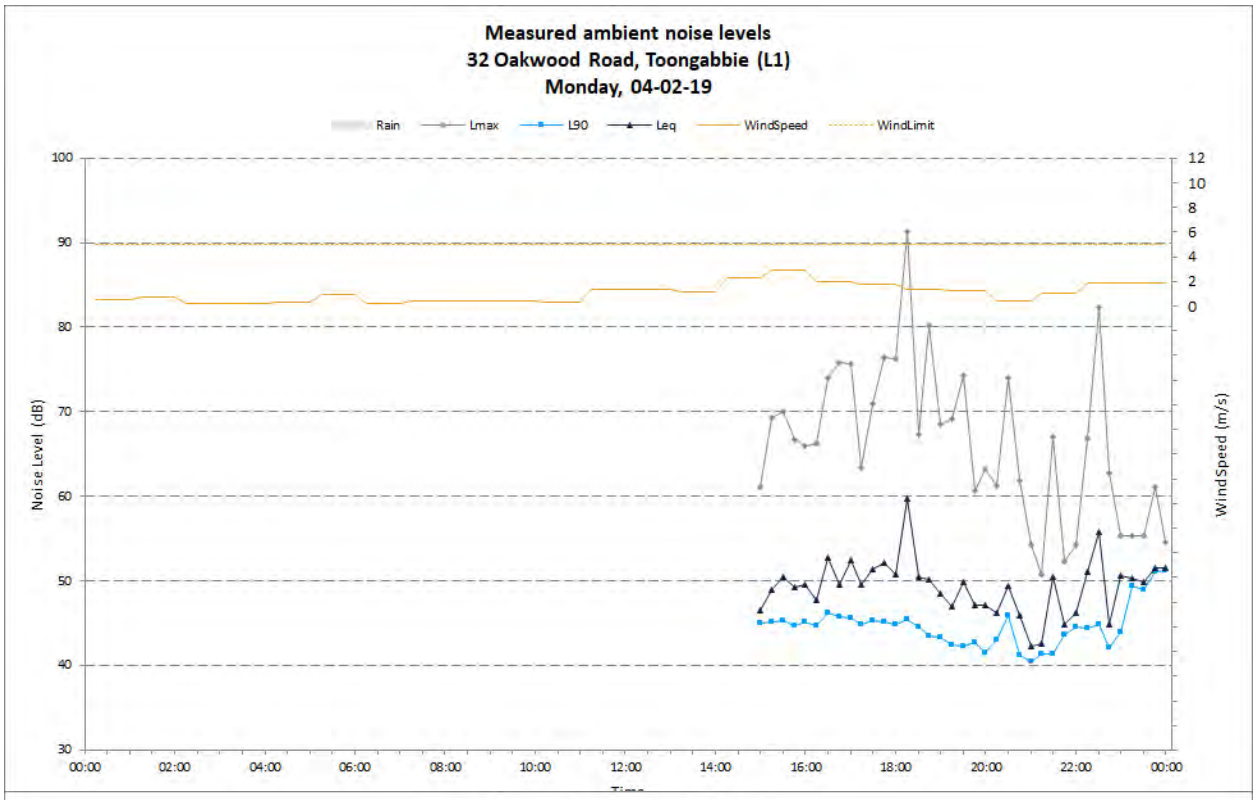
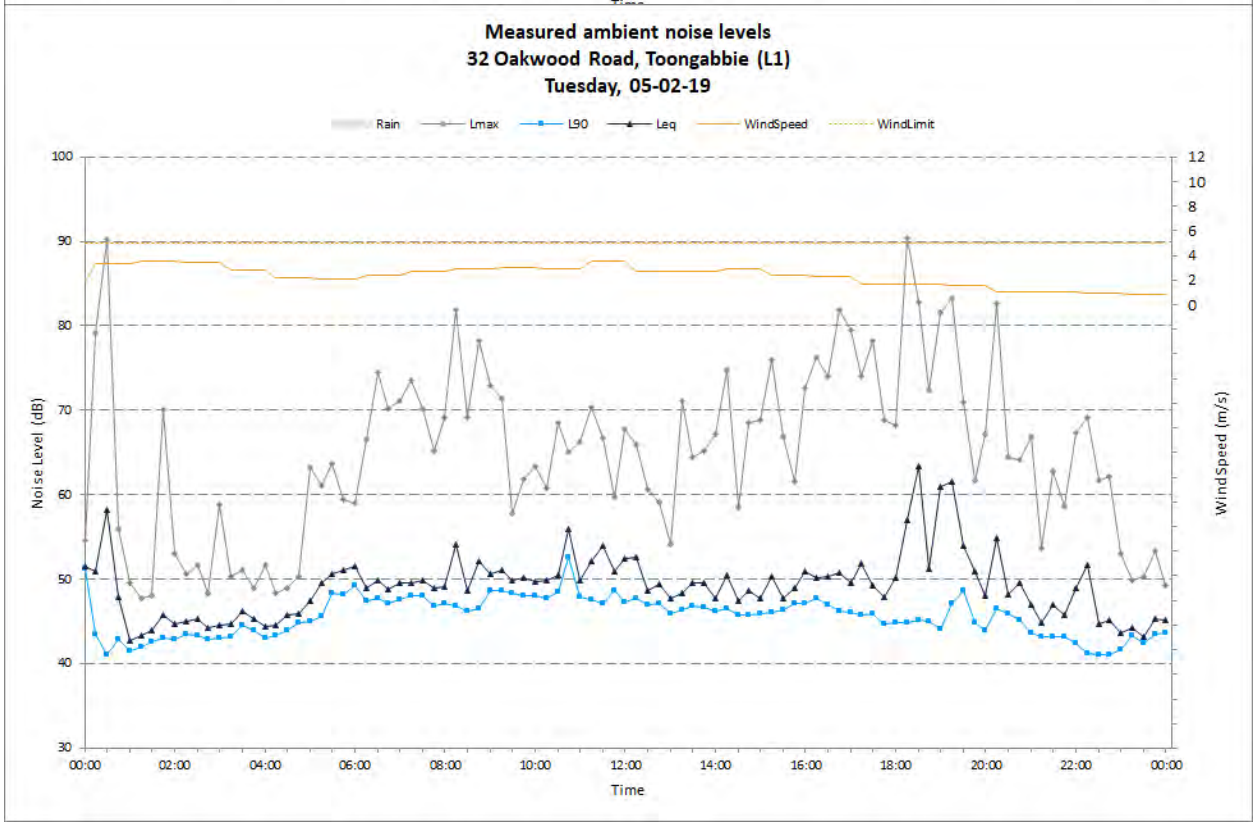


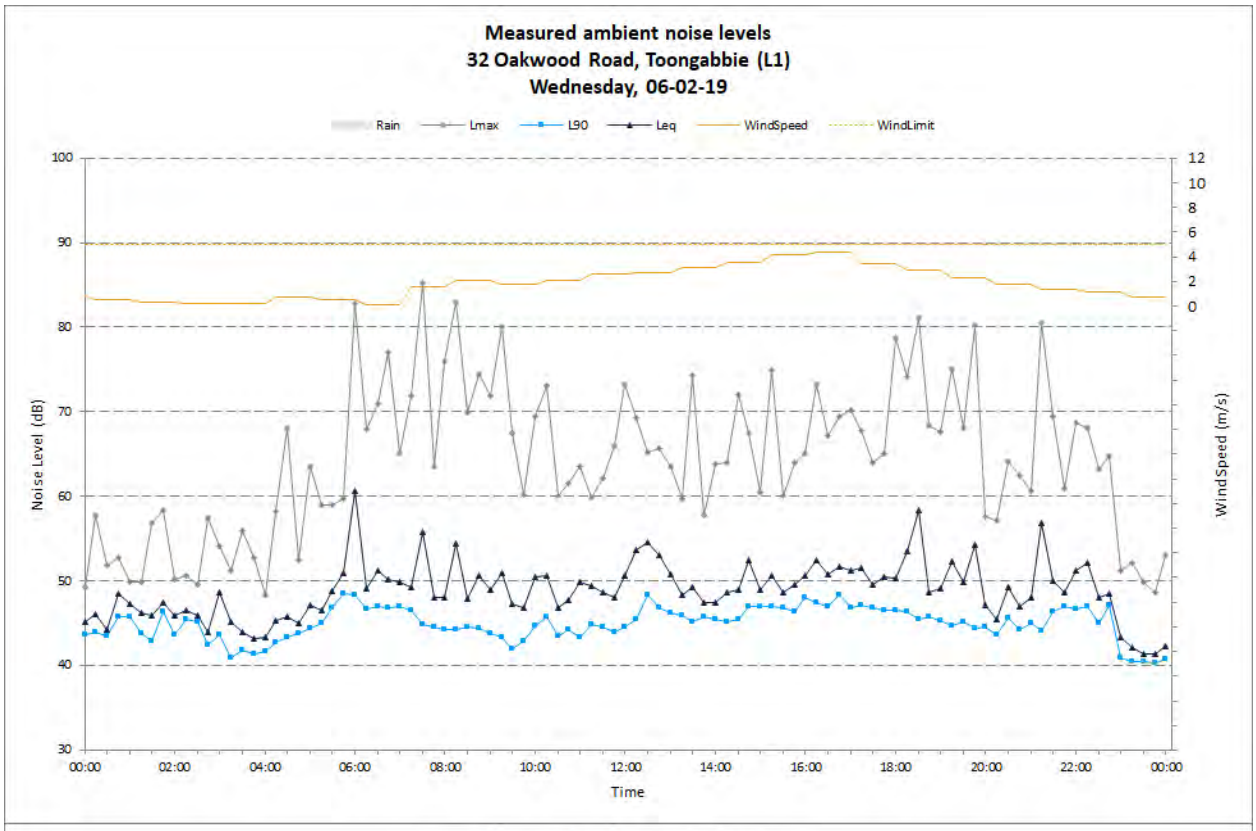
Table A.8.1 Ambient noise monitoring summary – 32 Oakwood Road, Toongabbie (L1)

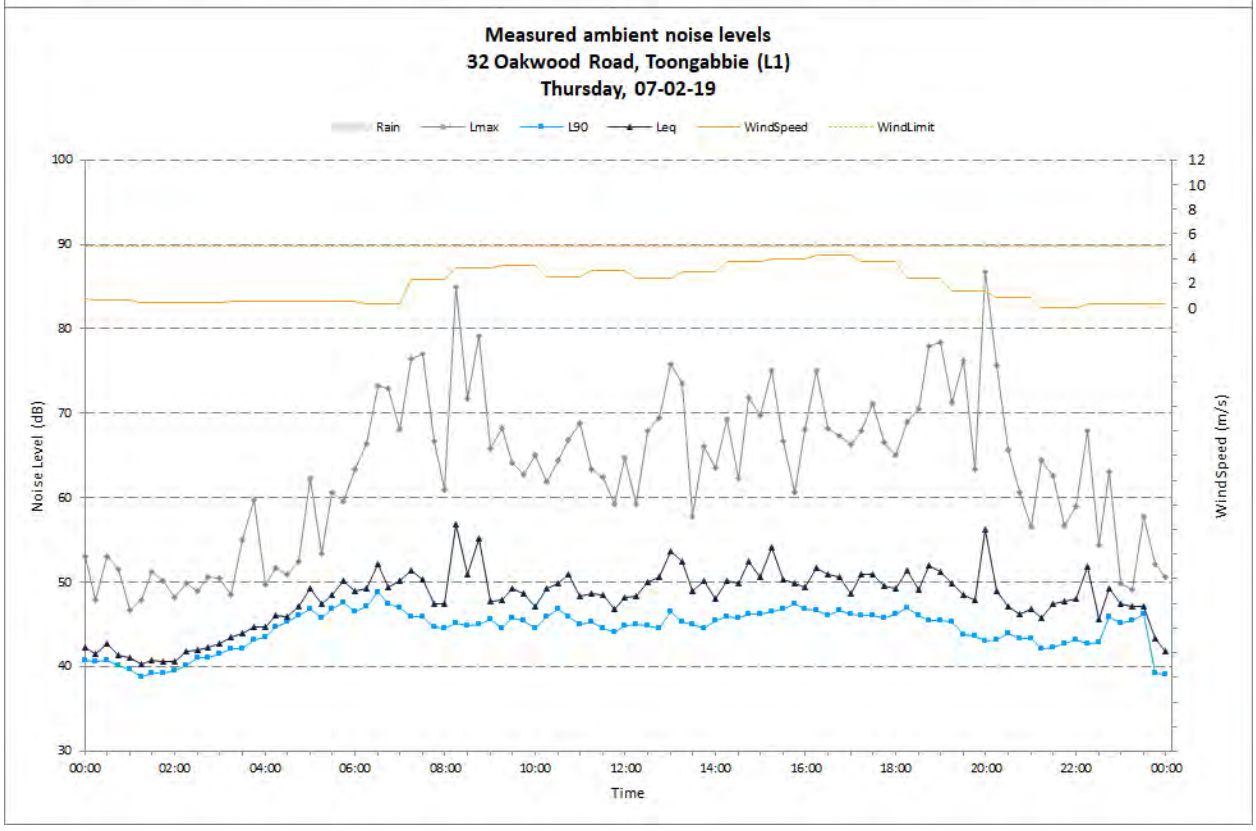
Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11hour}$ Day	$L_{Aeq,4hour}$ Evening	$L_{Aeq,9hour}$ Night
Monday, 04-02-19	0	41	42	0	51	50
Tuesday, 05-02-19	46	43	41	51	56	49
Wednesday, 06-02-19	44	44	40	51	52	47
Thursday, 07-02-19	45	42	39	51	50	47
Friday, 08-02-19	40	0	37	51	0	44
Saturday, 09-02-19	41	44	38	51	53	45
Sunday, 10-02-19	37	42	37	51	49	47
Monday, 11-02-19	39	43	40	51	54	50
Tuesday, 12-02-19	43	42	44	51	49	50
Wednesday, 13-02-19	44	47	40	52	51	46
Thursday, 14-02-19	42	44	40	50	49	46
Friday, 15-02-19	0	0	0	0	0	0
Summary Values						
RBL	43	43	40	-	-	-
Average L_{Aeq}	-	-	-	51	52	48

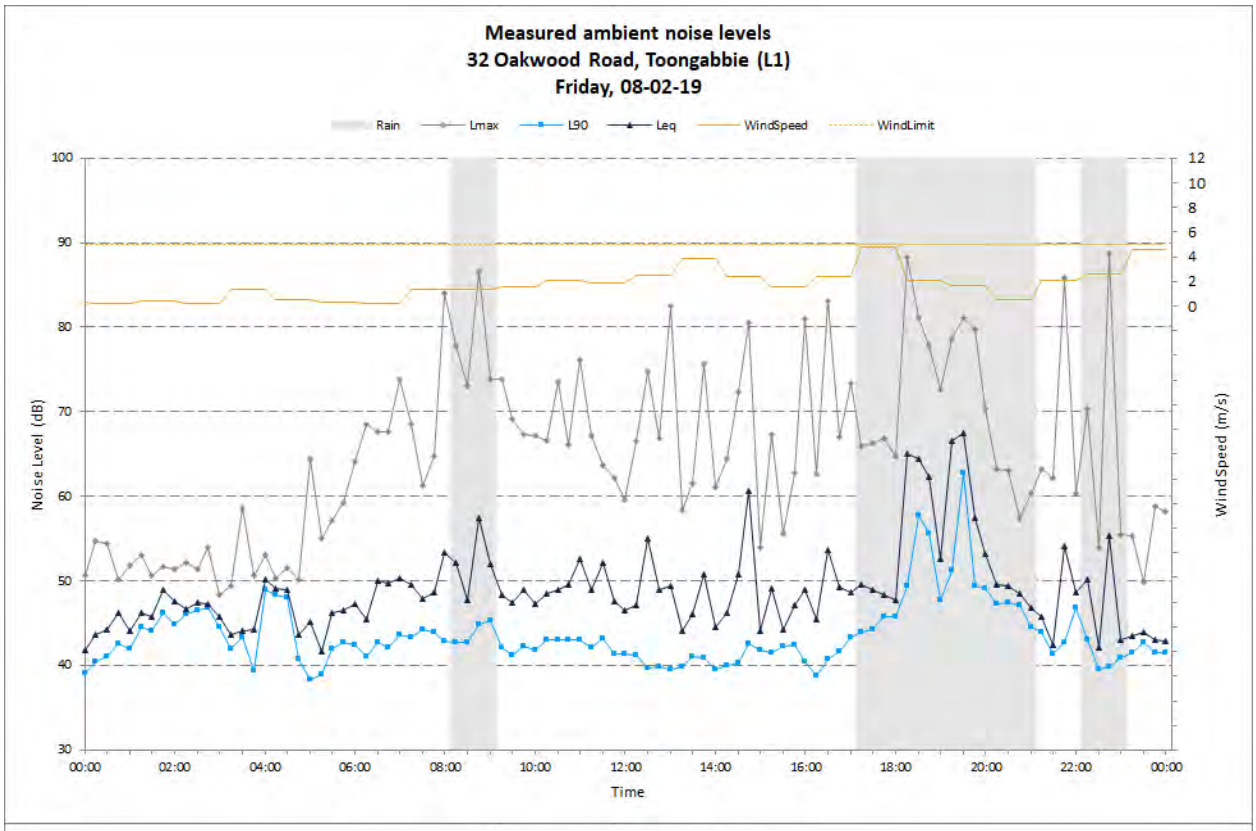
Notes: 1. *"0" indicates periods with too few valid samples due to weather or logger operation.*

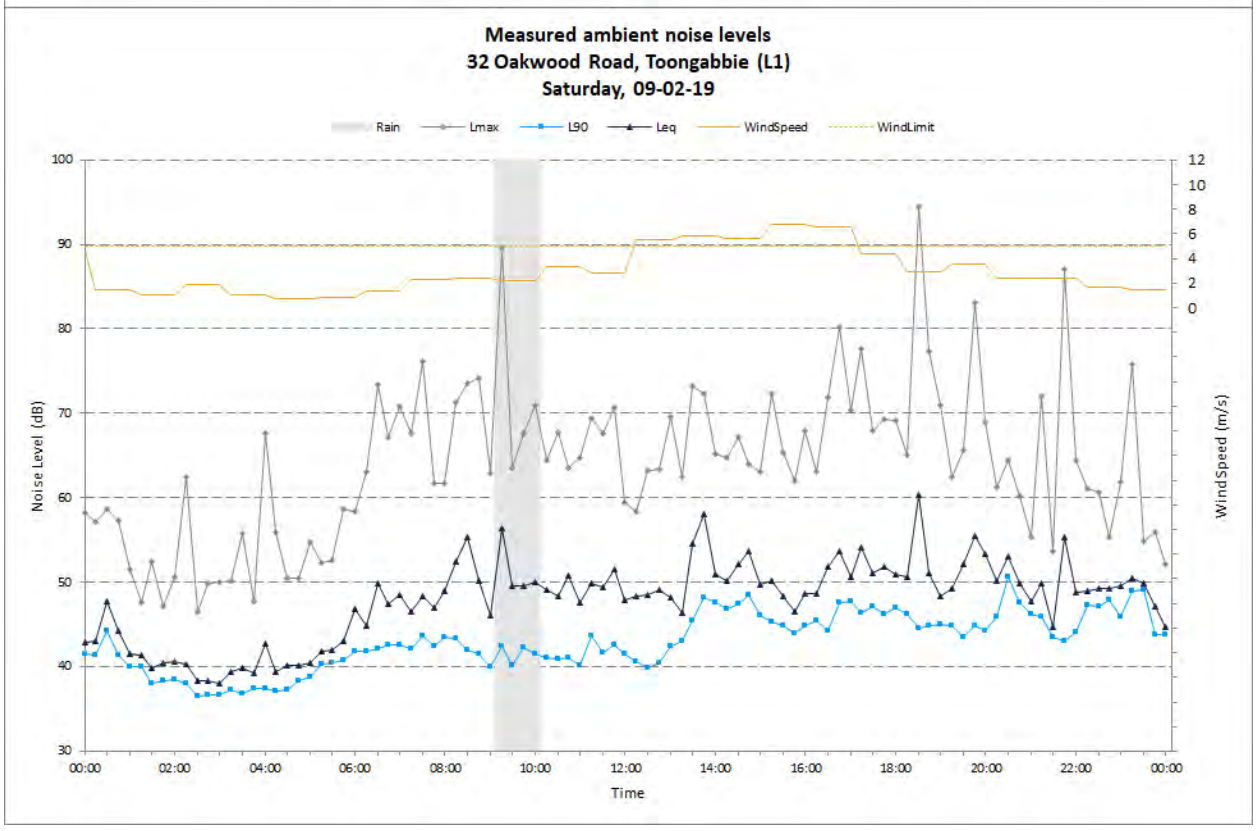

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Monday, 04-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

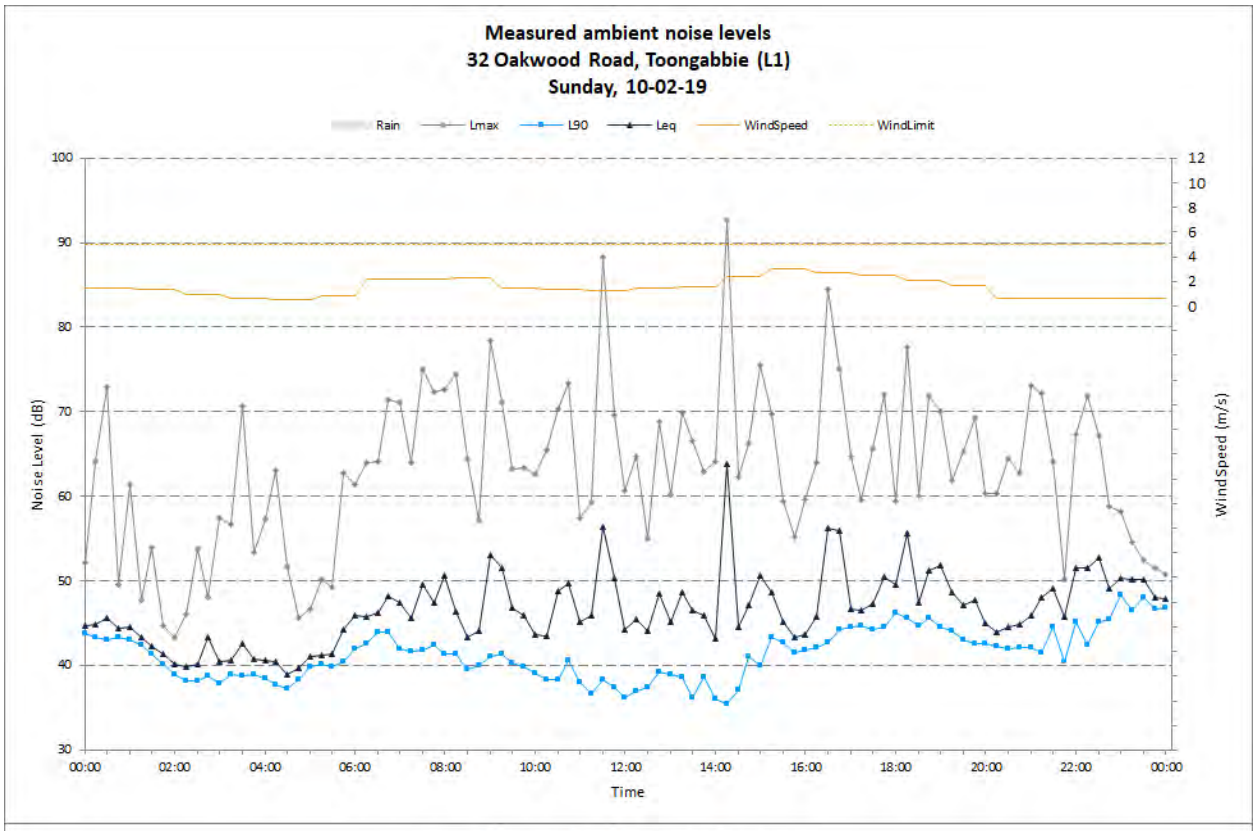

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Tuesday, 05-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

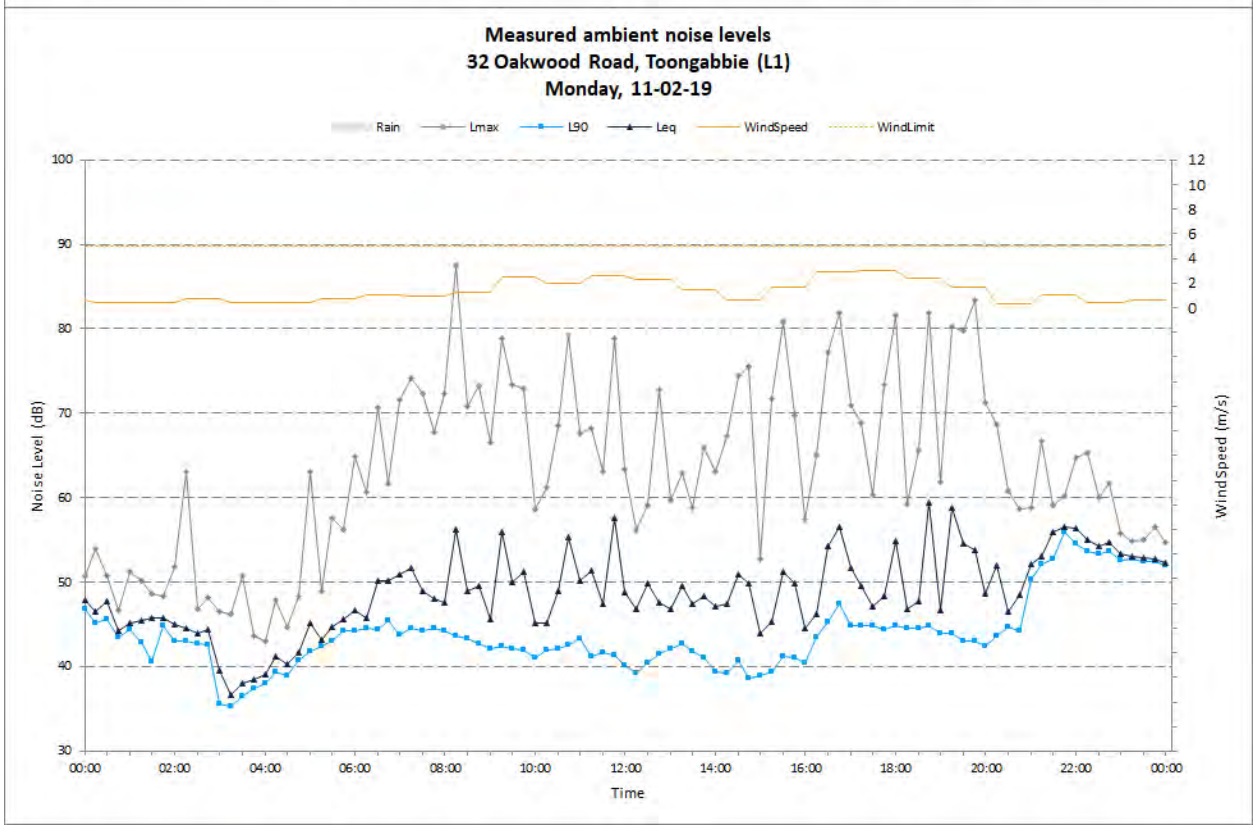

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Wednesday, 06-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

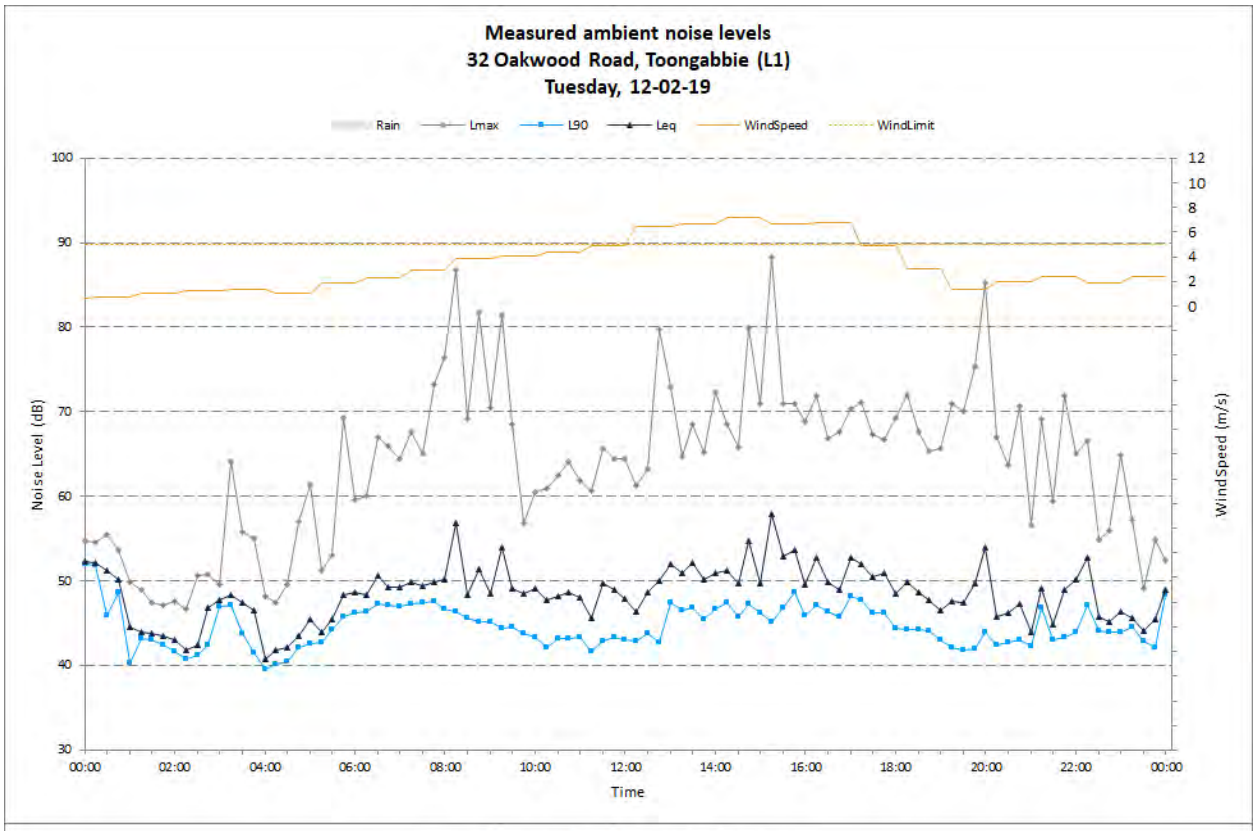

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Thursday, 07-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

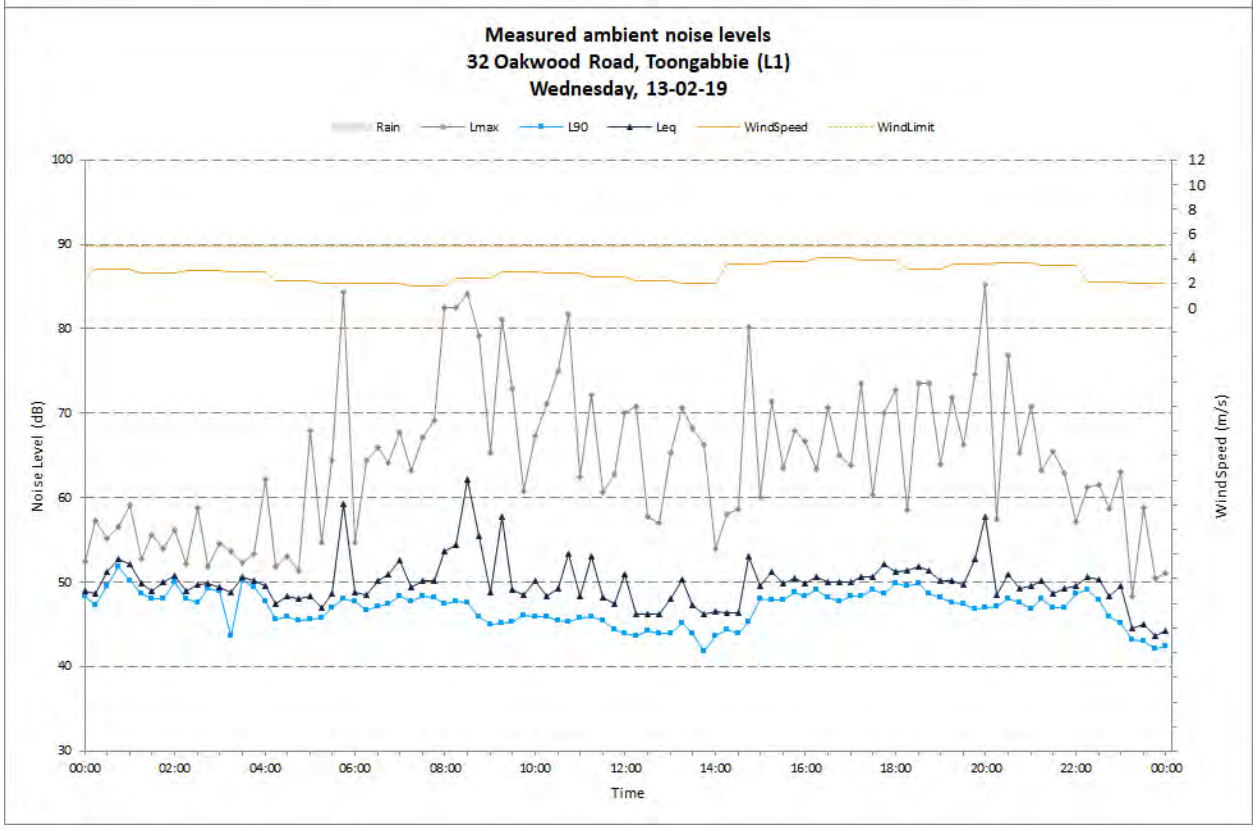

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Friday, 08-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

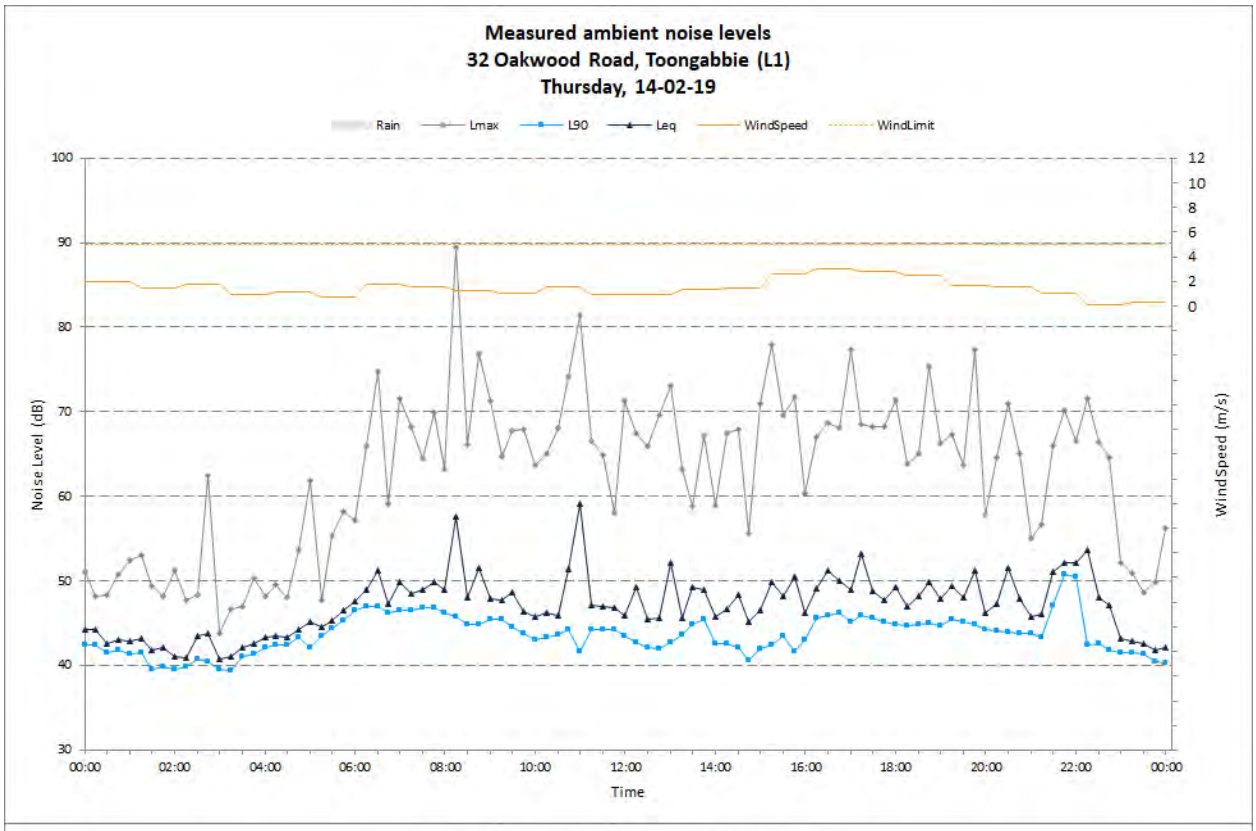

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Saturday, 09-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Sunday, 10-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Monday, 11-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Tuesday, 12-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Wednesday, 13-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Thursday, 14-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

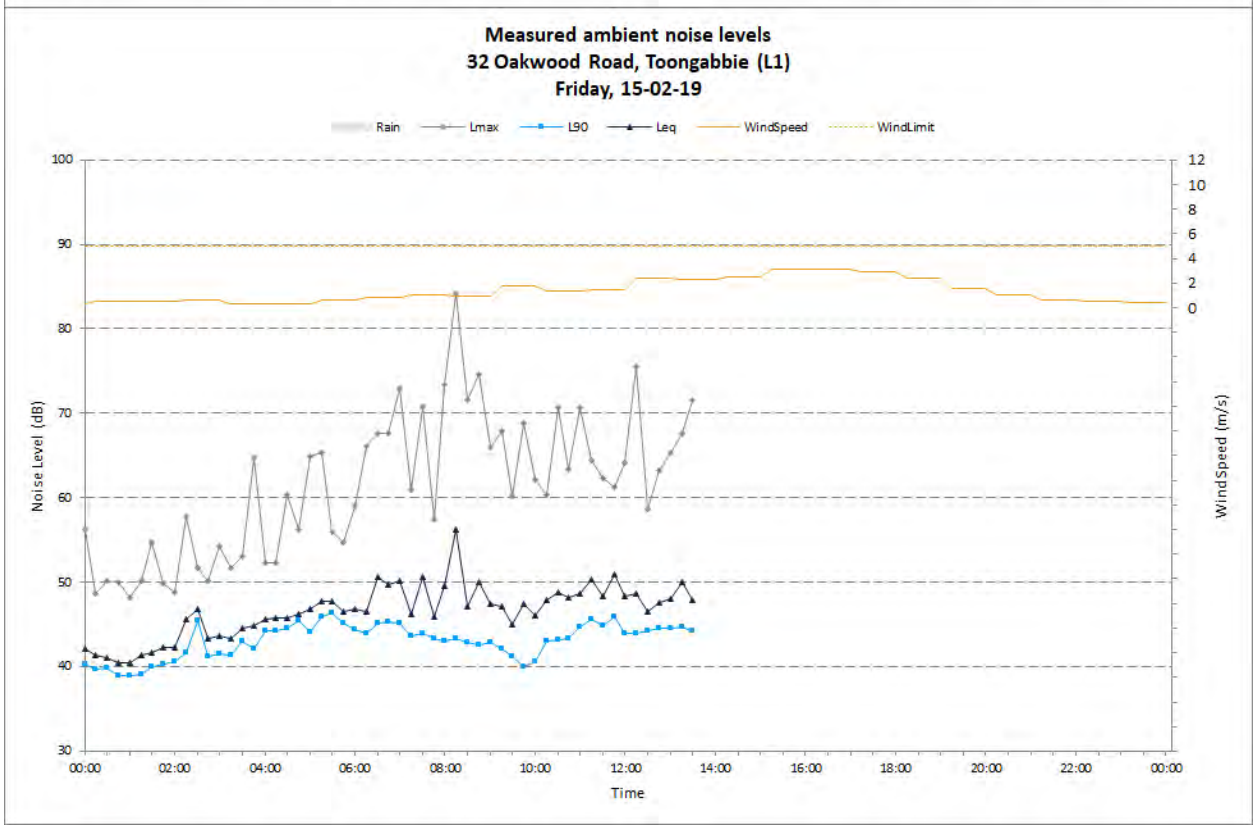
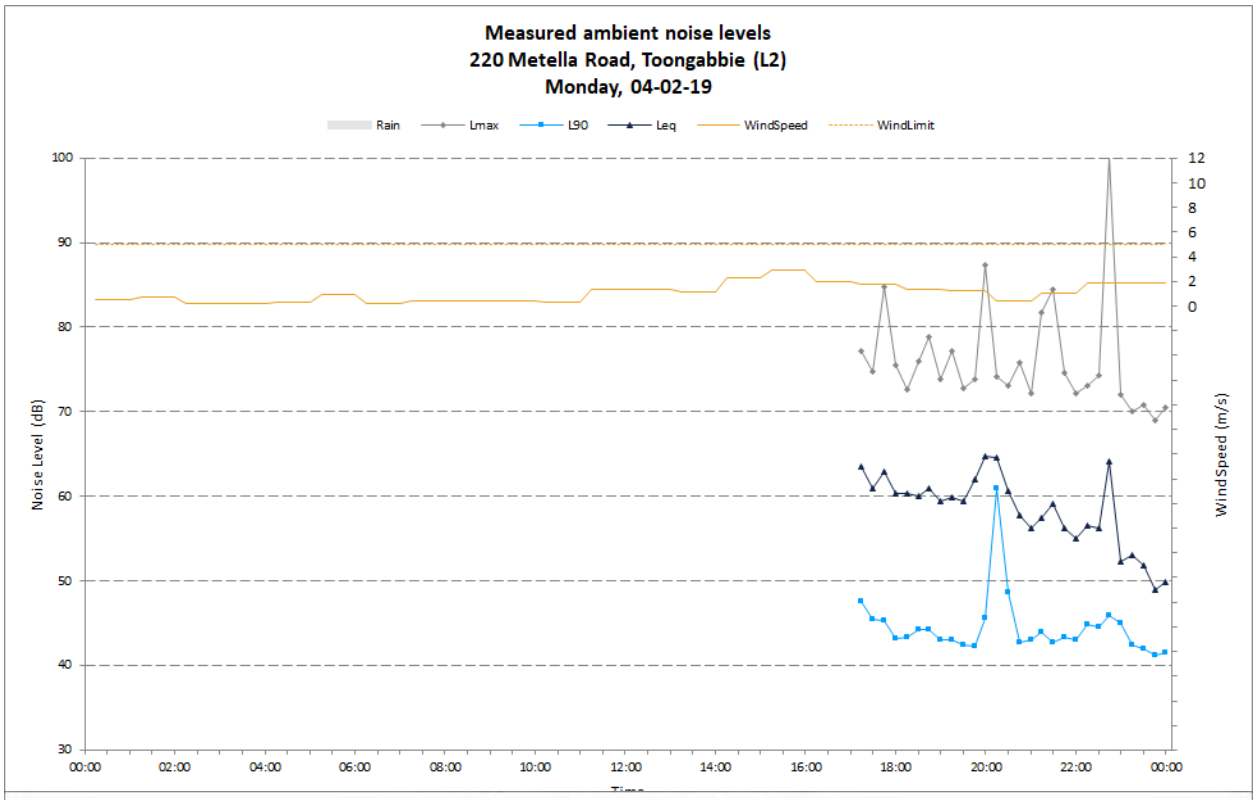
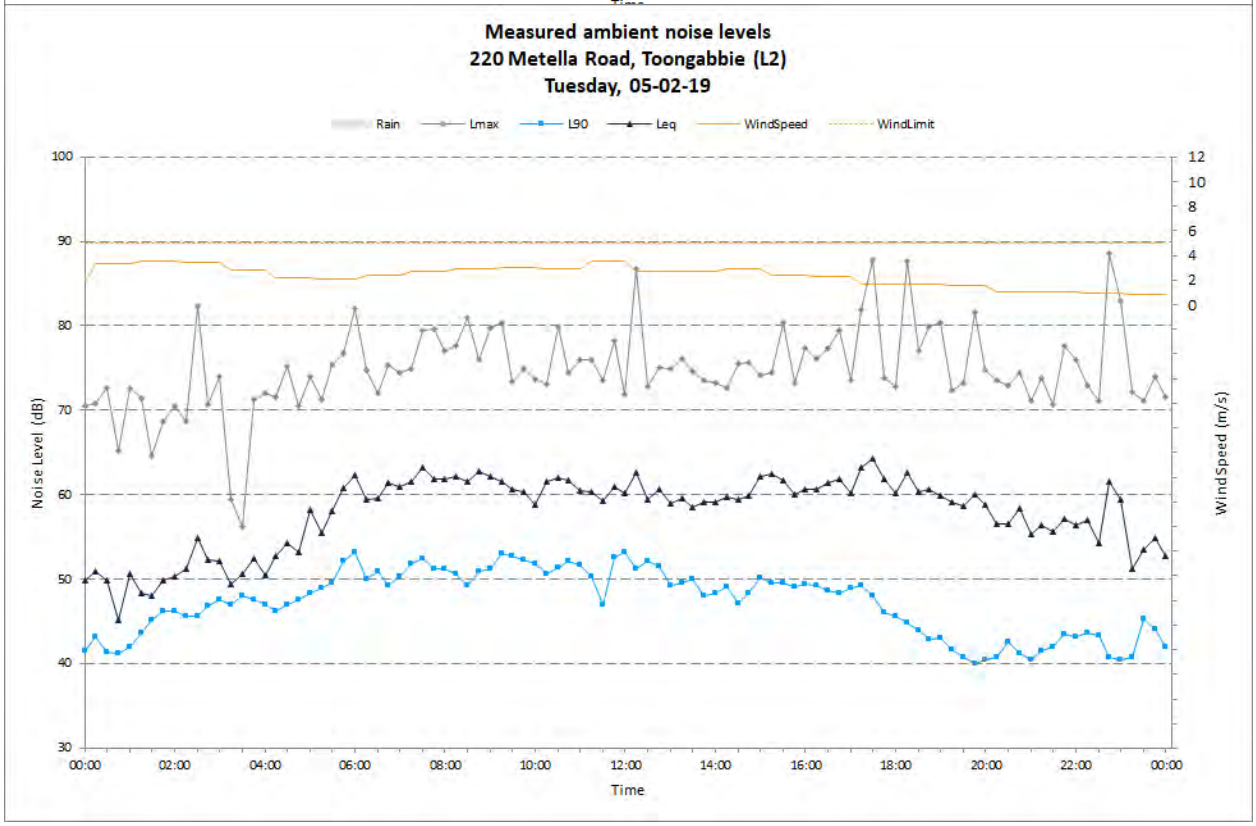

Measured ambient noise levels
32 Oakwood Road, Toongabbie (L1)
Friday, 15-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

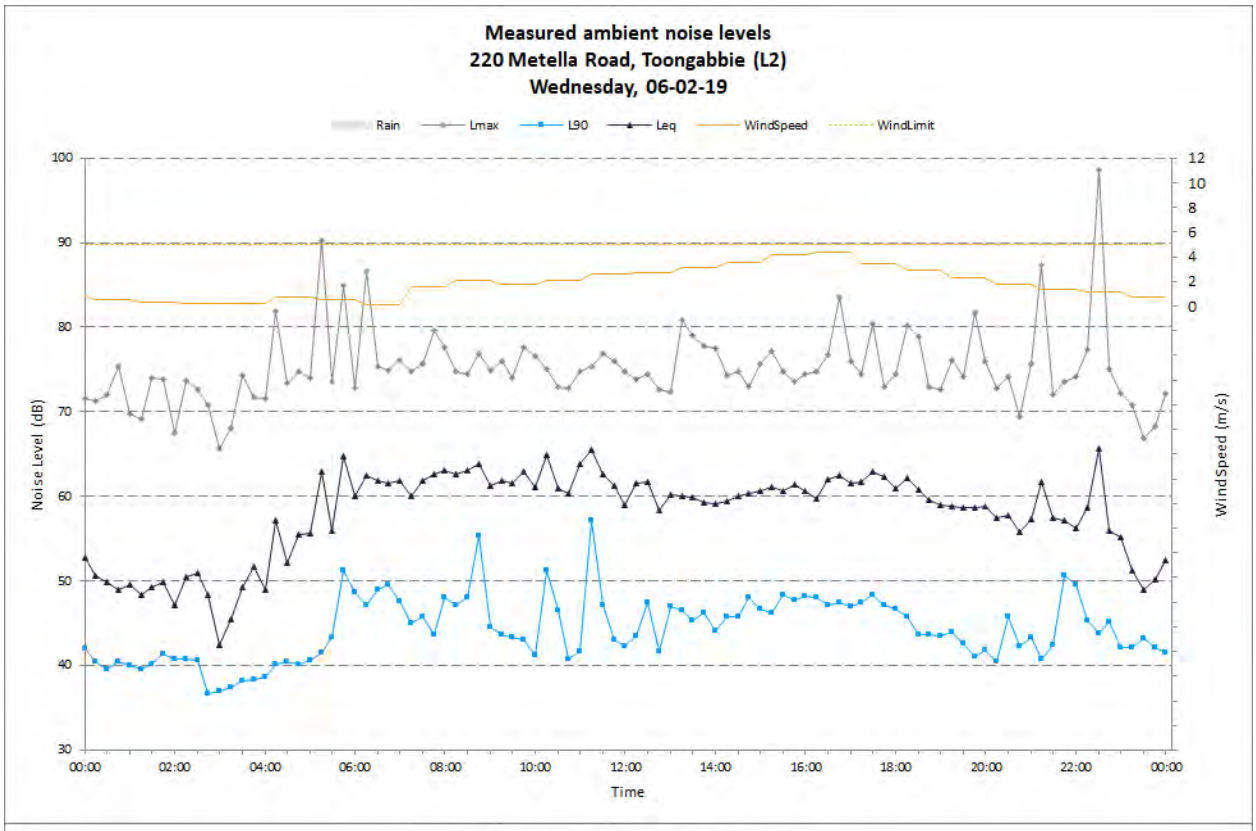
Table B.8.2 Ambient noise monitoring summary – 220 Metella Road, Toongabbie (L2)

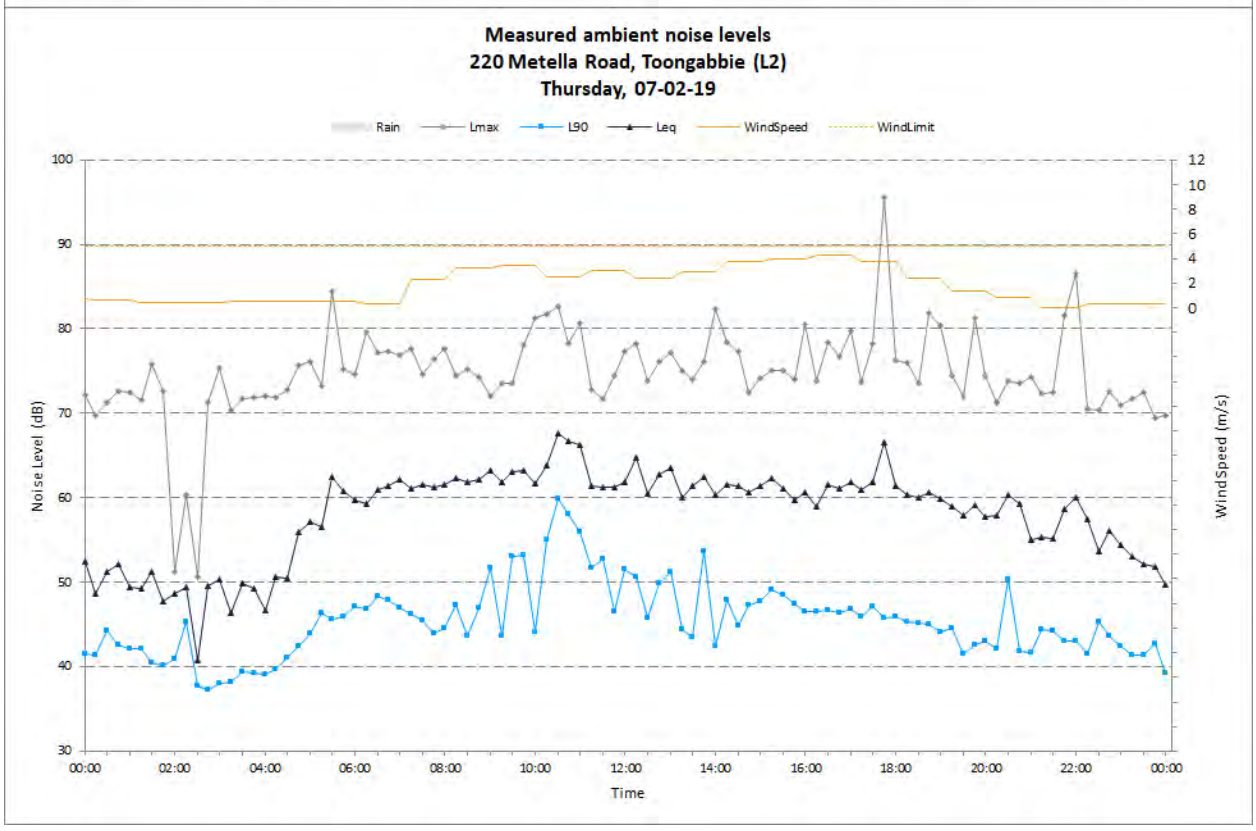
Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11hour}$ Day	$L_{Aeq,4hour}$ Evening	$L_{Aeq,9hour}$ Night
Monday, 04-02-19	0	43	42	0	61	56
Tuesday, 05-02-19	48	40	38	61	59	57
Wednesday, 06-02-19	42	41	38	62	59	57
Thursday, 07-02-19	44	42	38	63	59	56
Friday, 08-02-19	43	0	40	63	0	54
Saturday, 09-02-19	44	49	37	60	65	56
Sunday, 10-02-19	42	39	37	60	59	56
Monday, 11-02-19	43	41	39	62	61	56
Tuesday, 12-02-19	44	43	40	61	60	57
Wednesday, 13-02-19	46	47	42	61	59	56
Thursday, 14-02-19	40	0	0	61	0	0
Summary Values						
RBL	43	42	39	-	-	-
Average L_{Aeq}	-	-	-	61	61	56

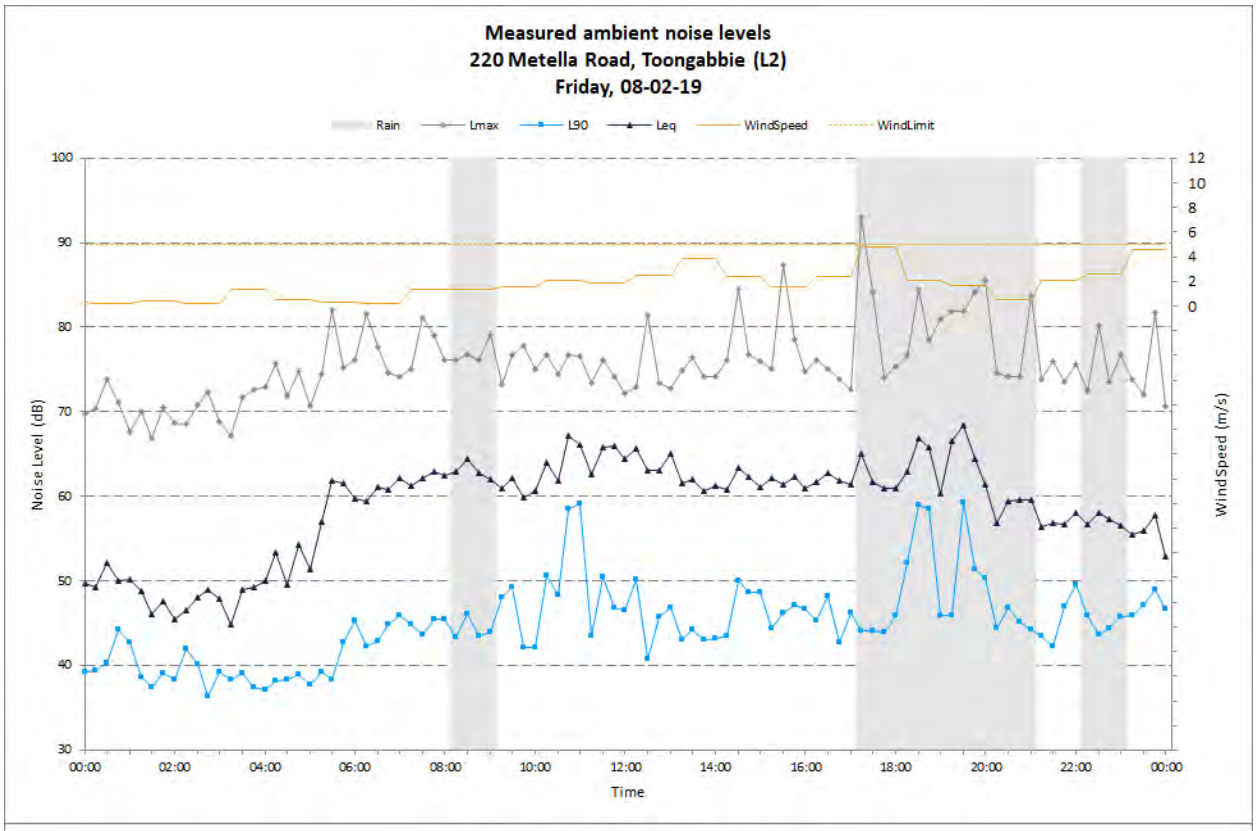
Notes: 1. *"0" indicates periods with too few valid samples due to weather or logger operation.*

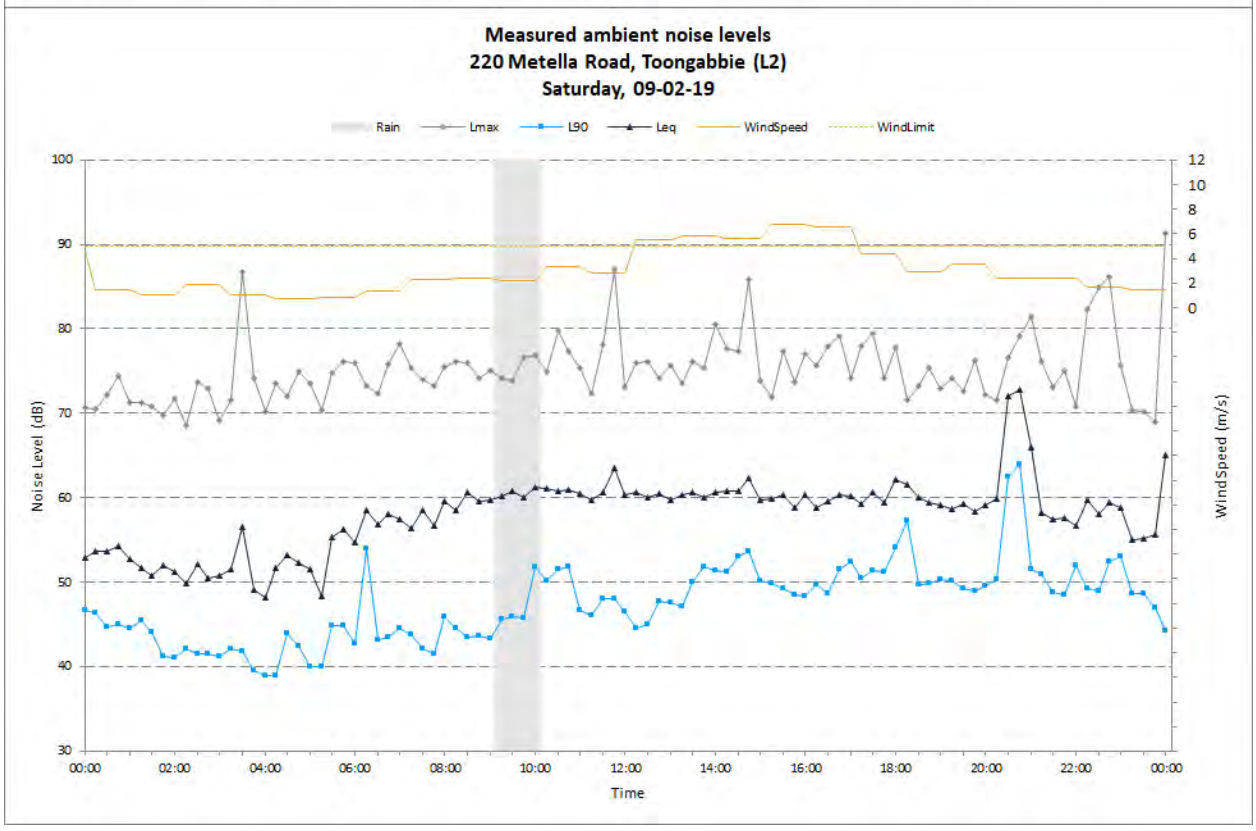

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Monday, 04-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

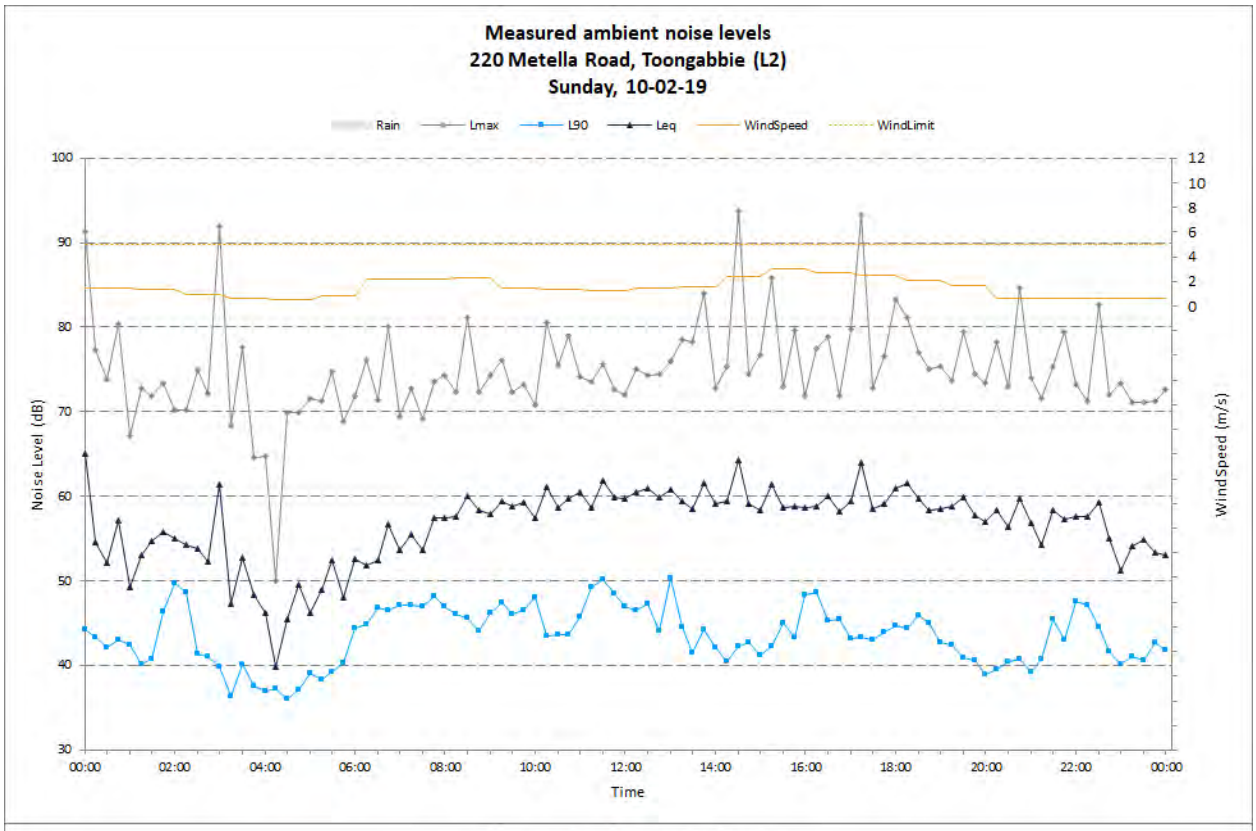

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Tuesday, 05-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time

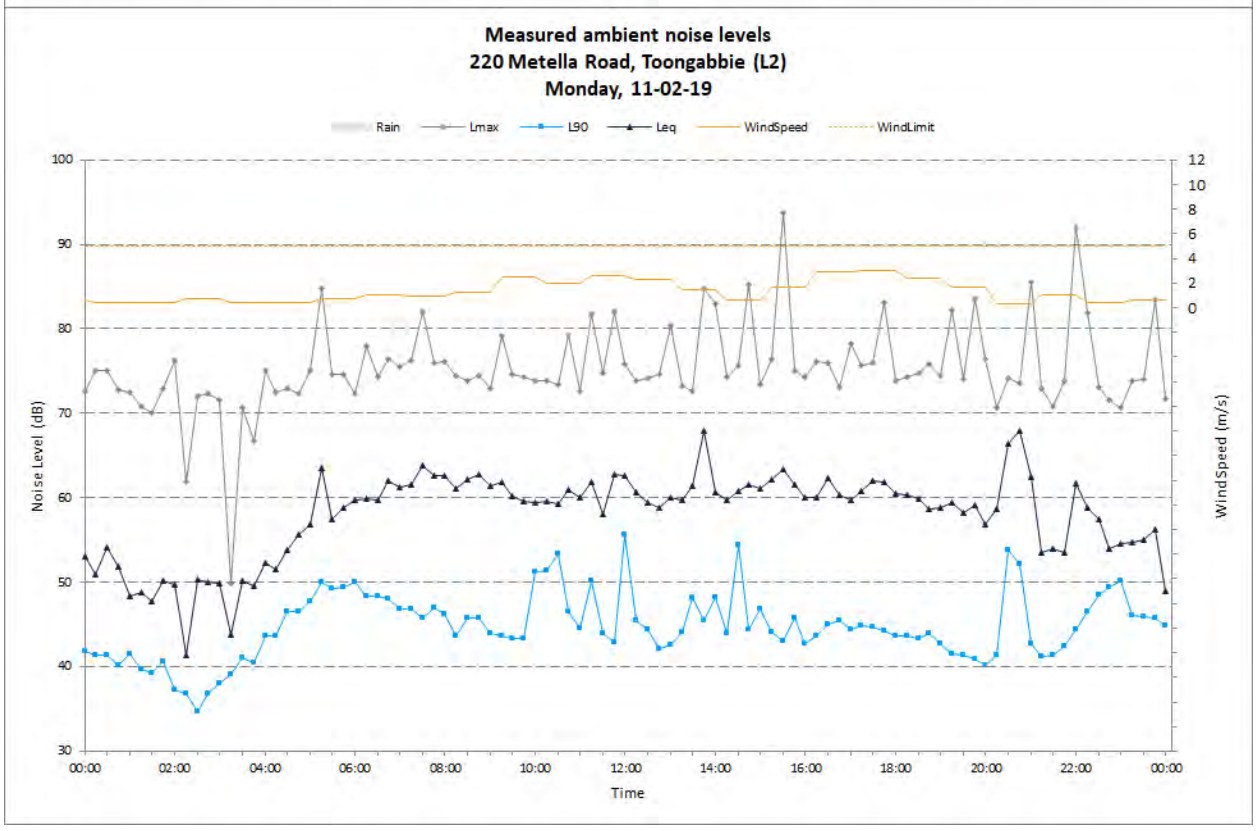

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Wednesday, 06-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

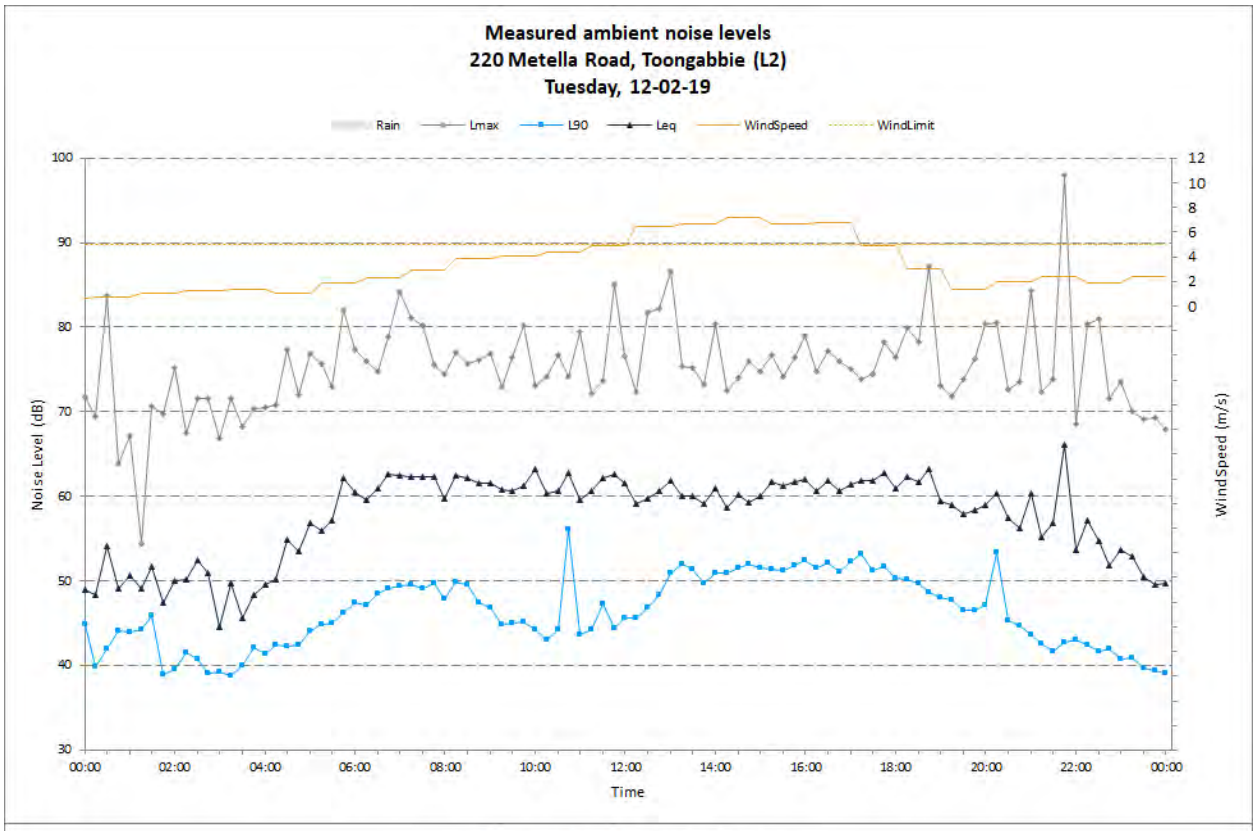

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Thursday, 07-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

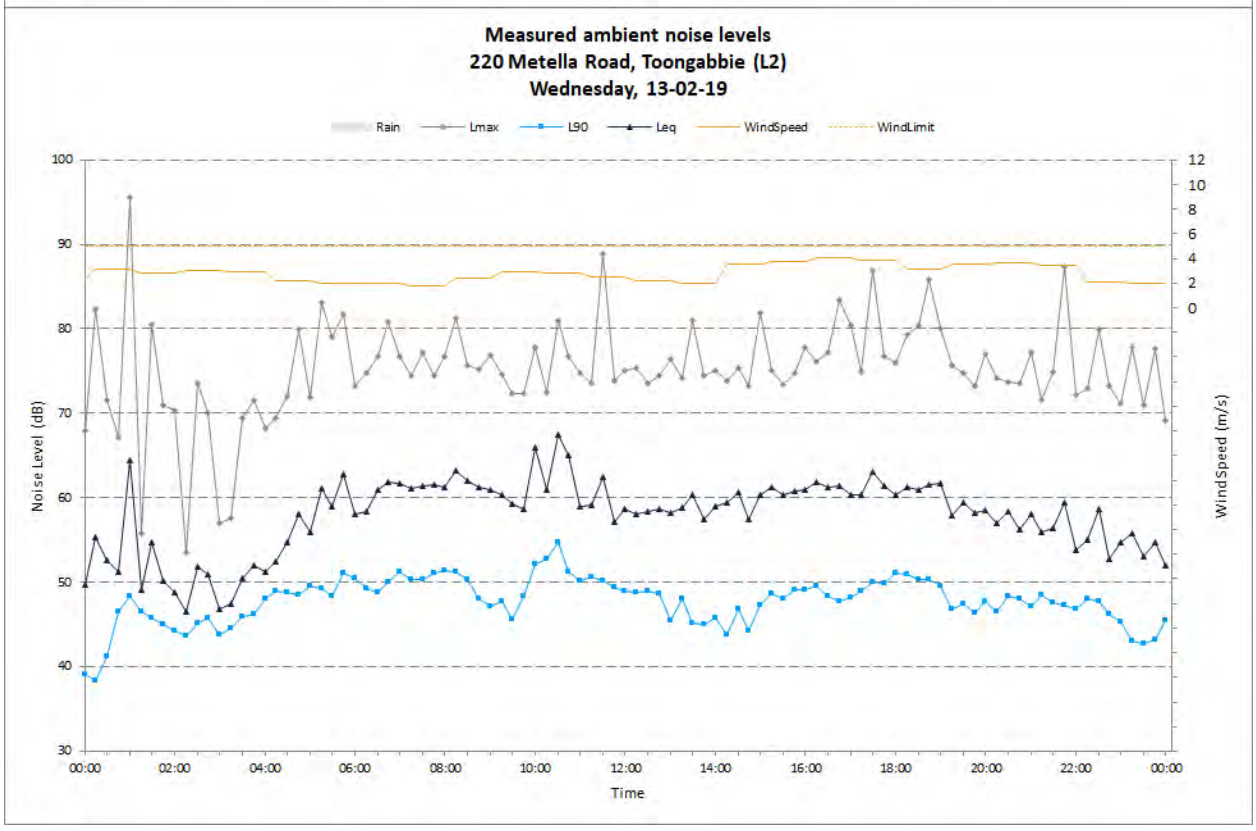

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Friday, 08-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Saturday, 09-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Sunday, 10-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Monday, 11-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Tuesday, 12-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time


Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Wednesday, 13-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

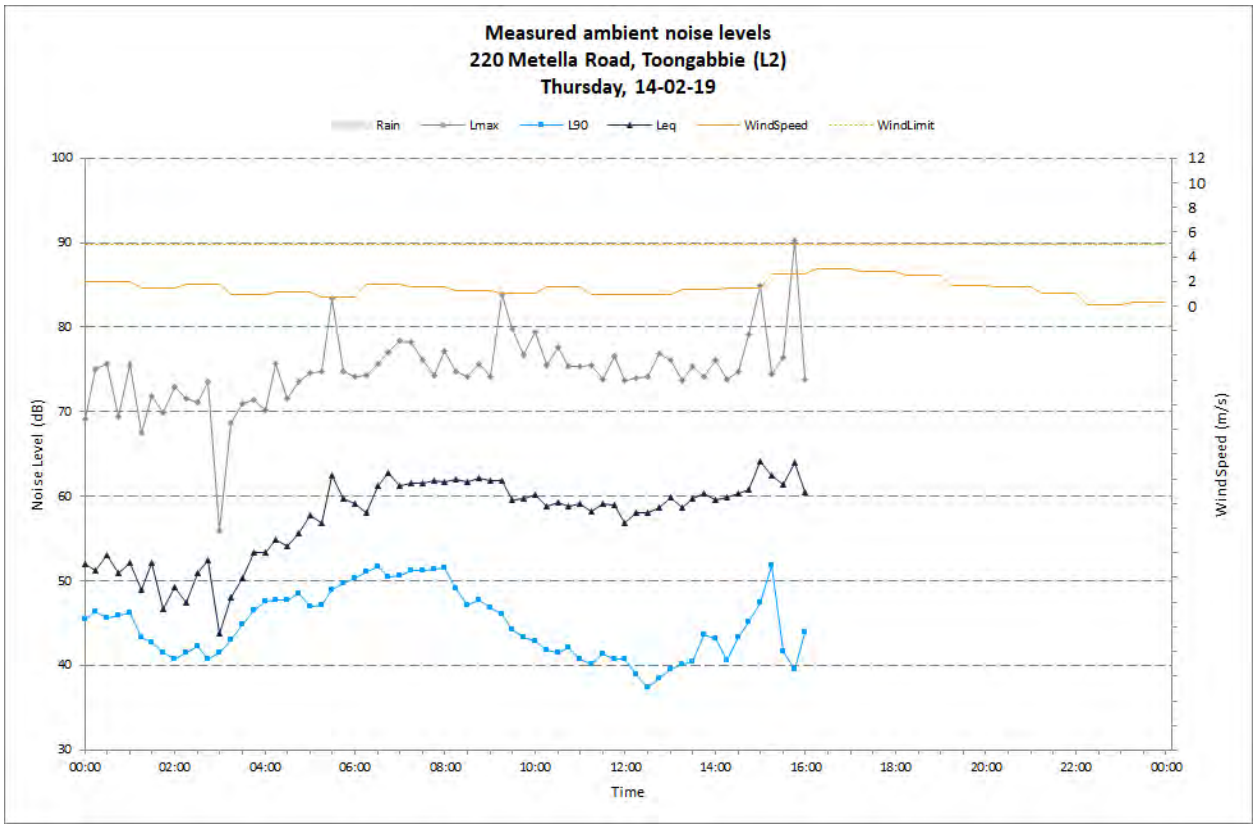
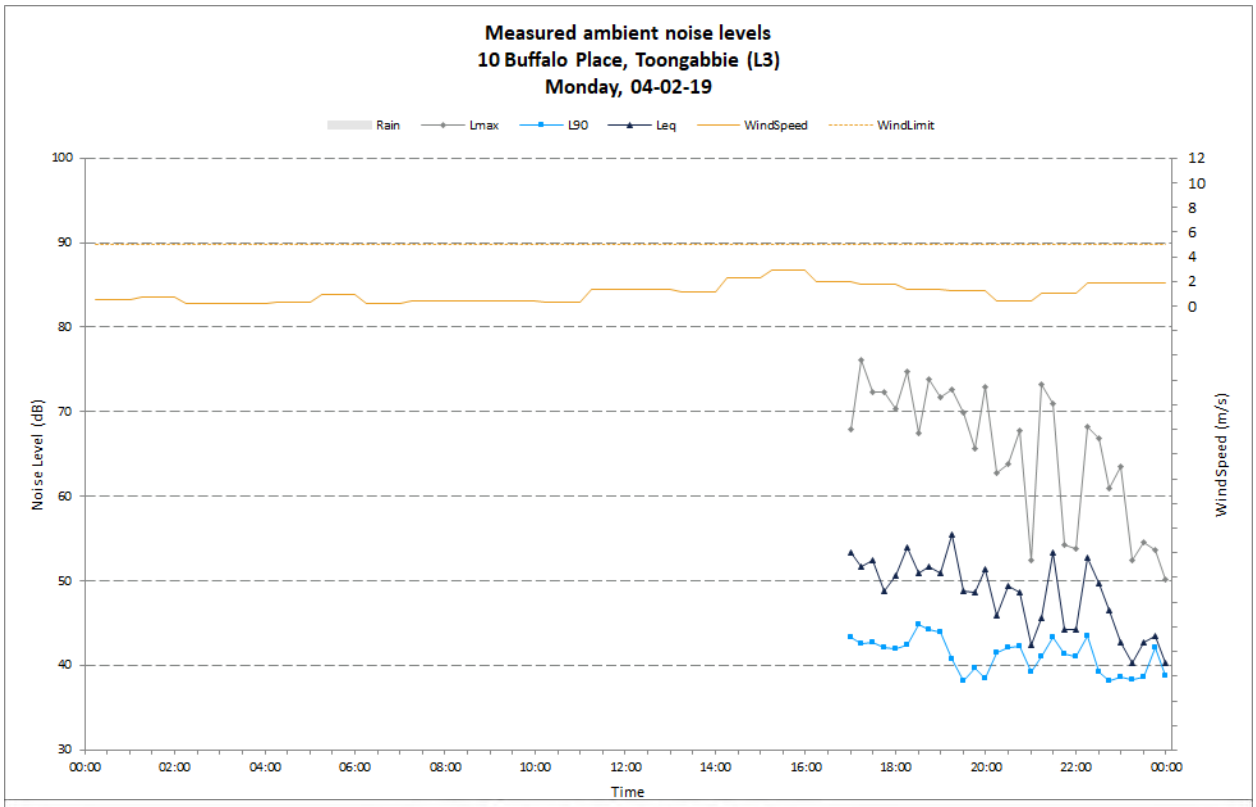
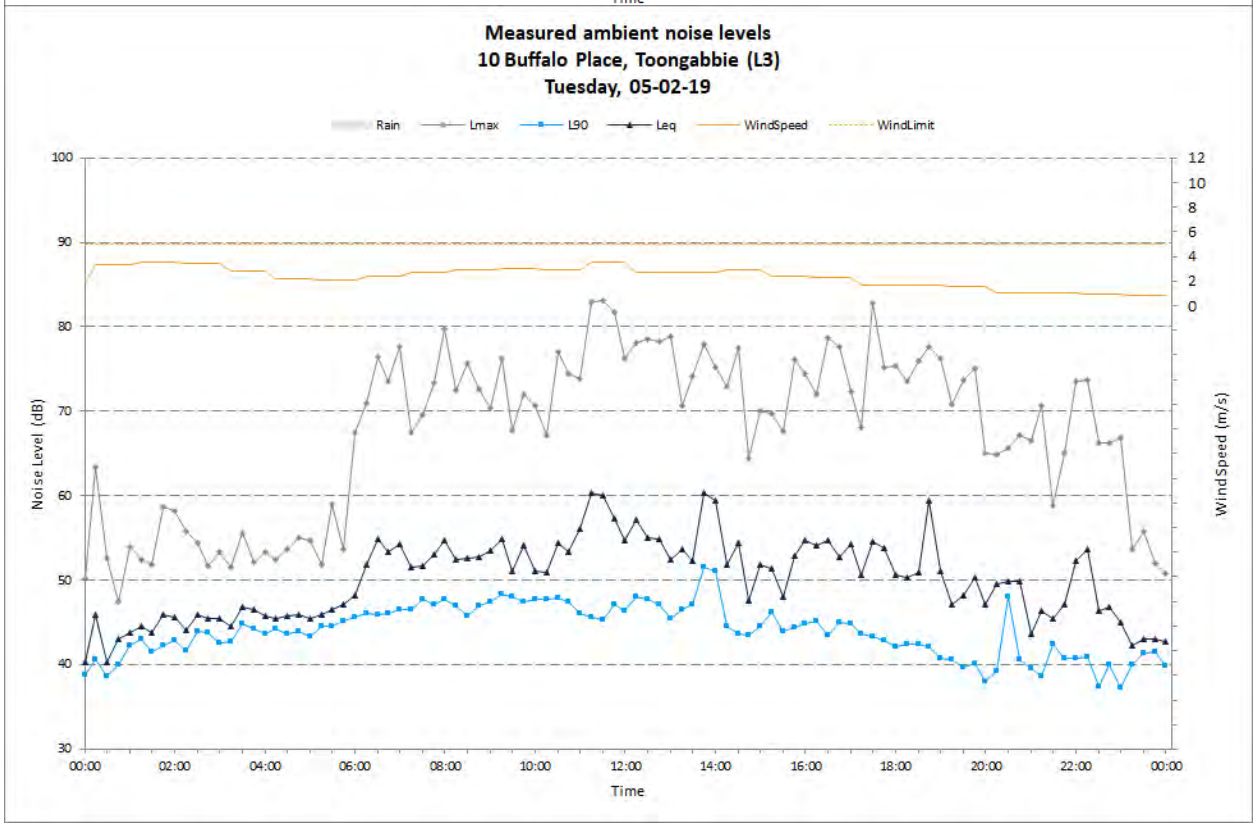

Measured ambient noise levels
220 Metella Road, Toongabbie (L2)
Thursday, 14-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

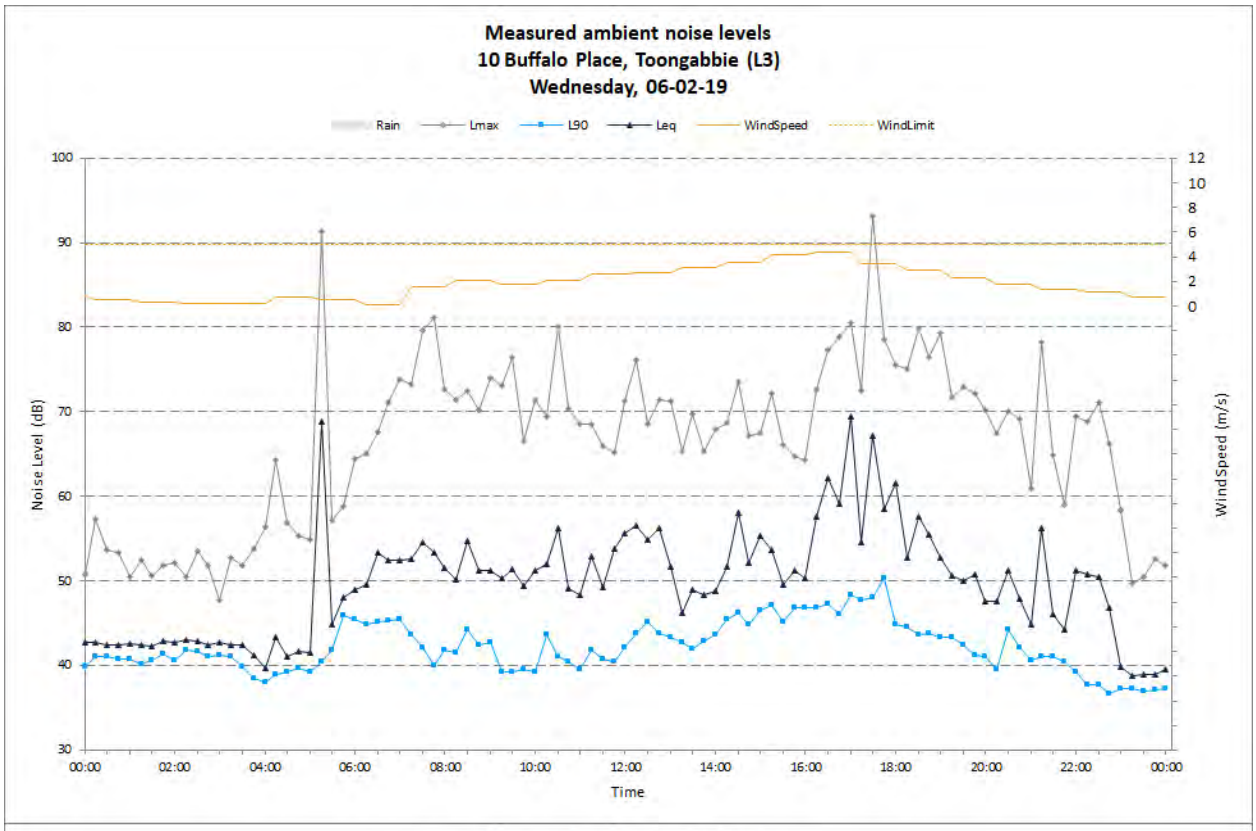
Table B.8.3 Ambient noise monitoring summary – 10 Buffalo Place, Toongabbie (L3)

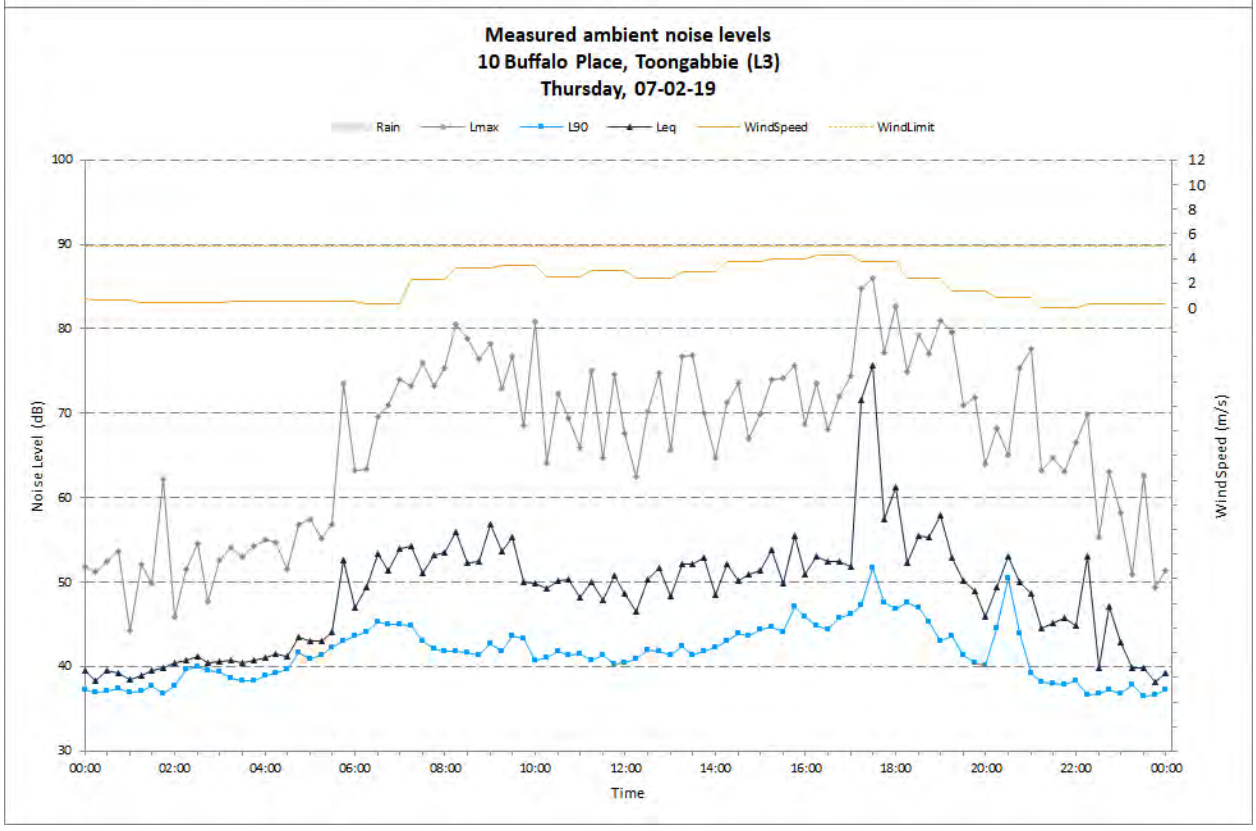
Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11hour}$ Day	$L_{Aeq,4hour}$ Evening	$L_{Aeq,9hour}$ Night
Monday, 04-02-19	0	39	39	0	51	48
Tuesday, 05-02-19	44	39	39	55	51	54
Wednesday, 06-02-19	40	40	37	58	52	46
Thursday, 07-02-19	41	38	36	61	52	45
Friday, 08-02-19	39	0	37	52	0	46
Saturday, 09-02-19	41	44	35	53	51	45
Sunday, 10-02-19	37	38	35	55	52	46
Monday, 11-02-19	39	39	40	54	51	47
Tuesday, 12-02-19	41	40	38	55	57	48
Wednesday, 13-02-19	40	42	36	54	53	44
Thursday, 14-02-19	36	37	35	54	51	45
Friday, 15-02-19	0	0	0	0	0	0
Summary Values						
RBL	40	39	37	-	-	-
Average L_{Aeq}	-	-	-	56	53	48

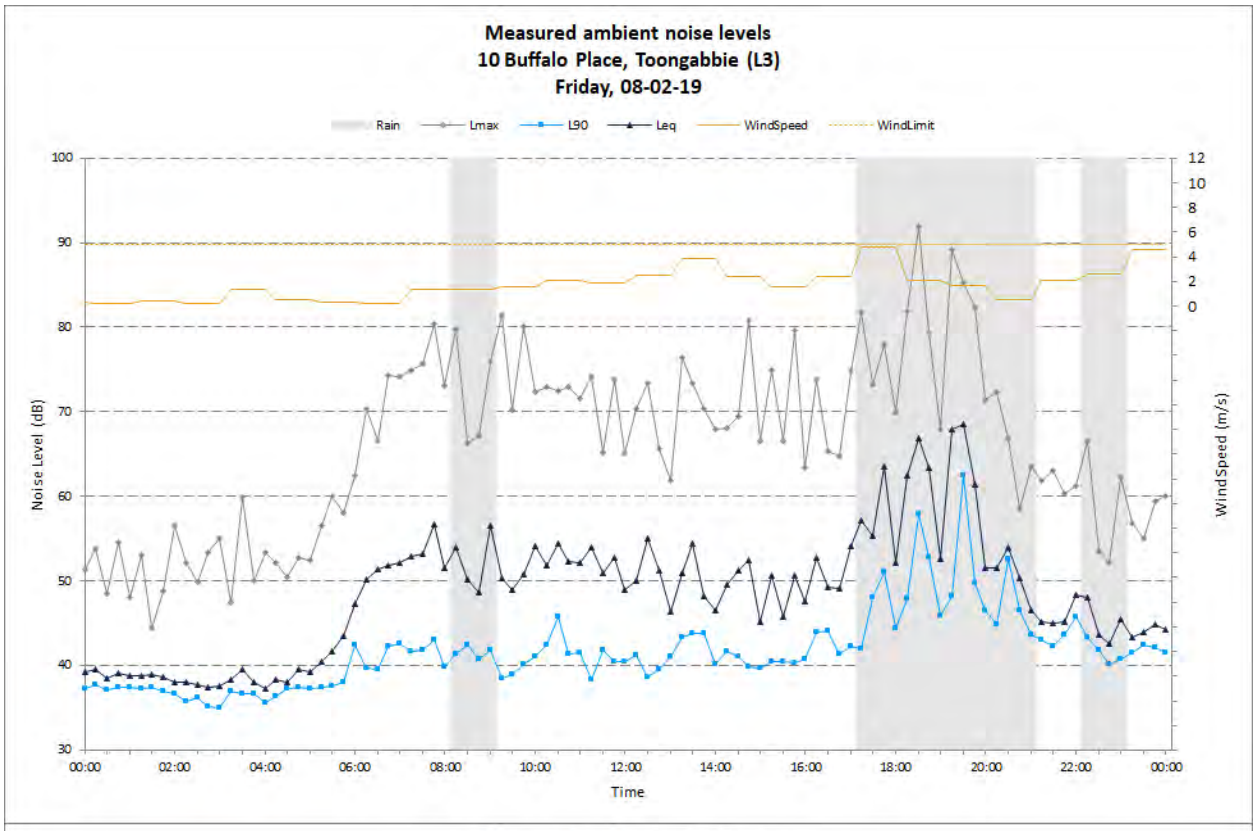
Notes: 1. *"0" indicates periods with too few valid samples due to weather or logger operation.*

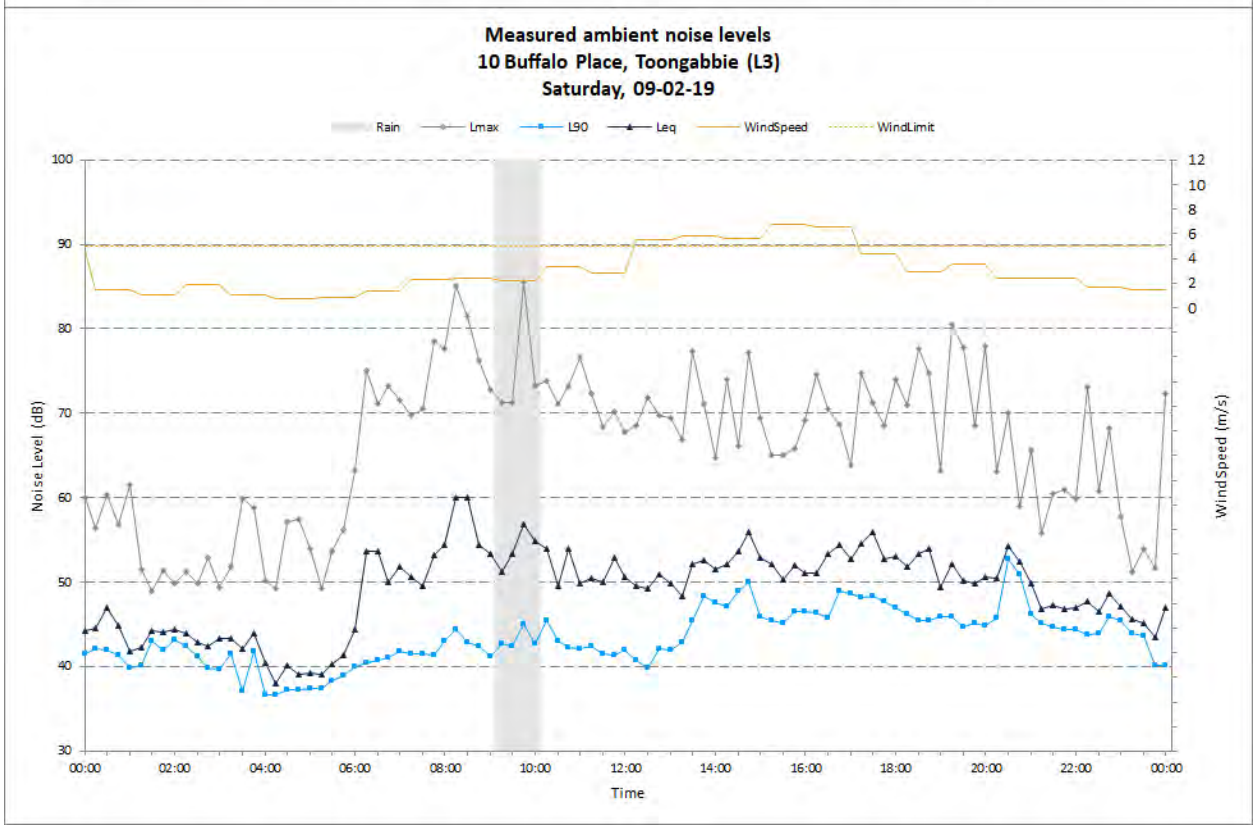

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Monday, 04-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

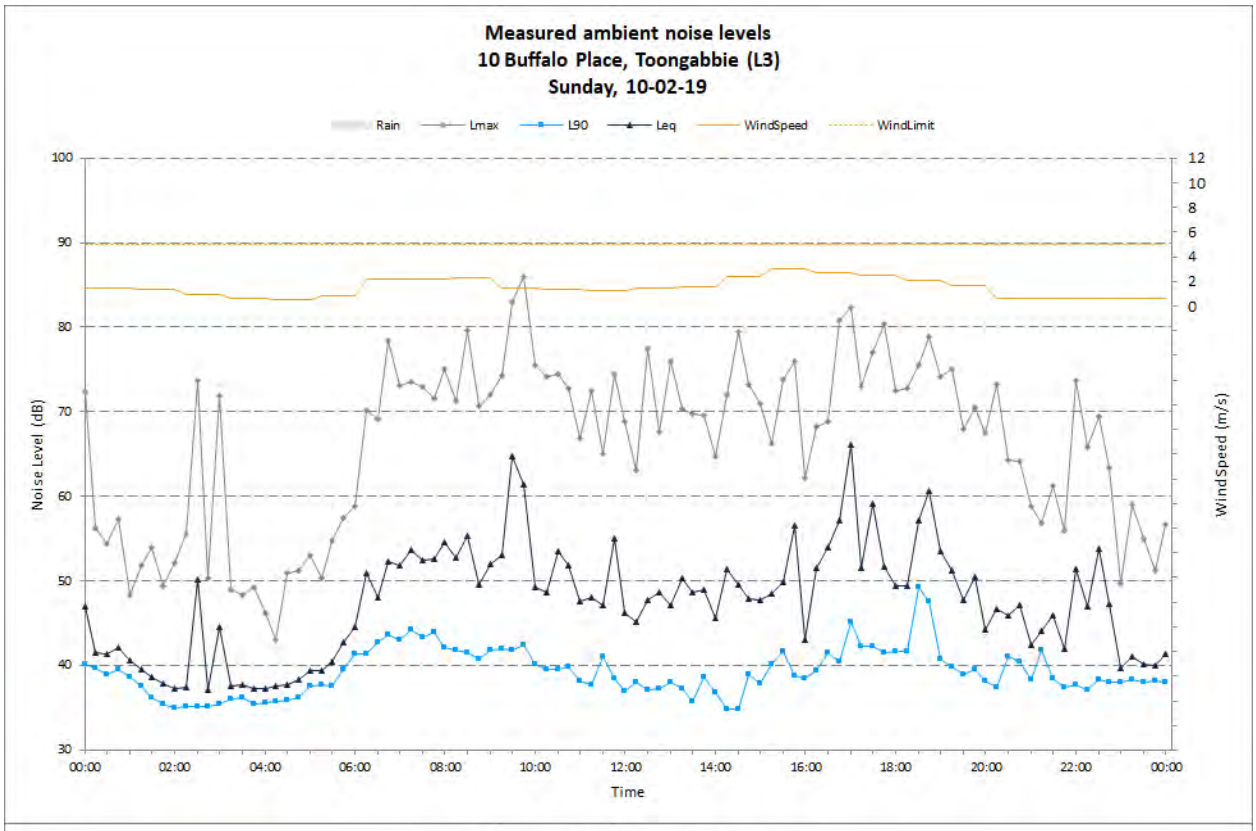

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Tuesday, 05-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

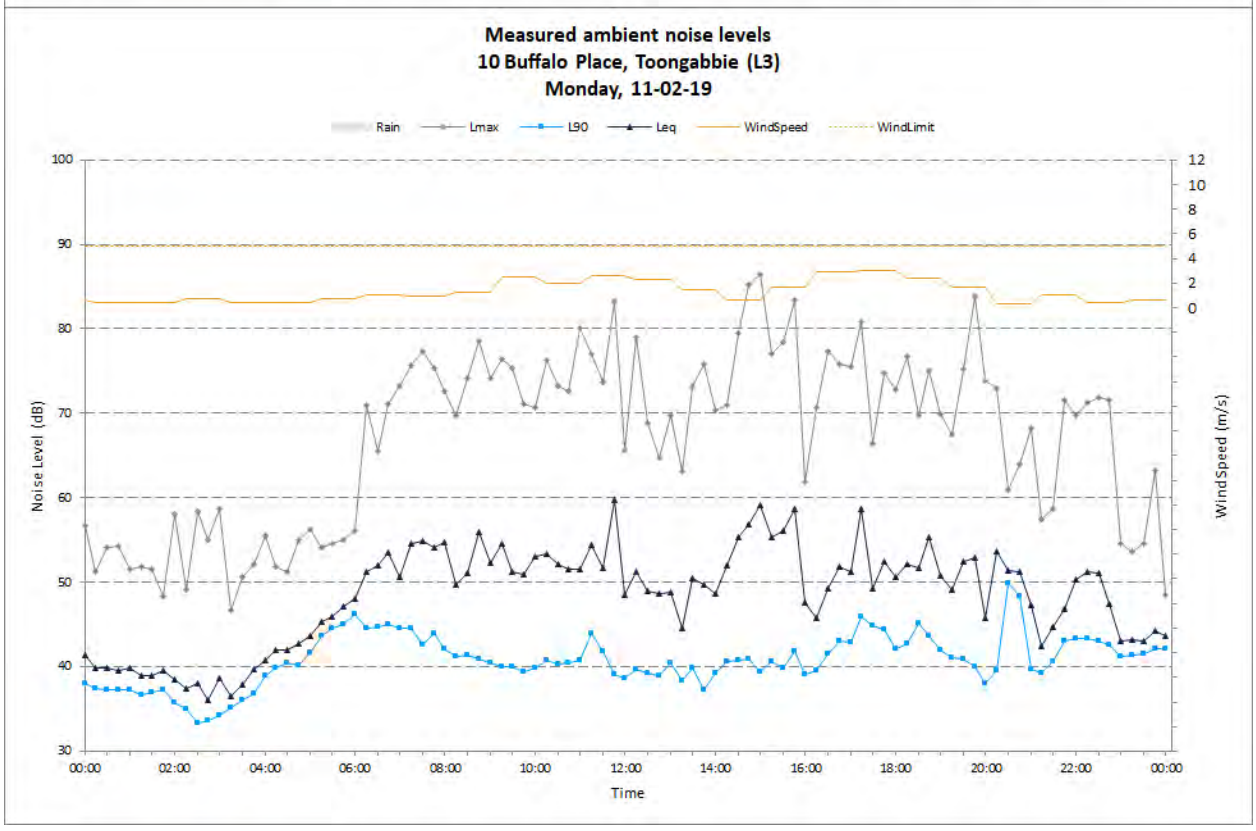

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Wednesday, 06-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

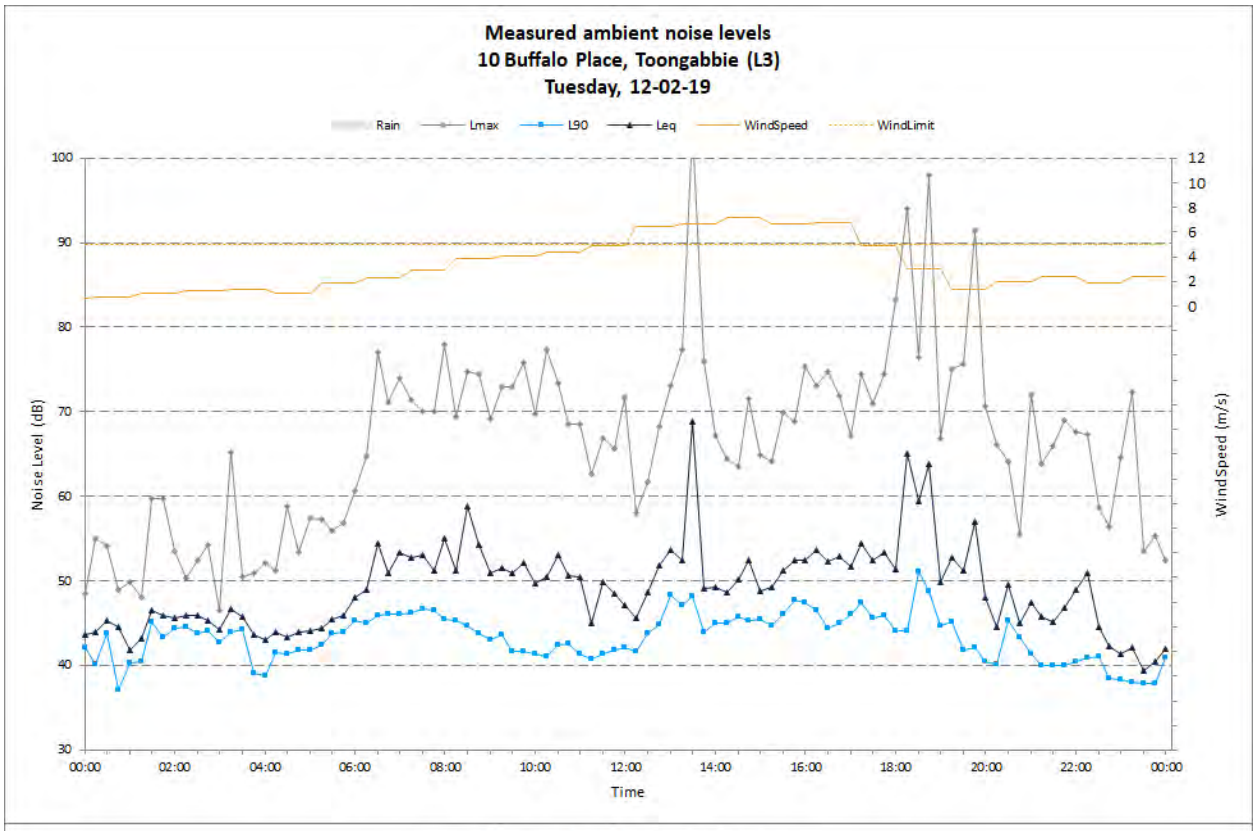

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Thursday, 07-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

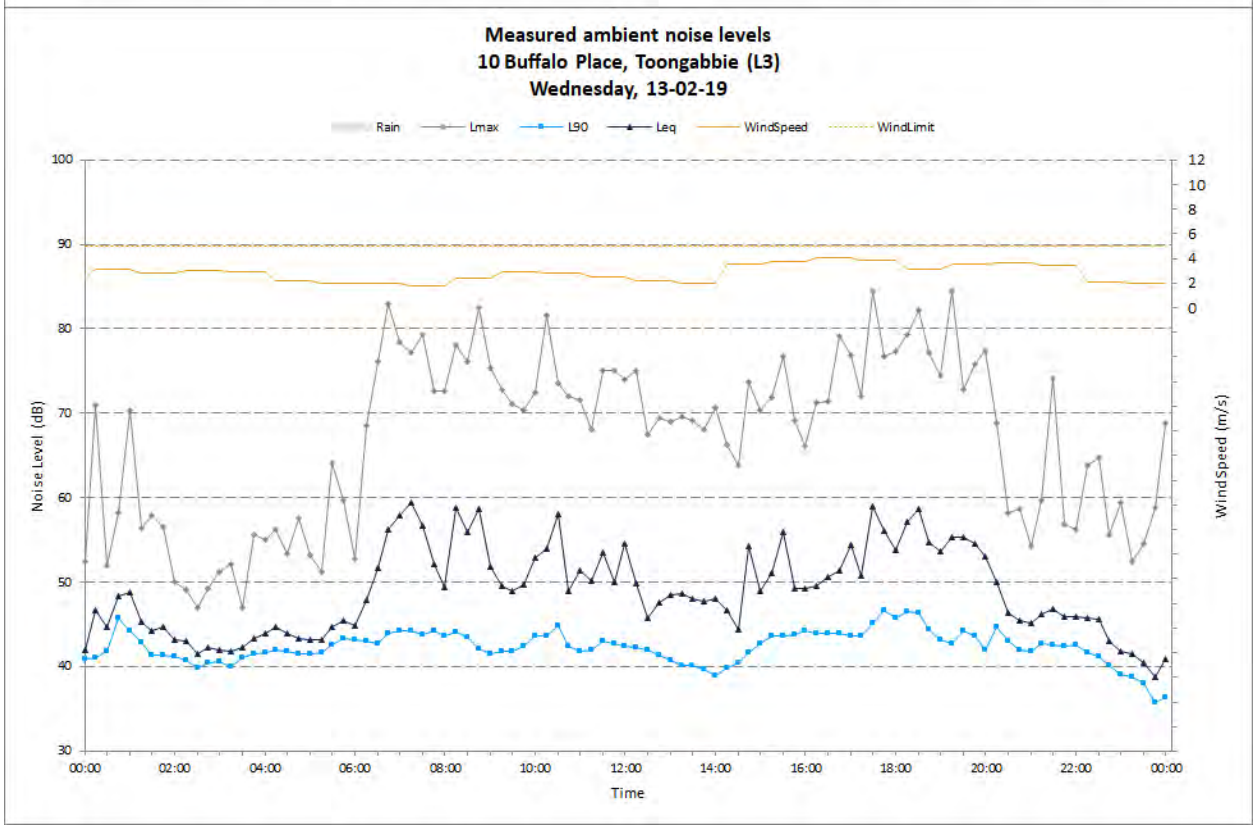

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Friday, 08-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

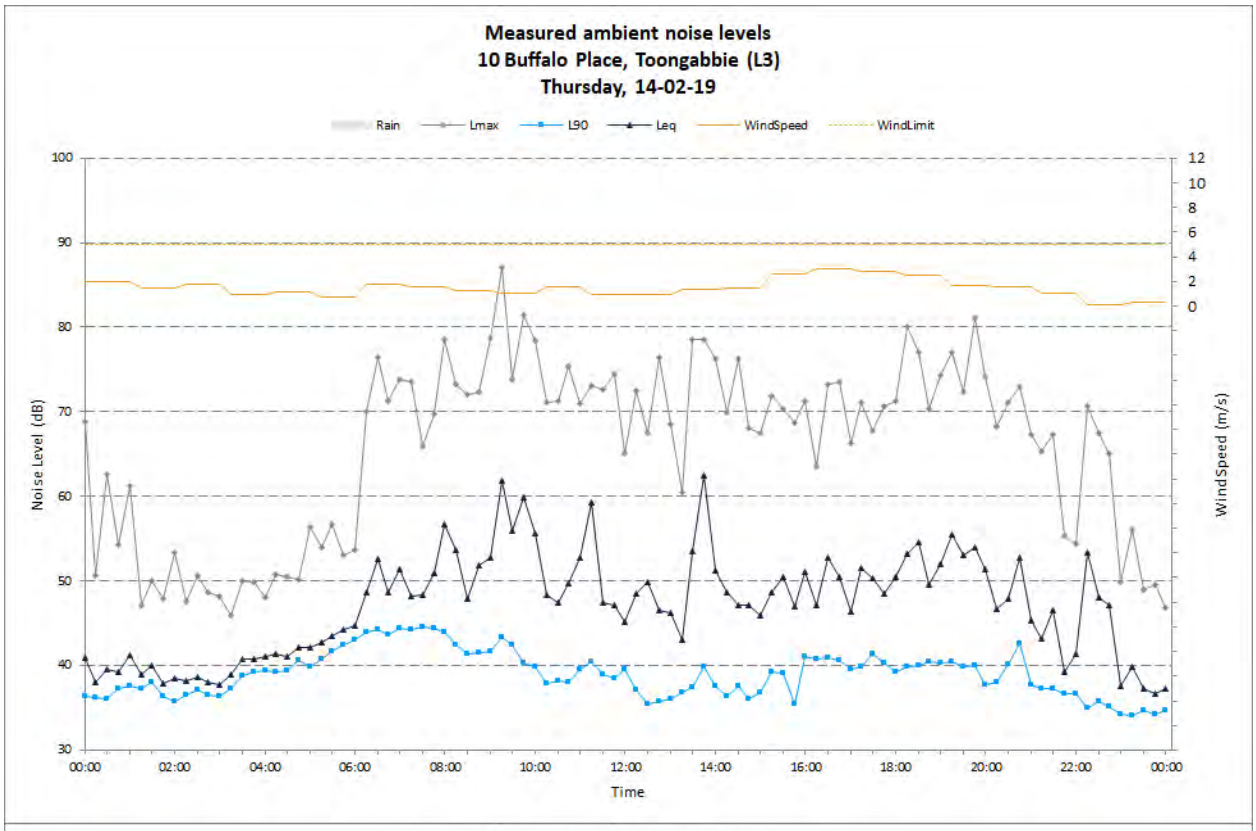

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Saturday, 09-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

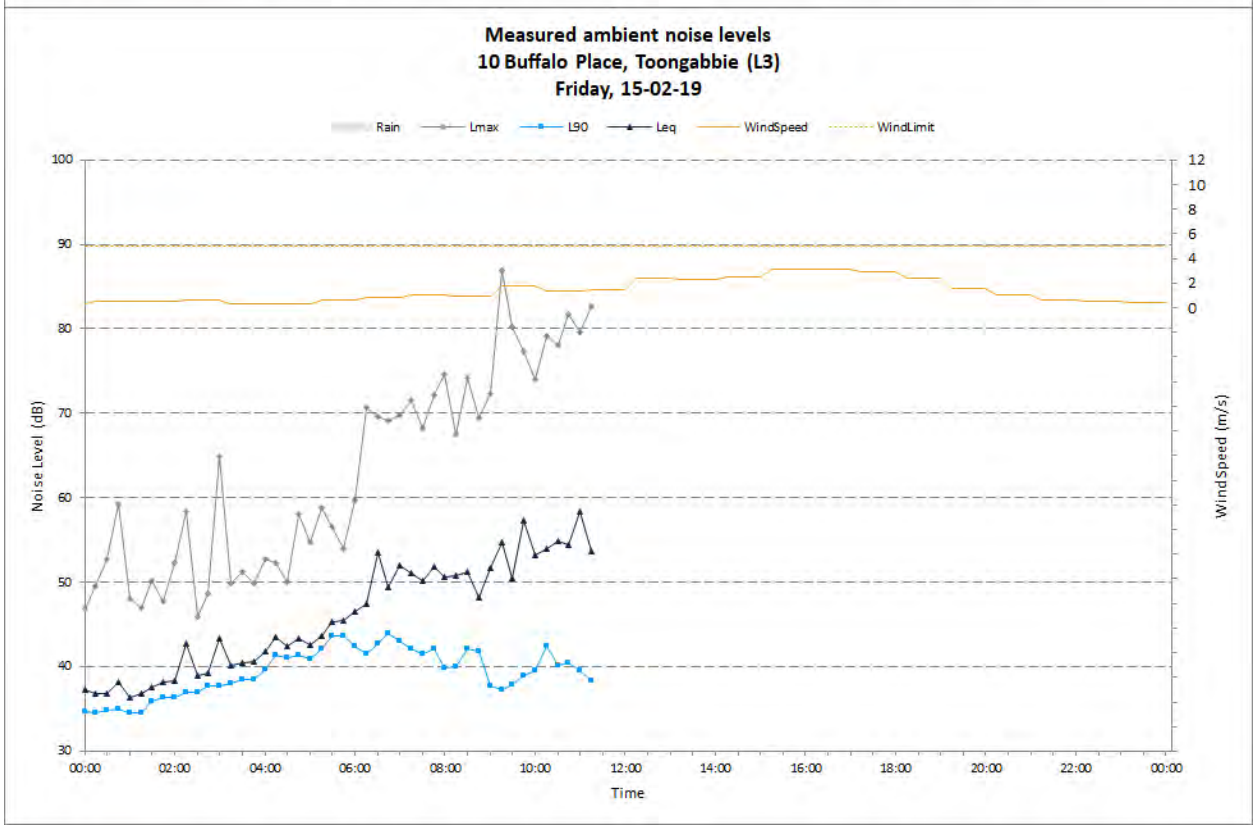

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Sunday, 10-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

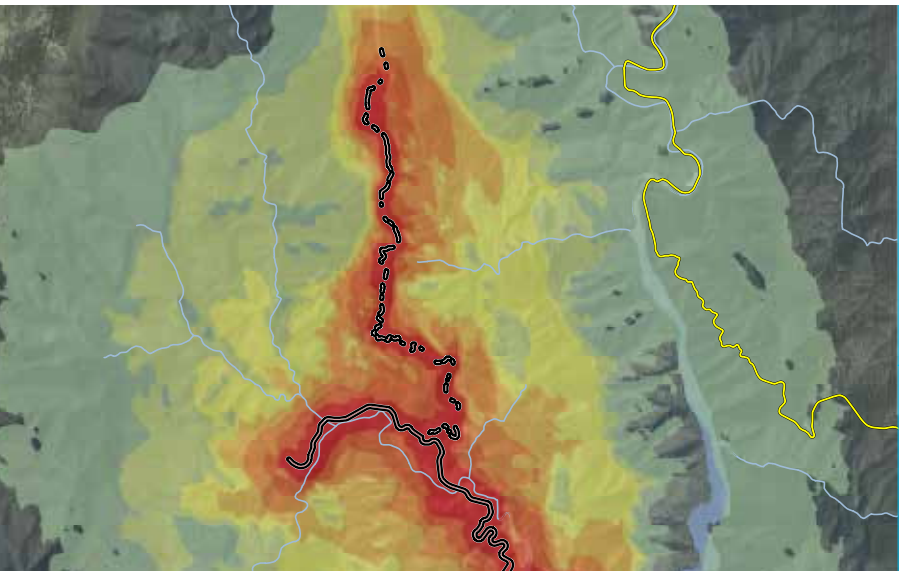

Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Monday, 11-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time


Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Tuesday, 12-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time


Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Wednesday, 13-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time


Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Thursday, 14-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00


Measured ambient noise levels
10 Buffalo Place, Toongabbie (L3)
Friday, 15-02-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00



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