Appendix 6

Traffic Impact Assessment

Kooragang Island Recycling Facility

Expansion Proposal

Traffic Impact Assessment

November 2015

prepared for

Boral Recycling Pty Ltd

prepared by

ARC Traffic + Transport

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Introduction

Boral Recycling Pty Ltd (**Boral**) proposes an expansion of its existing recycling facility (the **facility**) located within the broader Boral owned site land at the corner of Cormorant Road and Egret St, Kooragang Island (the **Boral Site**). The proposal is being assessed as a State Significant Development (**SSD**) under Part 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) and is seeking development consent to expand operations at the facility, including:

- increasing the maximum processing rate;
- importing additional waste materials that are not currently listed on the facility's Environment Protection Licence (**EPL**);
- increasing the stockpile heights; and
- increasing the hours of operation.

Accordingly, ARC Traffic + Transport (**ARC**) has been commissioned by Boral to prepare this Traffic Impact Assessment (**TIA**) to support an environmental impact statement (**EIS**) and development application (**DA**) for the proposal. In this regard, ARC has:

- Referenced the Secretary's environmental assessment requirements (SEARs) for the SSD application. The SEARs (Reference SSD 15_7015) of May 2015 require the following be addressed in regard to *Traffic and Transport*:

    - *details of road transport routes, access to the site, proposed layout of internal roads and parking on site in accordance with the relevant Australian standards;*
    - *road traffic predictions for the development during construction and operation;*
    - *an assessment of the predicted impacts of this traffic on road safety and the capacity of the road network, including consideration of cumulative traffic impacts at key intersections using SIDRA or similar traffic model; and*
    - *detailed plans of any proposed road upgrades, infrastructure works or new roads required for the development*

- Referenced the specific key agency assessment requirements provided to the Secretary, including: -

    - **Port of Newcastle**

      Traffic Management – Access to site is via Egret Street, a private road managed by Port of Newcastle. A 10 year 'Licence transverse' with 10 year option (to expire 2032) permits carriageway of this land. PON should be included in discussion along with Newcastle Council and RMS regarding the scope and known issues for the Traffic and Transport assessment in the EIS. In particular, the proposed traffic exit and entry arrangement onto/from Egret and Raven Street and the interaction with the adjacent NCIG driveway entrance.

- **Newcastle City Council**

  Council has not provided any specific traffic assessment requirements in regard to the proposal, however following consultation with Council's traffic section, ARC has prepared this assessment in line with Section 7.03.02 of the Newcastle Development Control Plan 2012 (**Newcastle DCP**), which requires the following for *significant* development proposals: -

  Issues addressed in the Traffic Impact Study include:

  - *review of the existing and proposed traffic network, traffic operating conditions and flows*
  - *likely car parking supply and demand, as well as servicing requirements*
  - *estimates of trip generation of the development*
  - *public transport services in the vicinity of the proposed development*
  - *impacts of generated traffic on the surrounding road network and the locality*
  - *safety of access between the site and the adjacent road network*
  - *pedestrian infrastructure, generation and movements*
  - *recommended improvement works*
  - *linkages with existing and proposed bicycle and pedestrian routes.*

- **Roads & Maritime Service (RMS)**

  It is noted that the RMS did not provide any direct correspondence to the Secretary in regard to the proposal. ARC has consulted with the RMS as part of the assessment process.

In response to these requirements, ARC has undertaken an assessment of the existing operation of the local road network surrounding the facility, and the manner in which that network would operate further to an approval of the proposal. This has included:

- On-site observations of the road network providing access to the sub-regional road network, including vehicle flows, types and speeds; sight distances at key locations; and general road and intersection operations;
- A detailed review of available traffic survey data, including traffic counts commissioned by ARC and others for numerous Kooragang Island assessments over the past 10 years; and traffic survey data provided by the RMS;
- A review of the existing facility's operations;
- An assessment of the traffic generation and distribution characteristics of the proposal;
- A detailed review of potential traffic increases and distribution changes within the immediate local and broader sub-regional road network arising from the proposal;
- An assessment of future levels of service at key intersections; and
- Reference to the appropriate traffic and transport guidelines and assessment criteria, including: -
  - Newcastle DCP
  - RTA Road Design Guide (**RTA RDG**)
  - RTA Guide to Traffic Generating Developments (**RTA Guide**)

- AustRoads Guide to Road Design Part 3 Road Geometry (**AustRoads GRD3**)
- AustRoads Guide to Road Design Part 4A Unsignalised and Signalised Intersections (**AustRoads GRD4A**)
- Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (**AS 2890.1:2004**)
- Australian Standard 2890.2: Parking Facilities – Off Street Commercial Vehicle Facilities (**AS 2890.2:2002**)
- Australian Standard 2890.6: Parking Facilities – Off Street Parking for People with Disabilities (**AS 2890.6:2009**)

1 Existing Conditions

1.1 Location

Boral owns a 12.4ha industrial site extending north from Cormorant Drive and west from Egret Street, Kooragang Island. The broader Boral site is occupied by a number of industrial enterprises, including: -

- Boral Cement works, which occupies the central and southern portions of the site;
- Boral Concrete, which occupies approximately 0.54ha adjacent to Egret Street in the north of the site;
- The recycling facility itself, which occupies some 2ha in the northern portion of the site; and
- Origin Energy, who currently lease a 1.85ha parcel of the site immediately south of the Boral Concrete and recycling facilities.

The locations of these individual sites across the Boral Site are shown in **Figure 1.1**.

1.2 Current Operations

1.2.1 Approval & Capacity

The facility currently operates under an existing development consent granted by Newcastle City Council in 2003 (DA 01/2716). The facility is approved to process 100,000 tonnes per annum (**tpa**) of construction and demolition material, and produces a range of [recycled] materials including aggregates, road base, pipe bedding, and engineered and non-engineered fill.

1.2.2 Operations

The facility comprises the following general areas and operations: -

- Car park, weighbridge and wheel wash;
- Office and administration building and load checking platform;
- Incoming materials stockpile area where incoming vehicles unload waste material;
- Processing plant;
- Processed materials stockpiles; and
- Water management area.

Figure 1.1 Boral Kooragang Island

Source: NearMap and Boral

More broadly, heavy vehicles carrying recyclable materials enter the facility from Egret Street, stopping at the weighbridge and undergoing a visual inspection of the load. Once the incoming material has been inspected, it proceeds to the incoming material stockpile area to unload. The truck then exits the facility via Egret Street. This process is essentially identical for vehicles arriving to collect recycled materials, though these vehicles are weighed on departure.

As recyclable materials are sourced only from registered customers (discussed further in **Section 1.2.4** below), the overwhelming majority of materials arrive in high (load carrying) capacity heavy vehicles rather than smaller trucks or private vehicles, thereby reducing the number of vehicle trips generated; additionally, the tare weight of all vehicles accessing the facility is recorded in the weighbridge system, meaning each vehicle is only required to be weighed once.

The facility is approved to operate between 7am – 5pm on Monday to Saturday, and employs 10 full-time staff. There are no operations on Sundays or public holidays. The facility provides 11 internal car parking spaces, including 2 disabled parking spaces. Additional parking is located outside of the main entry gate to Egret Street (but within the Boral Site), noting that the facility receives limited visitors.

1.2.3 Access

All access to the facility is via Egret Street, immediately south of the intersection of Raven Street, as shown in **Figure 1.2.3.1**.

Figure 1.2.3.1 Egret Street Access

Source: NearMap

Heavy vehicles arrive at the facility (overwhelmingly from the south – see also sections below) and under the direction of on-site staff proceed across the weighbridge and then to the on-site operational areas. The 'queuing area' between Egret Street and the weighbridge provides a sufficient distance such that there is no queuing back to Egret Street.

The Port of Newcastle (as stated in the **Introduction**) raised the issue of traffic entering and exiting the facility and their interaction with the adjacent Newcastle Coal Infrastructure Group (NCIG) driveway. The sight distance between the different approaches to the broader 'intersection' of the facility, the adjacent Newcastle Coal Infrastructure Group (**NCIG**) driveway, Egret Street and Raven Street are good, assisted particularly by the recently introduced Give Way conditions on the Raven Street [westbound approach) which provides controlled (low speed) movements from Raven Street to Egret Street and to the NCIG such that vehicles departing the facility (again almost exclusively to the south) have appropriate time to turn right.

Additionally, Egret Street, Raven Street and the two adjacent access driveways (the facility's and NCIG) generate very minor flows, with the NCIG driveway flow estimated (in the NCIG Environmental Impact Statement – and with reference to ARC observations) at less than 30vph in the peak periods, and little if any heavy vehicle traffic. Estimates of the facility's traffic flows are detailed in **Section 1.2.4** below.

Egret Street and Raven Street, which currently provide for all 'local' access between the facility and the sub-regional road network for the existing and proposed operations, are both approved for Restricted Access Vehicles (**RAV**s) up to 26m B-Doubles, as shown in **Figure 1.2.3.2** below with reference to the RMS *Restricted Access Vehicle Route Map* tool: -

Figure 1.2.3.2 RMS Restricted Access Vehicle Routes

Source: RMS

1.2.4 Existing Traffic Generation

As discussed in **Section 1.2.2** above, the overwhelming majority of materials arriving and departing the facility are transported by high capacity heavy vehicles. Based on information provided by the on-site weighbridge facilities, recyclable materials currently arrive in vehicles with an average capacity of 12.3 tonnes, while recycled materials depart in vehicles with an average capacity of 19.87 tonnes. These tonnages align well with past ARC studies of similar facilities in Glenfield, Chullora and Banksmeadow.

While the facility currently operates 7am to 5pm Monday to Saturday, weekdays have a higher average trip generation than Saturdays. With reference to the facility's 100,000 tpa capacity, an estimate of daily heavy vehicle trips considers: -

- 260 operating days (allowing for Saturday to generate only minor demand)
- Average recyclables arrival capacity 12.3 tonnes
- Average recycled departure capacity 19.87 tonnes
- 2 vehicle trips generated per heavy vehicle carrying recyclable materials
- 2 vehicle trips generated per heavy vehicle carrying processed materials

The existing facility's operations generate approximately 31 recyclable material and 19 processed material heavy vehicles loads per day, or a total of 100 heavy vehicle trips per day (**vpd**).

In addition, staff and [very minor] visitor demands are estimated to generate approximately 30 vpd, **bringing the total existing facility trip generation to an estimated 130vpd**.

The facility's weighbridge data, which records the time and weight of heavy vehicle movements, shows that the facility currently generates an average of some 10 vehicle trips per hour (**vph**) in the commuter peak periods. This is not uncommon in regard to recycling facilities (or indeed general heavy transport operations) given the higher time costs associated with transporting materials during commuter peaks. The weighbridge data demonstrates that movements are more concentrated in the period 10:00am – 4:00pm, where the facility's peak traffic generation can average 20 – 30 vph.

1.2.5 Trip Distribution

A review of heavy vehicle origins shows that the majority (more than 90%) of vehicles trips are generated to/from the west (Newcastle). These vehicles access Egret Street directly from Cormorant Road, while on departure these vehicles are required to turn east in Cormorant Road, then use the Cormorant Road & Teal Street roundabout to returning to the west.

A minority of vehicles are generated to/from the north (Stockton and beyond). These vehicles access Egret Street directly from Cormorant Road, and then use Raven Street to Teal Street for departure. With reference to **Section 1.2.3** above, these northbound departing vehicles are essentially the only trips generated by the facility through the intersection of Egret Street and Raven Street.

1.3 Kooragang Island Industrial Precinct

The broader area of Kooragang Island is a highly industrialised precinct north of Newcastle; with industrial facilities revolving principally around port related activities.

On Kooragang Island, and specifically sites off Cormorant Road and Heron Road, storage, processing and distribution sites dominate, specifically supporting the berthing facilities available on the northern side of the Hunter River (South Channel). The highly industrialised/commercialised nature of the precinct has a number of significant benefits, including: -

- Immediate access to the sub-regional and regional road network, specifically Cormorant Road to either Industrial Drive (south, east and west) or Nelson Bay Road (north) via wide industrial feeder roads including Egret Street and Raven Street. As discussed, most of these roads have RAV approval, which means they provide carriageway suitable to the movement of such vehicles. Further details on the road network are provided in **Section 1.4**.

- No residential areas on Kooragang Island, with the wider precinct identified for industrial development, and as such there is significant separation between the precinct and the nearest residential centres.

- Significant sharing of facilities and infrastructure in the area. The creation and constant redefinition over many decades of Kooragang Island has culminated in a precinct that provides for all of the demands of heavy industry; this is not

limited to the provision of an appropriate road and port infrastructure network, but also rail connections and feeder industries located within the precinct.

These are all important factors to consider as part of the traffic and transport assessment. While the trip generation of the proposal is estimated to be very moderate (refer to **Section 2**), there are many alternative locations where that same level of trip generation would have a significant impact on the existing local area, be it from traffic, noise or other impacts. The location of the facility within the precinct provides the greatest opportunity to minimise any such impacts

1.4 Key Local & Sub-Regional Roads

The broader road network surrounding the facility is shown in **Figure 1.4**, and key roads providing access for the facility are detailed in sections below.

Figure 1.4 Kooragang Island Road Network

Source: Google Maps

1.4.1 Industrial Drive

Industrial Drive is an arterial road which links Kooragang Island (via Tourle Street and Cormorant Road) and the Pacific Highway, and also Newcastle and the industrial precincts on the southern side of the Hunter River.

1.4.2 Cormorant Road/Tourle Street/Teal Street

Cormorant Road is part of Main Road (MR) 108 and accommodates through traffic movements (between Newcastle and regional links) and Kooragang Island. MR 108 comprises a number of individually named sections (i.e. Tourle St, Cormorant Road, Teal St, and Nelson Bay Road).

Cormorant Road provides two lanes over the Tourle Street Bridge with a 60 kilometre per hour (km/h) posted speed limit, then 80km/h posted speed limit through to Stockton. On the western approach to Egret Street, Cormorant Road widens to a four lane undivided carriageway, which continues to the roundabout at the intersection of Teal Street. To the east of the Teal Street roundabout Cormorant Road continues as a very wide two lane undivided road providing access to local industrial roads (Heron Street, Curlew Street) and through to the rear of the Kooragang Coal Terminal (**KCT**).

Cormorant Road is under the jurisdiction of the RMS between Industrial Drive and Teal Street; significantly, the RMS is currently finalising upgrade proposals for both Tourle Street (including a second two-lane bridge crossing of the Hunter River) and the provision of four traffic lanes through to Egret Street (the **Duplication Project**).

The Duplication Project is detailed in the 2014 Duplication of Tourle Street and Cormorant Road Kooragang Review of Environment Factors (**Duplication REF**). Appendix J of the Duplication REF provides a detailed traffic assessment prepared by AECOM, and identifies significant benefits arising from the Duplication Project, particularly in regard to mitigating significant queuing issues currently (and for some time) being experienced in Cormorant Road as a result of the single carriageway conditions west from Egret Street through to Industrial Drive.

As importantly, the Duplication REF identifies a significant improvement of operations at the Industrial Drive & Tourle Street intersection arising from the increase in throughput approach capacity arising from the Duplication Project.

Based on discussions with the RMS, the detailed design stage is expected to be completed by mid-2015, and with funding committed from both the Federal and State Governments the Duplication Project is expected to commence construction in mid-late 2015.

1.4.3 Egret Street

Egret Street – which provides access to the facility (and will continue to do so further to the Proposal) - is a wide industrial road with a 60km/h posted speed limit. It connects to Cormorant Road at its southern end and turns to Raven Street at its northern end. Egret Street is under the jurisdiction of Port of Newcastle.

1.4.4 Raven Street

Raven Street is a wide industrial road with a 60km/h posted speed limit. It connects to Egret Street at its western end; provides an intersection with Curlew Street to the north; and then winds back to Teal Street north of the intersection with Cormorant Road, where access is restricted by median to left in and left out. Raven Street is under the jurisdiction of Port of Newcastle.

1.4.5 Overview of Key Roads

In general, the local and sub-regional road network providing access to and within Kooragang Island is a well-designed industrial system, with wide local access roads with broad shoulders and turning aprons to accommodate large vehicles including oversized RAVs.

1.5 Key Intersections

1.5.1 Industrial Drive & Tourle Street

This is a major signalised intersection with significant capacity due to the number of approach and turn lanes, and accommodates traffic flows which are below future design capacity. Notwithstanding – and as detailed in the Duplication REF – the capacity of the intersection is currently reduced given the poor throughput from the single lane Tourle Street approach. This is one of the key improvements targeted in the Duplication Project, with significantly improved performance in respect to both general operating capacity and queue lengths forecast further to the provision of additional Tourle Street approach capacity.

1.5.2 Cormorant Road & Teal Street

This high capacity roundabout was updated some years ago by the RMS after operating as a priority intersection with poor geometry and a history of accidents. Much of the existing and future traffic generated by the facility will utilise this intersection, specifically as it provides for vehicles departing Egret Street (left out only as per below) to turn back to the west (towards Newcastle).

1.5.3 Cormorant Road & Egret Street

This intersection operates as a left turn only from Egret Street to Cormorant Road. A median strip currently restricts right hand turn operations from Egret Street, while allowing a right turn path from Cormorant Road to Egret Street.

1.5.4 Teal Street & Raven Street

This local access intersection provides left in and left out access only with a deceleration lane in Teal Street providing for the movements to Raven Street. Small numbers of vehicles depart Raven Street and then turn immediately right via the protected right hand turn lane to Sandpiper Close so as to turn back towards Newcastle, but this has been observed to be a very minor movement even during peak periods.

1.5 Local Traffic Conditions

Overall, the local road network operates at a good level of service, with most roads and intersections having significant spare capacity.

This is particularly the case for those intersections away from the primary Cormorant Road – Teal Street arterial route, where low observed peak traffic flows, coupled with excellent intersection geometry and sight distances, ensures a high standard of performance at the minor intersections including Egret Street & Raven Street (and the facility and NCIG access); and Raven Street & Curlew Street.

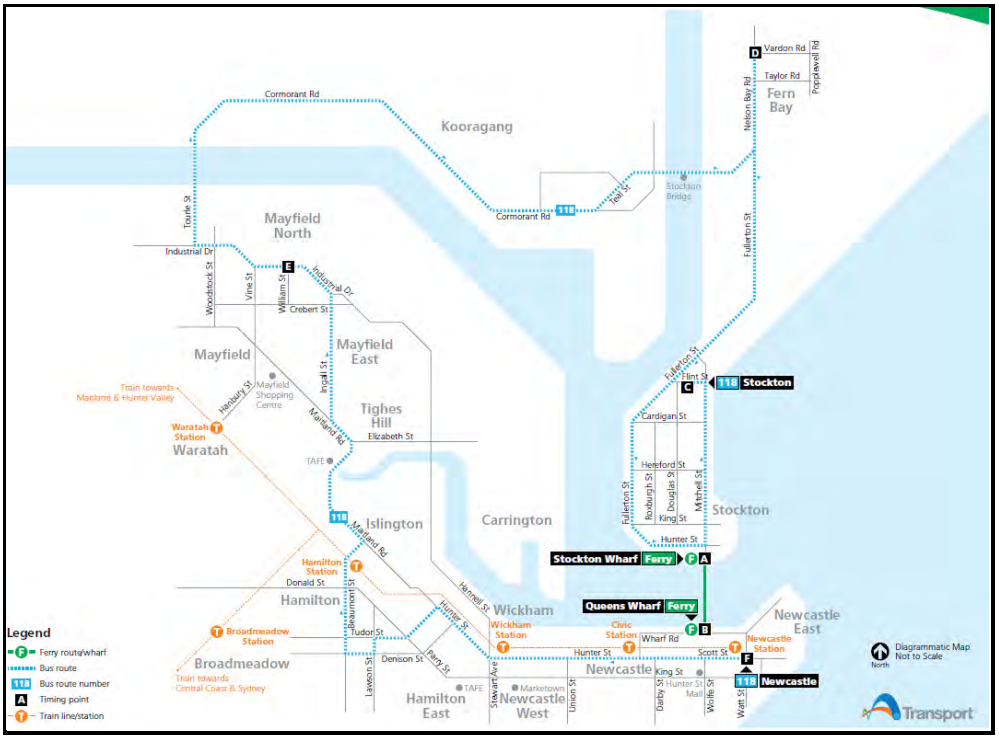
Even at the key intersections along Cormorant Road and Teal Street, the turning demands to/from the local access roads are at best moderate, and as such these intersections – Cormorant Road & Egret Street, and Cormorant Road & Teal Street – operate at a high level of service. While the existing peak period queuing in Cormorant Road currently impacts the capacity of these intersections, it is anticipated that further to the Duplication Project these intersections will all be able to operate at their full throughput capacity.

1.6 Pedestrian, Cycle & Public Transport Facilities

Kooragang Island is relatively poorly provided for in regard to non-car travel options for employees of the precinct.

Bus services are limited to the 118 service between Newcastle and Stockton (and Nelson Bay) (as shown in **Figure 1.6.1** below) which operates very infrequently. Trips between Newcastle and Stockton are augmented by ferry services (also shown below) but neither provides a reliable means of travel to the site.

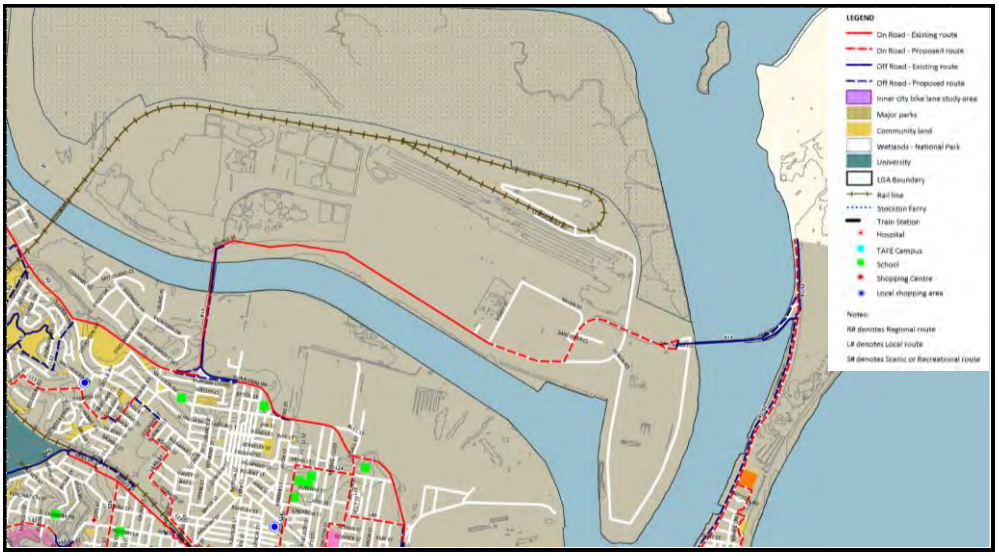
Figure 1.6.1 Kooragang Island Public Transport Services



Source: Transport for NSW

Cormorant Road forms part of the regional cycle route, which provides a popular recreational route including on-road cycle paths from Industrial Drive and a future on-road extension through to Stockton. However, it is again unlikely that any significant percentage of staff (either from the site and broader Precinct) will utilise cycling as a mode of transport to work.

Figure 1.6.2 Cycle Routes



Source: Council

2 The Proposal

2.1 Expansion of the Facility

2.1.1 Proposed Facility Capacity

As stated in the **Introduction**, Boral proposes an expansion of its existing facility including:

- increasing the maximum processing rate from 100,000 tpa to 350,000 tpa;
- importing additional waste materials that are not currently listed on the facility's Environment Protection Licence (EPL);
- increasing the stockpile heights; and
- increasing the hours of operation.

The proposal would expand the area of the facility to include sections of the adjacent Origin Energy and Boral Cement site. The proposed expanded site area is shown in **Figure 2.1.1**.

Figure 2.1.1 Facility Proposal

Source: NearMap & Boral

2.1.2 Staff & Operating Hours

The Proposal will require one additional full-time equivalent employee, bringing the total on-site staff to 11.

Significantly, the proposed operational hours will increase to 24 hours a day Monday to Saturday; and 6am to 6pm on Sunday for maintenance [only]. This extension of operating hours is designed to meet current market expectations and respond specifically to the construction and demolition waste requirements of larger projects (such as RMS roadwork and major infrastructure developments) which commonly operate outside of standard business hours, or indeed on a 24 hour basis.

2.2 Access

Access to and from the facility will continue to be via the existing access point to Egret Street. On-site, the existing processing [vehicle] paths layout will be retained, with additional stockpiling and processing areas provided in the extension areas of the development footprint.

A more detailed assessment of the future access operations is provided in **Section 2.5** below.

2.3 Trip Generation & Distribution

2.3.1 Heavy Vehicle Carrying Capacities

With reference to the discussion in **Section 1.2.4**, heavy vehicles currently accessing the facility have an estimated average carrying capacity of some 12.3 tonnes carrying recyclable materials, and 19.87 tonnes carrying processed materials. This is consistent with a standard vehicle capacity for the carriage of materials such as aggregates and different types of fill. Unlike smaller recycling facilities (or 'general waste' components of larger facilities), this facility is not open to the public, and therefore due to the larger load sizes, the number of heavy vehicles accessing the site is minimised.

In addition, the use of on-site stockpiling allows larger and heavier loads to both deliver to and pick up from the facility. The proposal to increase stockpiling capacity will allow the site to maximise the efficiency of heavy vehicle transport, and further spread outbound processed material trips.

In summary, there will be no increase in the average heavy vehicle carrying capacity as a result of the proposed facility expansion i.e. an average vehicle capacity of some 12.3 tonnes for recyclable materials, and an average vehicle capacity of some 19.87 tonnes for processed materials.

2.3.2 Traffic Generation

Based on the proposed capacity of the facility of 350,000 tpa (an increase of 250,000 tpa); the increased operating days per year; and the same heavy vehicle characteristics as described in **Section 1.2.4, Table 2.3.2** provides a summary of the heavy vehicle trip generation characteristics of the proposal.

Table 2.3.2 Proposal Heavy Vehicle Trip Generation

Existing Facility Operations				Proposed Facility Operations				
Heavy Vehicle	Recyclable Materials	Processed Materials	Total	Heavy Vehicle	Recyclable Materials	Processed Materials	Total	Increase over Existing
Average HVs per day	28	17	45	Average HVs per day	98	61	159	113
Average HV movements per day	56	35	91	Average HV movements per day	196	121	318	227

As summarised in **Table 2.3.2**, on an average day, there will be approximately 159 heavy vehicles arriving at and departing from the facility, which corresponds to approximately 318 daily heavy vehicle movements, or **an additional 227 heavy vehicle trips per day**.

In addition, staff and [very minor] visitor trips are expected to be essentially unchanged from existing generation (approximately 30 vehicle trips per day), i.e. the proposal would not generate any additional light vehicle trips.

2.3.3 Peak Period Generation

As discussed in **Section 1.2.2**, the facility currently operates between 7am and 5pm Monday to Saturday. Based on the available weighbridge data, trips are distributed primarily across later morning and early to mid-afternoon periods.

As a result of the proposal, it is expected that the majority of the facility traffic volumes would continue to occur during business hours, or slightly expanded to 6:00am – 6:00pm, generally in line with the operating hours of other similar facilities. While the Proposal provides for 24 hour operations, it is estimated that only 10% - 15% of trips would occur between 6:00pm and 6:00am, with up to 90% of trips therefore occurring between 6:00am and 6:00pm.

Based on the above, , and with reference to the facility's existing distribution of traffic volumes across the day, it is therefore estimated that the proposal could generate an additional 20 - 30 heavy vehicle trips in the AM commuter peak period, and 10 - 20 additional heavy vehicle trips in a peak hour during the PM commuter peak period.

With reference to **Section 1.2.4**, the resulting total future truck traffic generation of the facility is therefore estimated to be 40 vehicle trips per hour in the AM commuter peak period, and up to 30 vehicle trips per hour in the PM commuter peak period.

2.3.4 Trip Distribution

No discernible change to traffic routes used to access the site is anticipated, with 10% of heavy vehicles to/from the north-east, and 90% of heavy vehicles to/from the west. These trips would use the same distribution paths as existing trips, specifically: -

- Arrival trips from the west would use Cormorant Road to Egret Street, while departure trips to the west would use Egret Street to Cormorant Road, then the roundabout at Teal Street to return to the west.
- Arrival trips from the north-east would use Teal Street to Cormorant Road to Egret Street, while departure trips to the north-east would use Egret Street to Raven Street to Teal Street.

The Proposal would therefore result in the following **additional** heavy vehicle trips being generated to the road network during the peak periods: -

- **AM Peak Hour**
  - 13vph Cormorant Road west to Egret Street
  - 2vph Cormorant Road east to Egret Street
  - 13vph Egret Street to Cormorant Street, and thence U-turn at the Teal Street roundabout
  - 2vph Raven Street to Teal Street

- **PM Peak Hour**
  - 9vph Cormorant Road west to Egret Street
  - 1vph Cormorant Road east to Egret Street
  - 9vph Egret Street to Cormorant Street, and thence U-turn at the Teal Street roundabout
  - 1vph Raven Street to Teal Street

2.4 Traffic Impacts

Existing and proposed traffic flows as a result of the facility are minor when compared with other approved industrial operations on Kooragang Island. For example, the construction of the NCIG site generated (for an extended period) 230vph in both commuter peak periods to Egret Street, the majority of which had the same travel paths as the facility, however even under such 'high' volume conditions, these volumes had little impact on the operation of the local and sub-regional road network.

Therefore, as this proposal is forecasted to generate a fraction of the NCIG site peak – albeit on a permanent basis – the resulting traffic impacts on the road network are considered insignificant.

Notwithstanding, the future operation of key parts of that road network are examined below.

2.4.2 Egret Street

The additional trips generated by the proposal would not alter the industrial access road classification or environmental capacity of Egret Street, with the proposal generating an average of up to 1 additional vehicle trip every 2 - 3 minutes in a peak hour. Given the very low base traffic flows in Egret Street, this would have no impact on the traffic performance of Egret Street.

2.4.3 Raven Street

The additional trips generated by the proposal would not alter the industrial access road classification or environmental capacity of Raven Street, and suggest an average generation of 1 additional vehicle trip every 20 - 30 minutes in a peak hour. Given the very low base traffic flows in Raven Street, this would have no impact on the traffic performance of Egret Street.

2.4.4 Cormorant Road & Egret Street

At the intersection of Cormorant Road & Egret Street, vehicles turning left from Egret Street are opposed by 2 eastbound lanes, but the additional average demand of one vehicle every 4 - 5 minutes to this movement in a peak hour would have no impact on average delay, nor compromise the appropriateness of the existing intersection geometry.

It is noted that east from Egret Street, there is some considerable distance (approximately 800m) available for vehicles to merge to the centre lane so as to undertake a U-turn at the Teal Street roundabout.

At the intersection of Cormorant Road & Teal Street itself, the addition of up to 13vph to the U-turn movement (Cormorant Road eastbound to Cormorant Road westbound) and 2vph to the turn movement Teal Street to Cormorant Road (westbound) in the existing commuter peak periods has been assessed using the SIDRA intersection model. SIDRA reports no change in Level of Service further to these additional trips, nor significant increases in average delay, or reduction in available capacity.

In summary, the proposal would have no significant impact on the operation of the Cormorant Road & Teal Street intersection.

2.4.5 Industrial Drive & Tourle Street

The Duplication REF identifies significant improvements in the operation of the Industrial Drive & Tourle Street intersection further to the Duplication Project, particularly in regard to queue lengths, and by association to average delays and capacity.

The proposal would generate approximately 25 additional vehicle trips to the intersection in a commuter peak hour, split between arrival to and departure from Tourle Street, and further split to trips to/from the east and to/from the west. With reference to the signalised operations at the intersection, the proposal would on average generate 1 – 2 additional intersection movements per signal cycle; or more broadly no more than 6 – 7 additional movements to any single approach in a peak hour.

In summary, the proposal would have no significant impact on the operation of the intersection of Industrial Drive & Tourle Street intersection.

2.4.6 Teal Street & Raven Street

At the intersection of Teal Street & Raven Street, the additional demand of [on average] one vehicle every 20 minutes to the left turn Raven Street to Teal Street in the peak hour would have no impact on average delay, nor compromise the appropriateness of the existing intersection geometry.

In summary, the proposal would not have a significant impact on the operation of the intersection of Teal Street & Raven Street.

2.5 On-Site Requirements

2.5.1 Access Paths

On-site access paths – again to and from the existing Egret Street access point – will necessarily be designed to the maximum vehicle size accessing the facility, and with reference to turning paths as outlined in AS 2890.2:2002. All vehicles will continue to depart to Egret Street in a forward direction.

2.5.2 Facility Access & Queuing

As described in **Section 1.2.3**, queuing is currently contained on-site, and the weighbridge processing time under the supervision of on-site staff (which will continue under the Proposal) allows for an efficient processing of vehicles, such that even further to the proposal it is expected that queues will be contained on-site.

2.5.3 Parking

Section 3.13.06 of the Newcastle DCP provides the following *Objective* in regard to the provision of parking: -

> *Ensure adequate provision is made for on-site car parking and for employees and visitor's vehicles.*

Section 7.03.02 of the Newcastle DCP provides this further *Objective*: -

> *Ensure an appropriate level and mix of parking provision, having regard to the likely demand and the impacts of over/undersupply of parking.*

With regard to a 'parking rate', Table 1, Section 7.03.02 of Newcastle DCP requires the provision of *1 space per 100m^2 GFA, or 1 space per 2 staff, whichever is greater* for *Industrial Activity*.

Clearly, the provision of parking with regard to the size of the facility is inappropriate, given the most significant area is given over to low staff generating activity. Conversely, the provision of 1 space per 2 staff is also unrealistic given the very limited public transport or other non-car mode alternatives available to staff.

As stated in **Section 1.2.2**, the existing facility provides 11 parking spaces, 2 of which are design for accessible parking. This existing parking would appropriately (and realistically) meet the staff parking demands of the Proposal. In addition, parking is available immediately outside the facility (but within the broader Boral Site) to meet visitor and other occasional demands, and again this would meet any future demand generated by the proposal.

It proposed that the existing on-site staff parking spaces will be re-marked to provide dimensions compliant with the requirements of AS 2890.1 and AS 2890.6.

3 Conclusions

Further to a detailed traffic impact assessment of the proposal, ARC has concluded that the expansion of the existing Boral recycling facility in Egret Street, Kooragang Island, would have no significant impacts in regard to the operation of the local and sub-regional road network, and can provide appropriate on-site conditions to maximise staff and visitor safety and general operational efficiency. Specifically, ARC has determined: -

- The proposal will utilise the existing access point to Egret Street, and generate trips to the existing facility access paths to the west and north-east of the RRF.

- While the sub-regional road network – and Cormorant Road in particular – is currently under some stress during commuter peak periods, the Duplication Project will significant reduce average delays and queuing between Stockton and Industrial Drive, and also significantly improve the operation of local intersections.

- The trip generation of the proposal is very moderate, estimated to add up to 30vph in the AM commuter peak period and 20vph in the PM commuter peak period. Distributed to the key local roads and intersections, the trips generated by the proposal would have no significant impact on levels of service or capacity with the local and sub-regional road network.

- On-site access roads will be provided with reference to the appropriate Australian Standards for the largest vehicle accessing the facility.

- While the parking requirements for the Proposal do not neatly fit the requirements of the Newcastle DCP, on-site parking is appropriately and realistically provided with reference to peak staff and visitor demands.

Appendix 7

Noise Impact Assessment

Noise Impact Assessment

Kooragang Island Recycling Facility

Environmental Impact Assessment

Prepared for : Environmental Property Services

30 July 2015

MAC

Muller Acoustic Consulting

Document Information

Noise Impact Assessment

Kooragang Recycling Facility – Environmental Impact Assessment

Prepared for: Environmental Property Services

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MAC150113RP1	Final	30 July 2015	Oliver Muller	

Executive Summary

Muller Acoustic Consulting Pty Ltd (MAC) has completed a noise assessment for the proposed upgrade to the existing Boral recycling facility (the 'facility'). The facility is situated on the corner of Cormorant Road and Egret Street, Kooragang Island, NSW. The proposed upgrade will see an increase in production of recycled materials to 350,000 tonnes per year. Existing stockpiles are also proposed to be modified in both height and area. The proposal also seeks to modify its current hours of operation from the currently approved day time only hours to 24 hours six days per week.

The assessment considered the following noise-related aspects of the facility:

- operational noise;
- the potential for sleep disturbance to the nearest residential receivers;
- traffic noise generated by the facility;
- construction noise; and
- the potential for cumulative noise impacts on surrounding residential receiver catchments.

The assessment has been undertaken in accordance with the following policies and guidelines:

- Environment Protection Authority (EPA) 2000, NSW Industrial Noise Policy (INP);
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, Road Noise Policy (RNP); and
- Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG).

The modelling included the assessment of facility operations within the proposed extension area, processing, product loading and transportation for 24 hour operations. A barrier effect from surrounding buildings and topography was incorporated into the model. Based on the modelling results, facility operations are expected to comply with the Project Specific Noise Levels (PSNLs) at all receivers considered in this assessment.

Sleep disturbance during night periods is demonstrated to satisfy the relevant INP criteria, as a result no sleep disturbance issues are expected in surrounding catchments as a result of the facility.

Road traffic noise associated with facility truck movements are expected to comply with relevant RNP criteria and will be negligible compared to existing traffic noise levels on the Industrial Highway or Nelson Bay Road.

Construction works associated with the site upgrade will satisfy the standard construction noise criteria at all assessment locations.

Cumulative noise from the facility will satisfy relevant EPA amenity criteria and not contribute to an increase in existing industrial noise within the Mayfield, Stockton and Fern Bay residential receiver catchments.

Contents

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Environmental Property Services (EPS) on behalf of Boral Recycling Pty Ltd (Boral) to prepare a Noise Impact Assessment (NIA) for the proposed expansion to the existing Boral Recycling Facility (the 'facility') located on the corner of Cormorant Road and Egret Street, Kooragang Island, NSW (Lot 12 DP 10321462778).

The NIA was conducted to identify potential acoustic impacts associated with 24 hour (6 days) operation of the facility on the surrounding community and will accompany the Environmental Impact Statement (EIS) that is being prepared for the facility. The NIA has been prepared in accordance with the following policies and guidelines:

- Environment Protection Authority (EPA) 2000, NSW Industrial Noise Policy (INP);
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, Road Noise Policy (RNP); and
- Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG).

A glossary of terms, definitions and abbreviations used in this report, along with a list of common noise sources and their typical sound level is provided in Appendix A.

1.1 Background

The facility is currently approved to process up to 100,000 tonnes of recyclable material (building, concrete and demolition waste etc.) per year. The proposed expansion will allow for operations to process up to 350,000 tonnes of recyclable construction and demolition material per year to meet market demands.

Additionally, the proposal would result in existing stockpile areas and heights increased and will require a change to existing operating hours. Currently the facility operates from 7am to 5pm Monday to Saturday, and seeks approval to operate 24 hours, Monday to Saturday with maintenance on Sundays and Public Holidays from 6am to 6pm.

1.2 Vibration Impacts

The potential for vibration impacts have been qualitatively reviewed for this assessment. The review identifies that vibration impacts from the facility would be negligible.

The Construction Noise Strategy (Transport for NSW, 2012) sets out safe working distances to achieve the human response criteria for vibration. The minimum distance to achieve the residential human response criteria for continuous vibration using an >18tonne roller is 100m, this would be significantly less for tracked plant which will be the main vibration generating source on site. The nearest receiver to the facility is over 2km away, therefore, human exposure to vibration is not expected. Furthermore, where the human response criteria are satisfied, the structural criteria for sensitive receivers (3mm/s) will be achieved.

For industrial receivers, the nearest offset distance to potential vibrating sources is >50m. Historic vibration measurements of tracking plant (excavator/dozers etc) identify that the intermittent human comfort of 0.8mm/s (workshops) would be achieved at a distance of 15m. Therefore, vibration impacts are not considered to be an issue for the project and have not been considered further in this assessment.

2 Noise Policy and Guidelines

The following section summarises relevant policy and guidelines pertinent to undertaking an industrial noise assessment. Key policies relevant to the facility include the INP, RNP and ICNG.

2.1 Industrial Noise Policy

The EPA released the NSW INP in January 2000. The INP provides a process for establishing noise criteria for consents and licences enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The specific policy objectives of the INP are:

- to establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses;
- to use the criteria as the basis for deriving project specific noise levels;
- to promote uniform methods to predict, quantify and assess noise impacts, including a procedure for evaluating meteorological effects;
- to outline a range of mitigation measures that could be used to minimise noise impacts;
- to provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- to carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

2.1.1 Assessing Intrusiveness

The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) from the project should not be more than 5dB above the existing rating background level (RBL) in any assessment period. Therefore, when assessing intrusiveness, the background noise needs to be measured. Where the RBL is less than 30dBA, a value of 30dBA is used.

2.1.2 Assessing Amenity

The amenity assessment is based on noise criteria relevant to a specific land use or locality. The criteria relate only to limiting cumulative or combined levels of industrial noise in a locality. Where existing industrial noise approaches the criterion value, then noise levels from proposed industries need to meet the amenity criteria so that cumulative noise or 'industrial-creep' is minimised. The amenity assessment methodology takes into consideration areas of high traffic noise when assessing ambient industrial noise.

Private residences and other sensitive receivers potentially affected by the facility are safeguarded by the EPA's amenity categories as presented in Table 2.1 of the INP. Table 2.1 of the INP is reproduced in Table 1.

Table 1 INP Amenity Categories

Type of Receiver	Indicative Noise Amenity Area	Period	Recommended LAeq(Period) Noise Level, dBA	
			Acceptable	Recommended Max
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/ Industrial Interface	Day	65	70
		Evening	55	60
		Night	50	55
Industrial	All	When in use	70	75
Hospital Ward - external	All	Noisiest 1-hour period	50	55

Note : Monday – Saturday Daytime 7am to 6pm; Evening 6pm to 10pm; Night-time 10pm to 7am. On Sundays and Public Holidays, Daytime 8am to 6pm; Evening 6pm to 10pm; Night-time 10pm-8am.

2.2 Sleep Disturbance Objectives

The EPA provides guidance on assessing sleep disturbance for industrial sites in the INP via its application notes. Section 4 of this assessment outlines the relevant EPA approach and criteria for managing impacts of sleep disturbance from industrial sites.

2.3 Road Noise Policy

The road traffic noise criteria are provided in the NSW EPA's Road Noise Policy (RNP) (2011). The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in Section 4.

2.4 Interim Construction Noise Guideline

Noise associated with construction activities for industry are often assessed as operational noise, as the emissions from plant and associated equipment are similar. Therefore, construction activities within the facility site boundary have been assessed against a background +5dB INP criteria rather than background +10dB as per the ICNG. This assessment approach follows contemporary assessment methodologies for assigning construction noise criteria on projects where construction emissions are not dissimilar to that of operational noise.

2.5 Cumulative Noise Guideline

To limit continuing increases in industrial noise within a particular area, ambient industrial noise should not exceed the levels specified in Table 2.1 of the INP. There are many existing industrial sources in the vicinity of Kooragang Island. Therefore, cumulative operational noise has been considered in this assessment and compared against the INP's acceptable and recommended maximum amenity criteria levels. Section 4 summarises the relevant criteria pertaining to cumulative noise.

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3 Existing Environment

3.1 Receiver Review

The facility will be situated on approximately 12.4ha on the corner of Cormorant Road and Egret Street, Kooragang Island. There are several surrounding industrial receivers to the site and the nearest residential receivers are situated in Mayfield, 2.2 km to the south west and Fern Bay, situated 2.6 km to the north east of the site. Additionally, neighbouring industrial receivers are situated to the north and east of the site and the Stockton Centre (east) is the nearest Hospital receiver to site.

Figure 1 provides a locality plan identifying the position of receivers in relation to the facility. The receiver addresses, MGA(56) coordinates and approximate distance to the facility are summarised in Table 2. The modelled receivers are representative of adjacent land users and residents.

Table 2 Receiver Locations

Receivers	Address	Easting	Northing	Approximate Distance to Facility (m)[1]
Residential				
R1	Crebert Street, Mayfield	383217	6359535	2080
R2	Fullerton Street, Stockton	386647	6359435	2880
R3	Fullerton Street, Fern Bay	387234	6361838	2810
Industrial				
I4	23 Egret Street, Kooragang Island	384538	6361366	70
I5	80 Cormorant Road, Kooragang Island	384449	6361579	120
Hospital				
H6	342 Fullerton Street, Stockton (Stockton Centre)	387276	6361048	2800

Note 1. Distance measured from receiver to approximate site boundary.

3.2 Background Noise Environment

Information on the existing acoustic environment surrounding the subject site, in particular Mayfield and Fern Bay, is readily available from historic environmental assessment submissions from adjacent industrial sites. Most recently, the Port Waratah Coal Services (PWCS) Terminal 4 (T4) Project (SLR 2012) has been validated by attended measurements and subsequently adopted for this project.

Figure 1 - Locality Plan

Noise Impact Assessment - Boral Recycling Facility, Kooragang Island

0 650m

4 Project Specific Noise Criteria

4.1 Operational Noise Criteria

The operational noise criteria for the facility have been derived from historic assessments for industries situated on Kooragang Island. A review of historic assessments confirm criteria were determined in accordance with Section 4.0 of the INP. The intrusiveness and amenity design criteria are derived from logging measurements conducted at catchments representative of surrounding receivers to the facility. The Project Specific Noise Levels (PSNLs) (project criteria) is the lower of the intrusive or amenity criteria. The existing L_{Aeq} in the catchments surrounding the site are dominated by industrial and road traffic noise sources.

Receiver R1 (Mayfield) has been adopted as an urban receiver for consistency with historic reports and in accordance with INP definitions. Urban areas are defined as being dominated by an existing industrial noise contribution ("urban hum"), are near commercial and industrial developments and are exposed to constant road traffic noise. For receiver R2 and R3, the suburban category has been adopted. Table 3 summarises the INP criteria for receivers surrounding the facility.

Table 3 Project Specific Noise Criteria, dBA LAeq(15minute) (re 20uPa)

Receiver Location	Period	RBL	Intrusiveness Criteria LAeq(15minute), dBA[2]	Amenity Criterion LAeq(period),dBA[1]	PSNL, dBA
R1	Day	46	51	60	51 $L_{Aeq(15minute)}$
	Evening	47	52	48	48 $L_{Aeq(period)}$
	Night	43	48	39	39 $L_{Aeq(period)}$
R2/R3	Day	44	49	55	49 $L_{Aeq(15minute)}$
	Evening	45	50	45	45 $L_{Aeq(period)}$
	Night	40	45	40	40 $L_{Aeq(period)}$
Industrial (I4/I5)	When in use	-	-	70	70 $L_{Aeq(period)}$
Hospital (H6)	Noisiest 1-hour period	-	-	50	50 $L_{Aeq(period)}$

Note 1: Adjusted to account for the existing industrial noise contribution in accordance with values contained within Table 2.2 of the INP.

Note 2: Adopted from baseline data obtained from the T4 EA.

4.2 Attended Noise Surveys

To confirm historic noise data and to gain an understanding of the existing noise environment, MAC conducted night time attended noise monitoring at representative receiver locations. The purpose of the measurements were to identify ambient noise sources and to quantify the existing industrial noise contribution.

Background noise levels were assessed in accordance with the INP's 'Short Term Method' for determining background noise. The operator-attended noise measurements were conducted using a Type 1, precision integrating sound level meter in order to quantify the existing ambient industrial noise contributions at assessed receiver locations. During the measurements, weather conditions were calm and clear with a 1m/s west to northwest wind.

The results of attended noise measurements and observations are summarised in Table 4.

Table 4 Operator-Attended Noise Survey Results, 30 June 2015

Receiver Location	Time (hrs)	Primary Noise Descriptor (dBA re 20 µPa)			Description and SPL, dBA
		LAmax	LA_{90}	LA_{eq}	
R1	22:21	76	52	60	Traffic – 55 to 76dBA Industrial hum – 48 to 52dB
R2	22:51	87	51	59	Traffic – 65 to 87dBA Industrial hum – 50 to 53dB
R3	23:12	86	48	62	Traffic – 52 to 86dBA Industrial hum – 48 to 52dB

Attended monitoring identified that the industrial noise was constant and controlled the background noise environment at all assessed receivers. The measured LA_{90} noise levels are considered representative of each catchment and validate adoption of historic data. It is noted that attended measurements were slightly higher than historic levels, this is largely due to the assessment metrics. As stated in the INP application notes, comparing short term measurements often result in higher levels compared to data obtained over an entire assessment period (ie RBL). Notwithstanding, this assessment has adopted the slightly lower historic RBLs (Table 3) for the assessment as a conservative approach to assessing noise emissions from the facility.

4.3 Sleep Disturbance Criteria

The INP criterion discussed in Section 4.1, considers the average noise emission from an industrial site over a 15 minute, day, evening and night period (where applicable) and is appropriate for assessing noise from relatively steady-state sources. However, noise from intermittent or impulsive sounds are required to be assessed using the L_{A1} or L_{Amax} noise metrics.

The most important impact of such intermittent noises would be the disturbance of sleep of nearby residents. The EPA provides guidance on assessing sleep disturbance for industrial sites. The EPA via its application notes, nominate a screening criteria of background noise level (L_{A90}) plus 15 dB shall apply to maximum noise level events from the site. These noise levels are to be calculated at one metre from the bedroom facade at the nearest residential properties. Where noise levels have been calculated above the screening criteria, additional analysis should be undertaken, referencing guidance on maximum noise levels and sleep disturbance listed in the RNP (EPA, 2011). This guidance states:

- maximum internal noise levels below 50 to 55dBA are unlikely to wake sleeping occupants; and
- one or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect the health and well being of occupant's significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a partially open window will reduce external noise levels by 10dBA. Therefore, external noise levels in the order of 60-65dBA calculated at the facade of a residence are unlikely to cause sleep disturbance affects at worst case (ie with windows open).

The descriptors L_{Amax} and L_{A1} may be considered interchangeable, which is accepted by EPA.

If noise levels over the screening criteria were identified, then additional analysis would consider factors such as:

- How often the events would occur;
- The time the events would occur (between 10pm and 7am); and
- Whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

4.4 Road Noise Criteria

The principle guidance to assess the impact of road traffic noise at sensitive receivers is provided in the NSW EPA's RNP.

The road type category used to access the facility adjacent to residential areas is the freeway/arterial/sub-arterial category for Industrial Drive and Nelson Bay Road. Table 5 presents the road noise assessment criteria for freeway/arterial/sub-arterial roads, reproduced from Table 3 of the RNP.

Table 5 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of project/development	Assessment criteria, dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	LAeq(15hr) 60dB (external)	LAeq(9hr) 55dB (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 2dB.

4.4.1 Relative Increase Criteria

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in Table 6 due to the addition of vehicles on Industrial Drive and Nelson Bay Road should be considered for mitigation.

Table 6 Increase Criteria for Residential Land Uses

Road Category	Type of Project/Development	Total Traffic Noise Level Increase, dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
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 LAeq(15hr) +12dB (external)	Existing traffic LAeq(9hr)+ 12dB (external)

4.5 Cumulative Noise Criteria

To limit continuing increases in industrial noise within a particular area, ambient industrial noise should not exceed the levels specified in Table 2.1 of the INP. There are many existing industrial sources in the vicinity of Kooragang Island, including Orica, Port Waratah Coal Services (PWCS) and Newcastle Coal Infrastructure Group (NCIG) operations. Therefore, cumulative operational noise has been considered in this assessment and compared against the INP's acceptable and recommended maximum amenity criteria levels. The acceptable and maximum amenity criteria are reproduced in Table 7.

Table 7 Cumulative Noise Criteria

Type of Receiver	Indicative Noise Amenity Area	Period	Recommended LAeq(Period) Noise Level, dBA	
			Acceptable	Recommended Max
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban (R2/R3)	Day	55	60
		Evening	45	50
		Night	40	45
	Urban (R1)	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/ Industrial Interface	Day	65	70
		Evening	55	60
		Night	50	55

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5 Noise Assessment Methodology

5.1 Operational Noise Modelling Methodology

A computer model was established to determine the acoustic impacts of facility noise emissions to neighbouring receivers for worst case operations.

Brüel and Kjær Predictor Type 7810 (Version 10.01) noise modelling software was used to assess potential noise impacts associated with the facility. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'.

Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at various locations and heights, representative of realistic operating conditions for the assessed scenario. Appendix B provides modelled plant locations adopted for this assessment.

5.2 Operational Noise Modelling Parameters

The model incorporated three-dimensional digitised ground contours for the facility, stockpiles from adjoining industry, buildings and the surrounding land base topography. Note the modelling did not include on-site stockpiles, therefore predictions should be considered conservative. The model predicts LAeq noise levels, although it should be noted that this assessment has assumed that all plant and equipment operate simultaneously. In practice, such an operating scenario would be unlikely to occur and the results should therefore be considered conservatively high. Where relevant, modifying factors in accordance with Section 4 of the INP have been applied to calculations.

5.2.1 Meteorological Analysis

Noise emissions from industry can be significantly influenced by weather conditions. Wind has the potential to increase noise at a receiver when it is light and travels from the direction of the noise source. As the strength of the wind increases the noise produced by the wind will mask the audibility of most industrial sources.

Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions. To account for potential enhancements, the INP specifies that the source to the receiver wind component of speeds up to 3 m/s for 30% or more of the time in any seasonal period (ie day, evening or night), is considered to be a feature wind and predictions must incorporate these conditions.

The NSW INP Section 5.3 Wind Effects states:

> *'Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time or more in any assessment period in any season.'*

To determine the prevailing conditions for the facility, weather data during the period January 2014 to May 2015 was obtained from the Bureau of Meteorology's (BOM) Newcastle weather station located approximately 5 km south east of Kooragang Island, at Nobbys Pilot Station. The data was analysed using the EPA's Noise Enhancement Wind Analysis (NEWA) program in order to determine the frequency occurrence of winds for speeds up to 3 m/s in each season.

Table 8 summarises the results of the wind analysis, includes the dominant wind direction and percentage occurrence during each season for all assessment periods. A default Category F Stability Class was adopted for the night assessment period. The results of the detailed analysis of meteorological data is presented in Appendix C.

Table 8 Seasonal Wind Speed and Direction						
Season	Wind Direction ±(45°)			% Wind Speeds 0.5 to 3 m/s		
	Day	Evening	Night	Day	Evening	Night
Summer	WNW	SW	SW	10	12	22
Autumn	S	SSW	SE	9	16	27
Winter	SSE	ESE	ESE	9	18	30
Spring	SSE	SW	SSE	8	11	27

Based on the results of this analysis, the relevant meteorological conditions adopted in the noise modelling assessment are summarised in Table 9.

Table 9 Modelled Site Specific Meteorological Parameters				
Assessment Condition	Temperature	Wind Speed / Direction	Relative Humidity	Temperature Gradient
Daytime - Calm	20°C	n/a	60%	n/a
Evening - Calm	10°C	n/a	90%	n/a
Night- Inversion	10°C	n/a	90%	F Class

5.2.2 Modelling Scenarios

Two worst case operational modelling scenarios were adopted in this assessment to represent noise emissions during neutral and noise enhancing meteorological stages. The scenarios are summarised below:

Scenario 1 – Neutral Meteorology

The neutral meteorology (Scenario 1) consisted of modelling a calm wind conditions and 0°C/100m temperature gradient. This scenario represents a 'neutral' meteorological situation with regards to the enhancement of the facility operations.

Scenario 2 – Noise Enhancing Meteorology

Scenario 2 consisted of modelling a 0m/s wind speed and a Category F Stability Class. This scenario represents a 'worst-case' meteorological situation with regards to the enhancement of facility operations.

5.2.3 Sound Power Levels - Operation

Mobile plant noise emission data used in modelling for this assessment were obtained from the MAC noise database for relevant sources proposed to be used at the facility during at capacity production. The noise emission levels used in modelling are summarised in Table 10. Appendix D provides the octave sound power data of modelled plant for the operational scenarios.

Table 10 Equipment Sound Power Levels - Operation

Item	Sound Power Level (SWL), dBA
Mobile Crusher (x1)	116
Excavator (x3)	106
Loader (x3)	106
Road Trucks (x4)	102
Water Truck (x1)	101
Stabiliser Plant (x1)	115
Sleep disturbance assessment (LAmax)	
Impact noise event (impact)	115

5.2.4 Sound Power Levels - Construction

The construction noise emission levels used in modelling are summarised in Table 11. The construction scenario adopted a generic construction fleet representative of plant used in expansion activities such as construction of processing/crushing pads and internal roads. Plant items for this assessment were situated in and around the proposed operational footprint to provide an indicative worst case representation of noise emissions during construction. The construction modelling assessment adopted methodologies consistent with the operational assessment.

Table 11 Equipment Sound Power Levels - Construction

Item	Sound Power Level (SWL), dBA
Compactor	110
Road Trucks (x 4)	102
Grader	108
Backhoe/Small Excavator	101

6 Noise Modelling Results and Discussion

6.1 Operational Noise Results

Facility operations include processing, product loading and transportation (ingress and egress). The predicted noise levels at each receiver during neutral (calm) meteorologic and enhancing (inversion) conditions are provided in Table 12.

The results of the model (Table 12) show that noise emissions from the facility satisfy the PSNL at all receivers for both modelled meteorological conditions. Appendix E provides noise contour results for facility operations.

Table 12 Predicted Operational Noise Levels, dBA L_{Aeq}.

Receiver Location	Day (Calm)	Evening (Calm)	Night (Inversion)
		Residential	
R1	32	32	38
Criteria	51LAeq(15minute)	48 LAeq(period)	39 LAeq(period)
R2	<30	<30	31
R3	<30	<30	<30
Criteria	49 LAeq(15minute)	45 LAeq(period)	45 LAeq(period)
		Industrial	
I4	59	59	62
I5	57	57	61
Criteria	70 LAeq(period)	70 LAeq(period)	70 LAeq(period)
		Hospital	
H6	<30	<30	<30
Criteria	50 LAeq(period)	50 LAeq(period)	50 LAeq(period)

6.2 Sleep Disturbance Results

Noise modelling quantified the levels from maximum night time events from the near point of the facility boundary to each assessed residential receiver.

Noise level predictions from L_{Amax} events are presented in Table 13, and do not exceed the sleep disturbance screening criteria at any assessed receivers.

Table 13 Sleep Disturbance Results, LAmax					
Receiver Location	Predicted LAmax Noise Level dBA		RBL	LAmax Criteria dBA	Maximum Criteria Exceedance dBA
	Calm	Enhancing			
R1	35	41	43	58	Nil
R2	<30	30	40	55	Nil
R3	<30	<30	40	55	Nil

6.3 Traffic Noise Results

The 2012 annual average daily traffic (AADT) count for Industrial Drive and Nelson Bay Road has been estimated using RMS counting stations at Mayfield and Fern Bay respectively. The traffic count data used in this assessment are reproduced in Table 14.

Table 14 AADT Levels for Mayfield and Nelson Bay Road	
Location	AADT (2015)
Mayfield	32318
Nelson Bay Road	23062

The facility proposes to increase truck movements to 226 per day (24hrs) with vehicles accessing the site via either Industrial Drive or Nelson Bay Road where they pass residential receivers.

The United States (US) Environment Protection Agency's road traffic calculation method was used to predict the LAeq noise levels from site trucks travelling past receivers along Industrial Drive and Nelson Bay Road. This method is an internationally accepted theoretical traffic noise prediction model. Existing product receipt and dispatch from the facility is 50 trucks per day (100 movements). The proposed number of trucks is up to 113 per day (226 movements). For this assessment, it has been assumed that all site trucks will travel along either Industrial Drive or Nelson Bay Road to and from site, therefore, calculations should be considered conservative. The distribution of vehicles for both existing AADT and site trucks has been assumed as 80% for day and 20% for night.

The results of the traffic noise calculations are presented in Table 15 and demonstrate the noise levels from facility related road trucks would remain below the relevant road noise criteria.

Table 15 Operational Road Traffic Noise Levels, dBA LAeq.

Distance to Nearest Receiver(m)	Assessment Criterion	Existing Traffic Noise	Additional (future) Site Traffic Noise	Existing + Future Site Combined Total
Day LAeq(15hour), dBA				
15[1]	60	57	50	58
18[2]	60	55	49	56
Night LAeq(9hour), dBA				
15[1]	55	54	47	55
18[2]	55	52	46	53

Note 1: Industrial Drive.

Note 2: Nelson Bay Road.

The traffic noise contribution from the facility is predicted to be negligible compared to existing traffic on either Nelson Bay Road or Industrial Highway. Additionally, existing road traffic noise levels are not increasing by more than 2 dB and satisfy the relative increase noise criterion.

6.4 Construction Noise Results

Predictions have quantified levels from typical construction activities occurring at the facility for the day assessment period. Noise predictions identify that construction noise as a result of the works associated with the proposed facility would satisfy relevant criteria for all receivers.

Table 16 Predicted Construction Noise Levels, dBA L_{Aeq}.

Receiver	Day (Calm)	Criteria
Residential		
R1	<30	51[1]
R2	<30	49[1]
R3	<30	49[1]
Industrial		
I4	50	75[2]
I5	46	75[2]
Hospital		
H6	<30	45 (internal)[1]

Note 1: Operational noise criteria adopted.

Note 2: Criteria obtained from the ICNG (DECC, 2009).

6.5 Cumulative Noise

The cumulative noise assessment has reviewed existing industrial noise in the locality surrounding the facility.

The cumulative noise assessment has quantified existing industrial noise via attended noise monitoring to determine if the facility would increase existing industrial noise at surrounding catchments (ie Mayfield, Stockton and Fern Bay). Table 17 presents a comparison of existing measured industrial noise against those predicted for the facility. To quantify cumulative noise, monitoring was conducted during the night period for two reasons. Firstly ambient traffic levels are lower than day and so reduce any masking of industrial noise. Secondly noise enhancing meteorological conditions are more prevalent.

Results indicate that noise emissions from the facility would satisfy the relevant amenity criteria and not result in an increase of existing cumulative industrial noise at assessed receivers.

Table 17 Cumulative Noise Review

Receiver	Existing Night Industrial Noise Contribution (ie no facility related noise)	Facility Noise Contribution (Night predictions)	Existing + Future Site Combined	Change in dB	Criteria
		Night, dBA			
R1	52	38	52	Nil	50
R2	51	<30	51	Nil	45
R3	48	<30	48	Nil	45

7 Conclusion

MAC has completed a noise impact assessment for the proposed expansion of the existing Boral Recycling Facility located on the corner of Cormorant Road and Egret Street, Kooragang Island, NSW.

The assessment has quantified potential operational noise emissions pertaining to processing and the receipt and dispatch of product via road trucks. The results of the NIA demonstrate that operational noise levels comply with the relevant INP criteria for all assessment periods.

L_{Amax} events from the facility will remain below the EPA nominated screening criteria for all residential receivers.

Additionally, the NIA demonstrates that the road noise criteria (RNP) will be satisfied at receiver distances of greater than 15m, additionally road noise generated by the project will be insignificant in comparison to existing Industrial Driver or Nelson Bay Road traffic.

Results identify that noise levels from the proposed construction works are anticipated to satisfy standard hours construction noise criteria at all assessed receivers.

Residential areas surrounding the facility are anticipated to have a negligible increases in cumulative industrial noise as a result of the facility.

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Appendix A - Glossary of Terms

A number of technical terms have been used in this report and are explained in the following table.

Glossary of Terms

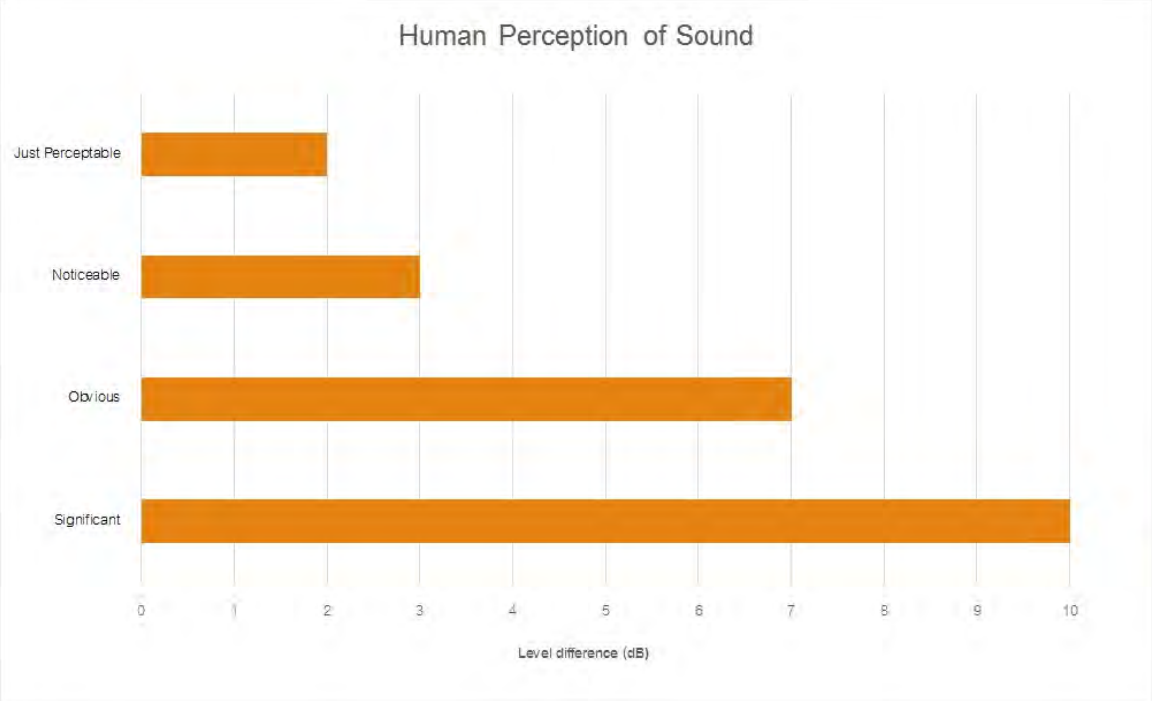
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). 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.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Appendix B – Modelled Plant Locations

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Appendix B

Modelled Plant Locations

0 60m

Appendix C – NEWA Meteorological Analysis

Table D1 NEWA Analysed Meteorological Conditions, Newcastle NSW									
Direction	Season	Day	Evening	Night	Direction	Season	Day	Evening	Night
		Percentage Occurrence %					Percentage Occurrence %		
0	Summer	6	6	9	180	Summer	4	5	13
0	Autumn	7	7	6	180	Autumn	9	14	21
0	Winter	4	4	2	180	Winter	8	11	12
0	Spring	4	3	5	180	Spring	7	10	23
22.5	Summer	5	4	9	202.5	Summer	6	8	20
22.5	Autumn	6	7	8	202.5	Autumn	9	16	19
22.5	Winter	4	6	4	202.5	Winter	6	9	5
22.5	Spring	4	5	6	202.5	Spring	7	10	20
45	Summer	3	2	8	225	Summer	9	12	22
45	Autumn	5	8	11	225	Autumn	8	14	13
45	Winter	4	8	7	225	Winter	3	6	1
45	Spring	3	4	10	225	Spring	7	11	13
67.5	Summer	1	1	7	247.5	Summer	8	11	22
67.5	Autumn	6	7	14	247.5	Autumn	8	14	11
67.5	Winter	4	15	13	247.5	Winter	3	4	1
67.5	Spring	2	5	12	247.5	Spring	6	10	8
90	Summer	1	1	7	270	Summer	9	10	20
90	Autumn	6	10	20	270	Autumn	8	11	8
90	Winter	7	18	25	270	Winter	2	4	0
90	Spring	3	4	17	270	Spring	6	7	5
112.5	Summer	1	1	8	292.5	Summer	10	11	13
112.5	Autumn	8	12	26	292.5	Autumn	8	9	3
112.5	Winter	7	18	30	292.5	Winter	3	4	0
112.5	Spring	3	5	21	292.5	Spring	7	6	3
135	Summer	1	1	8	315	Summer	9	10	11
135	Autumn	8	13	27	315	Autumn	9	6	3
135	Winter	8	17	29	315	Winter	3	4	0
135	Spring	4	6	22	315	Spring	8	5	2
157.5	Summer	3	3	11	337.5	Summer	6	5	6
157.5	Autumn	9	14	27	337.5	Autumn	6	5	2
157.5	Winter	9	16	23	337.5	Winter	3	2	0
157.5	Spring	6	7	27	337.5	Spring	5	2	1

Appendix D – Octave Sound Power Data

Table D1 LAeq(15-min) dBA Sound Power Level Spectrum

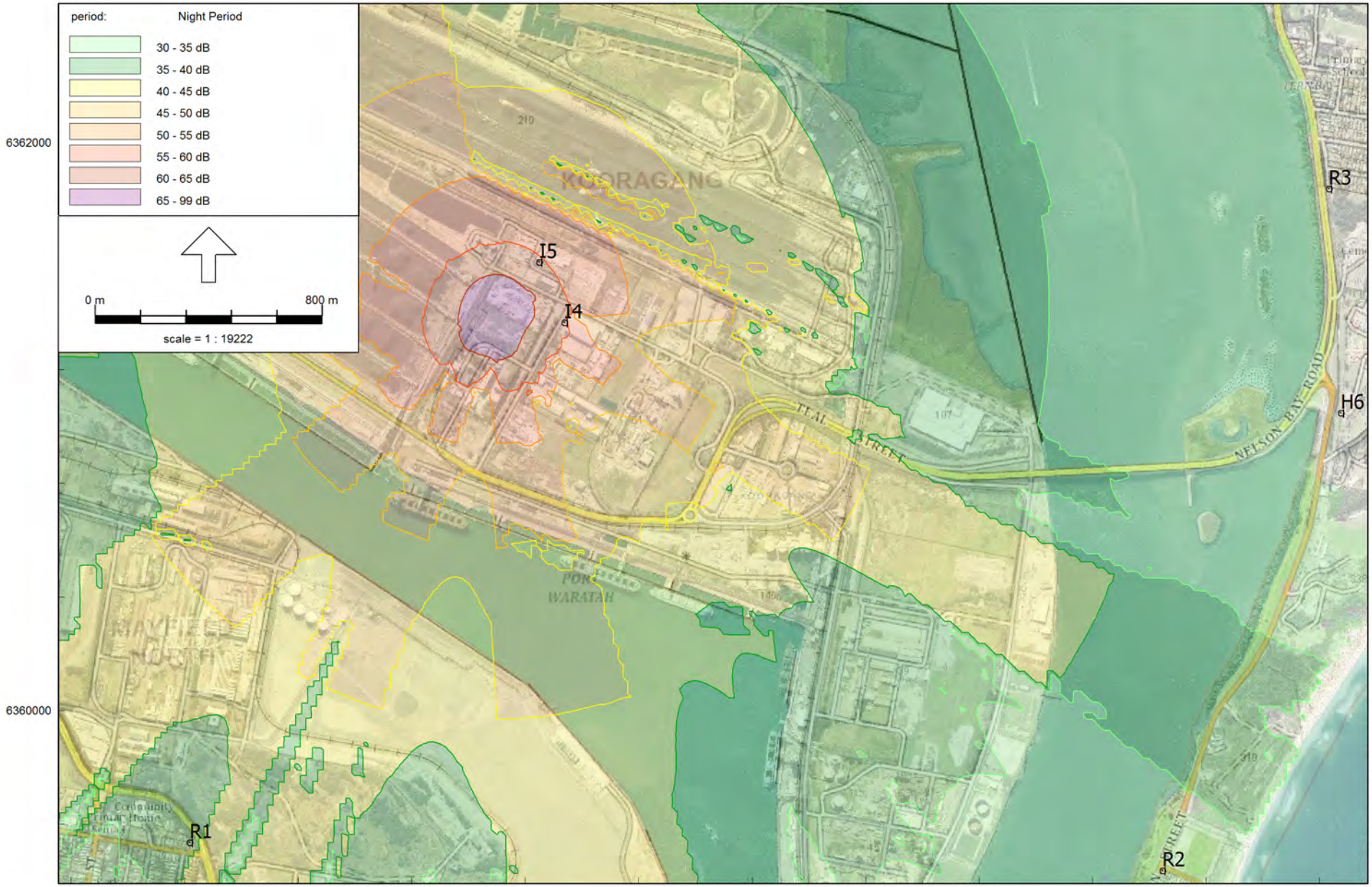
Noise Source	Octave Band Centre Frequency (Hz), dBA								Total
	63	125	250	500	1000	2000	4000	8000	dBA
Loader	77	95	94	100	101	98	93	90	106
Excavator	80	94	94	101	100	98	94	87	106
Water Cart	81	82	89	91	95	97	89	81	101
Stabiliser Plant	93	101	98	108	112	109	99	97	115
Crushing Plant	110	109	109	106	105	102	97	91	115
Road Truck	89	95	90	89	93	97	92	85	102

Appendix E – Operational Noise Contours

Boral Recycling Facility, Kooragang Island. Daytime dBA.

Muller Acoustic Consulting Pty Ltd.

Industrial noise - ISO 9613.1/2 (1/3 Octave), [version of Area - Operational Noise] , Predictor V10.01



Boral Recycling Facility, Kooragang Island. Night-time dBA.

Muller Acoustic Consulting Pty Ltd.

Industrial noise - ISO 9613.1/2 (1/3 Octave), [version of Area - Operational Noise] , Predictor V10.01

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Appendix 8

Water Management Report

Appendix 9

Green and Golden Bell Frog 7 part Test

Seven-part test – Green and Golden Bell Frog

The Project will require the modification of an existing constructed central drainage feature that has mature landscaping and a small ephemeral dam. The potential impacts of this proposal on the Green and Golden Bell Frog are considered below.

The Green and Golden Bell Frog (GGBF) is a relatively large, stout frog, ranging in size from approximately 45 mm to approximately 100 mm snout to vent length. Usually a vivid pea-green, splotched with an almost metallic brassy brown or gold. The backs of some individuals may be almost entirely green; in others golden-brown markings may dominate. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. OEH identifies the habitat and ecology as consisting of:

- Marshes, dams and stream-sides, particularly those containing Bullrushes (*Typha* spp.) or Spikerushes (*Eleocharis* spp.);
- Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available;
- Some sites, particularly in the Greater Sydney Region occur in highly disturbed areas;
- The species is active by day and usually breeds in summer when conditions are warm and wet;
- Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation;
- Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs; and
- Adults are preyed upon by various wading birds and snakes.

Extensive investigations of the Kooragang Island population of the GGBF were undertaken in 2012 for the T4 Project Environmental Assessment (Umwelt 2012). In addition to the GGBF population within the T4 project area, Umwelt (2012) plotted records throughout the vicinity of Kooragang Island and found only one historic record to the east of the site in an area likely to have since been developed and altered. The GGBF is not likely to occur in the immediate vicinity of the site.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

GGBF may occur within the subject site on occasion as part of a larger home range, although the probability of this is low. No evidence of occurrence was observed and no breeding habitat was recorded within the site. Potential foraging habitat, mostly in the form of mown grass and the constructed drainage channel, is of low value for this species as there is no known source population or breeding habitat that is directly connected to the site. The core known population of GGBF occurs approximately 1 km to the north of the site in Hunter Wetlands National Park and approximately 2 km to the west of the site. The Project site is separated from these areas by industrial development and large coal stockpiles.

The proposal will remove only a very small portion of low quality potential foraging habitat available to the species. The proposal is not likely to have an adverse effect on the life cycle of GGBF such that a viable local population will be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations are likely to occur within the subject site.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
>
> ***(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

No endangered ecological community are likely to occur within the subject site.

(d) In relation to the habitat of a threatened species, population or ecological community:

> ***(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and***

The proposal will remove or modify a maximum of 0.31 ha of landscaping along the constructed drainage, plus open mown grassy areas.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposal will not fragment or isolate habitat for the GGBF as it is already isolated from core known GGBF populations on Kooragang Island.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The habitat is of low importance and is not significant for the long-term survival of the GGBF.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The subject site is not located near any declared areas of critical habitat.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The proposal will remove a small area of planted native and exotic vegetation and as such this could be seen to contradict recovery strategies listed in documents such as the 2005 Draft Green and Golden Bell Frog Recovery Plan and The Green and Golden Bell Frog Key Populations in the Lower Hunter Management Plan. However, the impacts of the project are minor and are not expected to interfere with the recovery of this species.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposal may increase the operation of the KTP "Clearing of vegetation" however, the proposal will remove a maximum of 0.31 ha of planted vegetation and as such is a very small contribution to this KTP. No other KTP's are likely to be exacerbated significantly by the project.