Boral St Peters

Concrete batching plant and quarry materials handling facility

Environmental Assessment

Prepared for Boral Resources (NSW) Pty Limited
July 2016



BORAL

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Environmental Assessment

Modification of development consent | Boral St Peters

Prepared for Boral Resources (NSW) Pty Ltd | 21 July 2016

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Environmental Assessment

Final

Report J15100RP2 | Prepared for Boral Resources (NSW) Pty Ltd | 21 July 2016

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1 Introduction

1.1 Overview

Boral Resources (NSW) Pty Ltd (Boral) own and operate a concrete batching plant (CBP) and construction materials handling facility (the handling facility) at 25 Burrows Road South, St Peters (the site). The site's regional setting and local context is illustrated in Figures 1.1 and 1.2, respectively.

A modification to the development consent (Modification 10) is proposed to:

- simplify the development consent by removing complex and irrelevant conditions; and
- seek production limits for the CBP and throughput limits for the handling facility.

In relation to the CBP, the production limit sought is 280,000 cubic metres (m^3) per annum, which is an increase of 25,800 m^3 per annum (or about 10%) over the combined total of the CBP and asphalt plant for the site that were originally approved in 1996. No works are required to the site or CBP to achieve this increase. The throughput of the handling facility is about 760,000 tonnes per annum (tpa); no increase in throughput for the handling facility is sought.

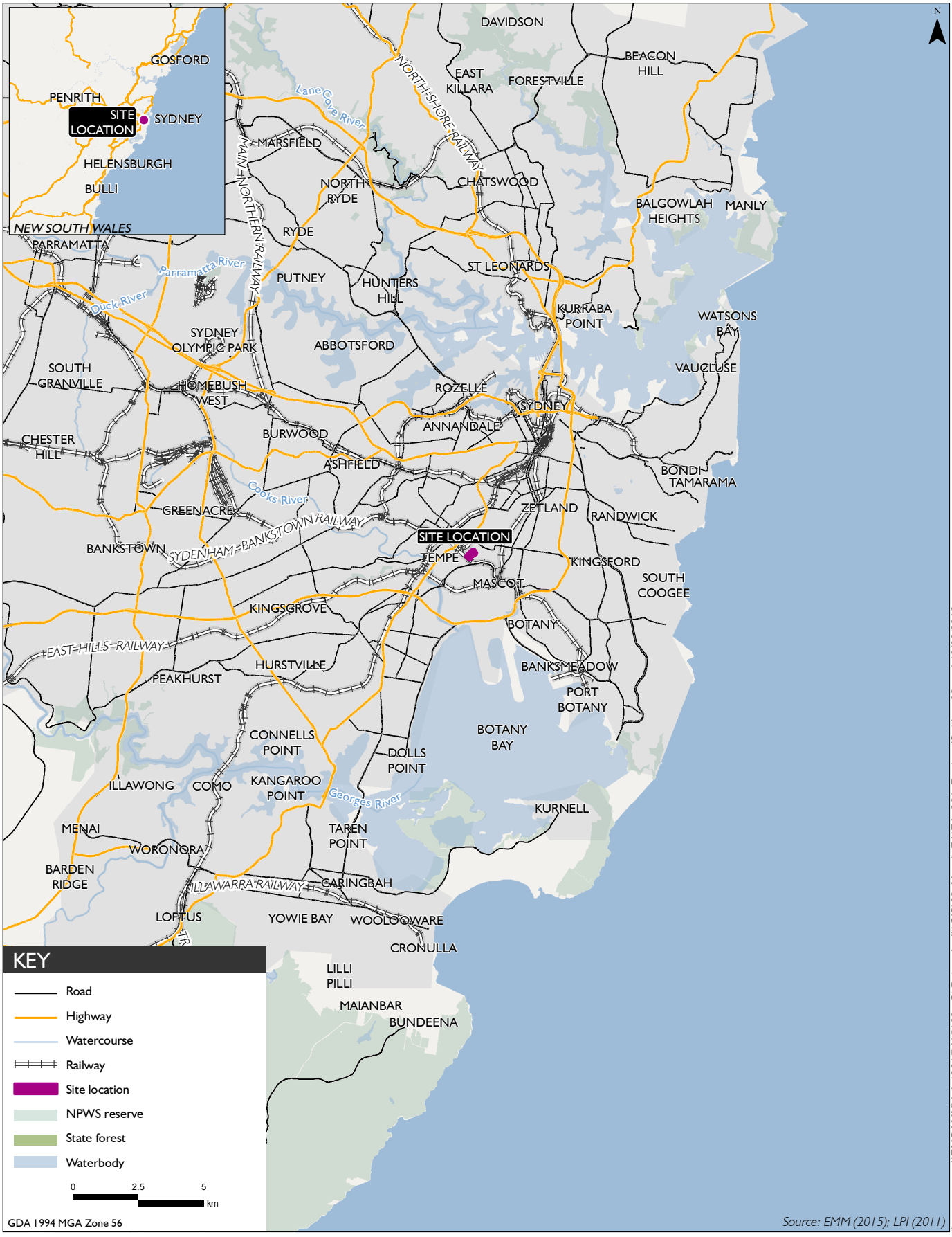
It is largely an administrative modification of the development consent to simplify (ie remove complexity) and remove irrelevant conditions. This application is referred to as the modification.

1.2 Background

The site receives bulk construction materials (aggregate, sand and cement) predominantly by rail from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. These construction materials are used to make concrete at the CBP, or are temporarily stored at the handling facility for later distribution to other CBPs and asphalt plants within the Sydney metropolitan area. All concrete and construction materials are despatched from the site by truck.

On 6 September 1996, the then NSW Minister for Urban Affairs and Planning granted development consent to Boral under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of the CBP and the handling facility at the site. The development consent also permitted Boral to construct and operate an asphalt plant. This plant was constructed and operated, but was subsequently decommissioned and demolished in 2002.

Since the development consent was granted, nine modifications to the consent have been approved. This has resulted in a complex and cumbersome development consent which is difficult to interpret. It requires all of the documentation that accompanied the original development application (DA) for the site and nine subsequent applications to modify the development consent to be reviewed to determine what is permitted to be undertaken on the site. Also, many conditions are no longer relevant as they relate to the asphalt plant, construction of the CBP and the handling facility, and activities which have already been completed at the site. A copy of the development consent, as currently modified, is contained in Appendix A.



Regional setting

Boral St Peters
Modification of development consent
Environmental Assessment
Figure 1.1



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Site Location

Boral St Peters
Modification of development consent
Environmental Assessment
Figure 1.2

Production and throughput is partly regulated by a condition of the consent restricting total daily vehicle movements (light and heavy vehicles). However, based on a review of supporting documentation for the original development application and modifications 2 and 3, the application of the condition restricting total vehicle movements seems to only consider vehicle movements associated with the CBP and asphalt plant, not the handling facility. That is because the traffic assessment that accompanied the original development application only considered traffic movements associated with the CBP and asphalt plant. While the asphalt plant has been demolished and does not generate vehicle movements, vehicle movements associated with the handling facility are much higher than those that were generated by the asphalt plant. As such, the condition places an unreasonable restriction on the amount of concrete and construction materials that the site can despatch.

Existing and planned infrastructure projects in the Sydney metropolitan area (CBD and South East Light Rail, and WestConnex) require a significant amount of concrete and construction materials for their construction. Most of these projects are located in the inner and middle ring suburbs of Sydney, and in the case of some elements of WestConnex, will be located in close proximity to the site. As such, the site's location in St Peters and its ability to receive construction materials by rail means it is ideal to provide construction materials to these projects.

1.3 Site location and surrounding land uses

The site comprises a CBP and handling facility which occupies Lot 1 in Deposited Plan (DP) 866946 at 25 Burrows Road South, located approximately 7 kilometres (km) south-west of the Sydney Central Business District (CBD) (Figure 1.2).

The site is a completely modified industrial site, located within the newly formed local government area (LGA) of the Inner West adjacent to its eastern boundary with the existing Botany Bay LGA. The site was formerly within the Marrickville LGA, which was merged with the LGAs of Ashfield and Leichhardt on 12 May 2016 to form the Inner West LGA. The site is principally surrounded by industrial land uses which correspond with the site's and surrounding properties' zoning as IN1 General Industrial under the *Marrickville Local Environmental Plan 2011* (Marrickville LEP).

The site is bordered by the Alexandra Canal to the south-east, Burrows Road South to the north-east, industrial land uses to the north-west and the Botany Goods Line to the south-west. It is serviced by arterial roads, with access to the Princes Highway via Burrows Roads South and Canal Road. The nearest residential properties are about 600 metres (m) to the north-west of the site on the northern side of the Princes Highway (Figure 1.3). Other surrounding features are:

- **North:** industrial land uses immediately north of the site, the Princes Highway, and residential areas on the northern side of the Princes Highway in Sydenham and St Peters.
- **East:** industrial land uses for approximately 1-1.5 km to the east, and beyond this, residential areas in Mascot.
- **South**: the Sydney International Airport is about 300 m to the south of the site beyond the Alexandra Canal.
- **West:** the Botany Goods Line is immediately west of the site; beyond this are industrial and commercial land uses, and residential areas further west in Tempe.

Assessment locations have been adopted at representative residential and industrial/commercial receptors close to the site, and are identified in Table 1.1 and Figure 1.3.

Table 1.1 Assessment locations

Receptor ID	Receptor location	Receptor type
R1	10 Terry Street, Tempe	Residential
R2	383 Princes Highway, Sydenham	Residential
R3	2 Burrows Road South, St Peters	Commercial/industrial
R4	19 Burrows Road South, St Peters	Commercial
R5	293 Coward St, Mascot	Commercial
R6	291 Coward St, Mascot NSW	Commercial
R7	283 Coward St, Mascot	Commercial
R8	Bellevue St, Tempe	Industrial
R9	Bellevue St, Tempe	Industrial
R10	6-10 Burrows Rd South, St Peters	Industrial
R11	4 Burrows Road South, St Peters	Commercial/industrial

1.4 Approval pathway

The modification to the development consent can be considered under the repealed Part 3A of the EP&A Act. As part of the repeal by the NSW *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* (Part 3A Repeal Act), transitional provisions were introduced (Schedule 6A of the EP&A Act) enabling 'transitional Part 3A projects' to continue to be subject to Part 3A of the EP&A Act (as in force immediately before the repeal and as modified by the Part 3A Repeal Act).

Specifically, the modification can be considered under section 75W of the EP&A Act which allows a proponent to request that the NSW Minister for Planning modify an approval for a project. Modifications under section 75W are required to be accompanied by an environmental assessment (EA); this document. The statutory framework and approval pathway are described in detail in Chapter 4.

1.5 Proponent

Boral is the proponent for the proposed modification. Boral is a wholly owned subsidiary of Boral Limited.

Boral Limited is an Australian owned, international building and construction materials group, with its headquarters in Sydney, Australia. With more than $5.2 billion worth of annualised sales, Boral Limited primarily serves customers in the building and construction industries with operations concentrated in three key geographical markets – Australia, the USA and Asia. Boral Limited has around 11,000 full-time equivalent employees.

In Australia, Boral Limited has over 500 operating sites. Boral Limited produces and distributes a broad range of construction materials, including quarry products, cement, fly ash, pre-mix concrete and asphalt; and building products, including clay bricks and pavers, clay and concrete roof tiles, concrete masonry products, plasterboard and timber.

The Boral Construction Materials and Cement division employs around 5,000 people alone in its quarry, concrete, asphalt, concrete placing and cement operations.

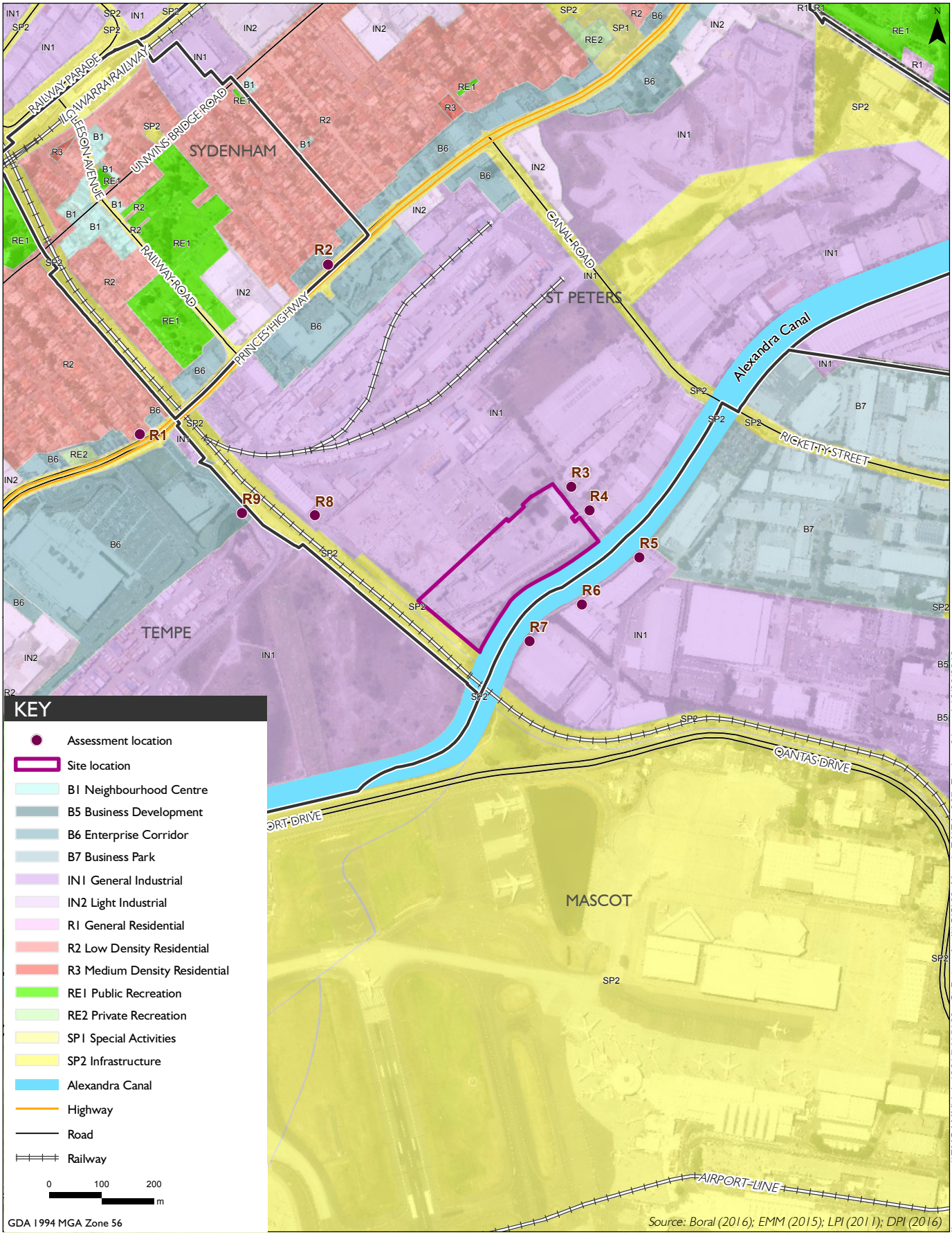
1.6 Document structure

This EA has been prepared to accompany the application for the administrative modification. The structure of this EA is as follows:

- Chapter 1 – introduction;
- Chapter 2 – existing and approved operations - provides a background to the administrative modification, including the original DA and subsequent nine modifications to the development consent, and details on existing and approved operations at the site, including the operation of the CBP and handling facility;
- Chapter 3 – proposed modification - provides details of the proposed administrative modification, including a table identifying proposed changes to all conditions in the development consent;
- Chapter 4 – statutory framework - provides an overview of the statutory approval framework for the administrative modification;
- Chapter 5 – stakeholder consultation - provides details of consultation undertaken with the NSW Department of Environment and Planning (DP&E), Inner West Council, NSW Environment Protection Authority (EPA) and NSW Roads and Maritime Services (RMS);
- Chapter 6 – noise assessment - provides a summary of the results of a noise assessment undertaken for the proposed minor increase in production at the CBP;
- Chapter 7 – air quality assessment - provides a summary of the results of an air quality assessment undertaken for the proposed minor increase in production at the CBP;
- Chapter 8 – traffic assessment - provides a summary of the results of a traffic assessment undertaken for the proposed minor increase in production at the CBP;
- Chapter 9 – other matters - provides assessments of other matters; and
- Chapter 10 – justification and conclusion.

This EA contains eight appendices, including:

- Appendix A - a copy of the existing development consent for the site, as modified;
- Appendix B - copy of correspondence from DP&E dated 12 February 2016;
- Appendix C - plan of existing layout of the site;
- Appendix D - the results of a review of the existing development consent and proposed changes to the conditions of the consent;
- Appendix E - noise assessment;
- Appendix F - air quality assessment; and
- Appendix G - traffic assessment.



Surrounding land uses and zones

Boral St Peters
Modification of development consent
Environmental Assessment
Figure 1.3

2 Current operations

2.1 Approvals history

The site operates under Development Consent No. DA 14/96 which was granted on 6 September 1996 by the (then) NSW Minister for Urban Affairs and Planning. The Minister was the consent authority pursuant to *State Environmental Planning Policy No 34—Major Employment-Generating Industrial Development* (SEPP 34) (now repealed) which deemed that the site and its operations were significant to the State.

The development consent enables the construction and operation of the CBP, an asphalt plant and the handling facility. The asphalt plant has since been decommissioned and demolished. Since the development consent was granted, nine modifications to the consent have been approved. In most cases, the modifications have related to site layout changes, as described in Table 2.1.

Table 2.1 Summary of modifications to Development Consent No. DA 14/96

Modification	Approval date	Description
Modification 1	12 May 1997	Alteration of approved site layout to improve operational aspects of the CBP, and addition of one line to railway siding, making a total of three spur lines.
Modification 2	8 December 1998	Alteration of the approved site layout of the asphalt plant and handling facility, and additional timing to complete construction of the rail siding.
Modification 3	25 June 1999	Installation of liquefied butane gas tank to fuel asphalt dryer and bitumen heaters at asphalt plant.
Modification 4	7 April 2000	Rearrangement of the handling facility from the approved site layout, including construction of the storage bunkers for quarry product and additional cement silos, and delivery of cement by rail (in addition to road).
Modification 5	23 August 2001	Altered layout of weighbridge, office and single large ground storage bunker.
Modification 6	16 May 2003	Altered site layout to reflect decommissioning of the asphalt plant and subsequent changes to the handling facility, including relocation of the ground bunkers to the centre of the site, which were never undertaken by Boral.
Modification 7	11 February 2004	Altered site layout to improve materials handling activities on the site, including introducing a manual truck loading system, rearrangement of existing storage bunkers and provision of new bunkers and changes to vehicle access in the handling facility. Overall changes to the traffic circulation on the site were also approved.
Modification 8	3 December 2012	Altered rail siding to accommodate the full length of 28 wagon trains to improve the efficiency of receival of construction materials by rail.
Modification 9	4 July 2013	Altered the site layout to relocate the handling facility's site office and car park, reconfigured and increased the capacity of the aggregate and sand storage bunkers, relocated the weighbridge and wheel wash and improved traffic flow within the site.

2.2 General description and site layout

The site has two existing uses; a CBP and a construction materials handling facility. Both uses predominantly receive bulk construction materials (aggregate, sand and cement) from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. The majority of aggregate and sand material is received by rail. Some bulk construction materials as well as cement, fly ash and special admixtures used in the CBP are delivered to the site by road.

All materials received are either used to make concrete at the CBP, or stored at the handling facility for subsequent distribution to other CBPs and asphalt plants within the Sydney metropolitan area. Concrete

from the CBP is despatched by road in concrete agitators. All construction materials are despatched from the site by road in trucks.

The site has two driveways to Burrows Road South; the main driveway (Driveway 1) located in the middle of the site's boundary with Burrows Road South, and a second driveway (Driveway 2) located on the north-western boundary. The original layout of the site has been modified a number of times since the original consent to improve overall operation and efficiency and to account for the demolition of the asphalt plant. The current layout of the site is illustrated in Figure 2.1 and Appendix C.

The following sections describe the CBP, handling facility, access and traffic circulation, rail infrastructure, and water management in further detail. An operational flow diagram for the CBP and handling facility is illustrated in Figure 2.2.

2.3 Concrete batching plant

The CBP is located in the south western section of the site. The location and general arrangement of the CBP is illustrated in Figure 2.1. Key components include:

- rail unloading area, for sand and aggregate received by rail;
- elevated aggregate and sand bins;
- batching plant and elevated cement/fly ash silos;
- slump stands, where water added is to concrete agitators;
- concrete washout bays;
- truck washbays;
- concrete returns bays; and
- office, amenities and car park.

Plates 2.1 to 2.6 show operations at the CBP.

2.3.1 Production and operation

The operation of the CBP involves the dry and wet batching of aggregates, sand, cement, fly ash and admixtures with water. The CBP produces approximately 254,200 m^3 of concrete per annum, which is based on combined production estimates for concrete and asphalt (the latter is no longer produced at the site). The EIS which accompanied the DA for the site in 1996 stated that the CBP would have a maximum production rate of 200,000 m^3 per annum. It also stated that that the asphalt plant (no longer at the site) would have a maximum production rate of 108,400 tonnes per annum (tpa), which equates to approximately 54,200 m^3 per annum. Combined, this is a maximum production rate of approximately 254,200 m^3 per annum.

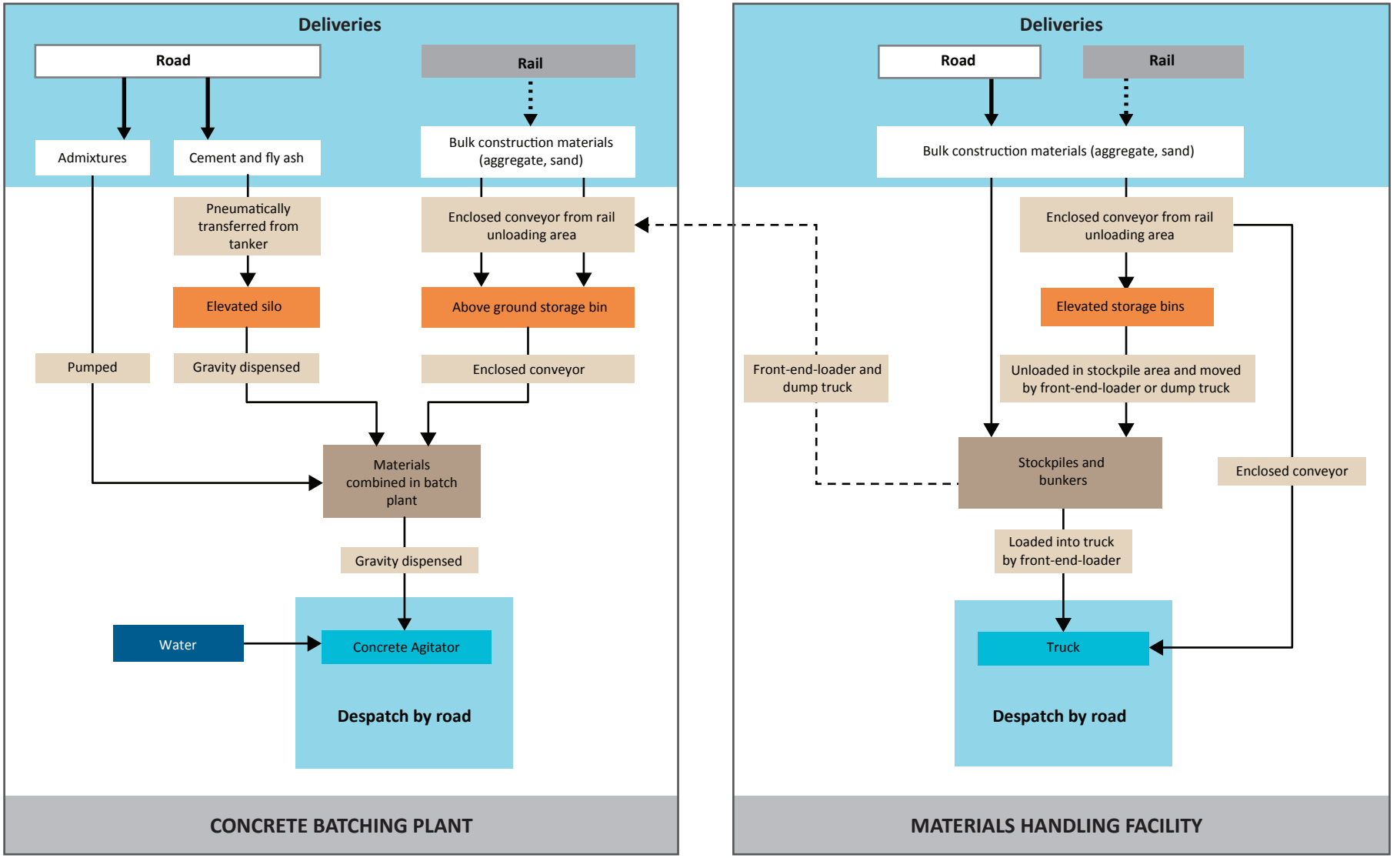
Aggregates, sand and cement are received at the site (primarily by rail) and transferred via conveyor to elevated storage bins. From the storage bins, these materials are dispensed via conveyor to the batching plant. Fly ash and admixtures are received via truck and stored in silos above the batching plant. These are gravity dispensed to the batching plant below.



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Site Layout

Boral St Peters
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Environmental Assessment
Figure 2.1



Operational flow diagram

Boral St Peters
Modification of development consent
Environmental Assessment
Figure 2.2

The CBP gravity dispenses the dry batched product into concrete agitators (also known as transit mixers) in the loading alley beneath the batching plant. The site has two loading alleys for dry batching into the concrete agitators (see Plate 2.4). Admixtures are automatically dispensed in measured quantities into the concrete agitators.

Once the concrete agitators are filled with dry product, they proceed to one of two dual slump stands where water is added to concrete agitators prior to dispatch (see Plate 2.5). The concrete agitators blend the dry batched product and water, and the end product (concrete) is then transported by road to customers.

Empty concrete agitators returning to the CBP are washed out in a series of washout bays (see Plate 3.6). Once full, concrete in the washout bays is dried before being sent by truck for recycling. The CBP also recycles unused concrete from the concrete agitators. Unused concrete is dried in a drying yard located adjacent to the washout bays and then transported by truck for recycling.

2.3.2 Materials handling and storage

Aggregates and sand are delivered to the CBP mostly by rail, where they are bottom-dumped from rail wagons into pits below ground level at the rail unloading area. They are transferred from the pits at the unloading area by conveyor to elevated, fully enclosed storage bins, located in the south-western corner of the site (see Figure 2.1and Plate2.2). Aggregates and sand are also transferred to the CBP from the handling facility.

Table 2.2 presents the volume of bulk construction material inputs to the CBP.

Table 2.2 Bulk construction materials – CBP(for an annual production of 254,200 m^3)

Material	Quantity
Aggregate	262,000 t
Sand	203,000 t
Cement/fly ash	118,000 t
Admixtures	400,000 litres (L)

Cement and fly ash are transported to the site by either rail, or road in tankers and transferred pneumatically (ie by pressurised hose) to elevated silos located above the batching plant. During the batching process, cement and fly ash are conveyed inside sealed airslides from the silos to a sealed weighing hopper, from where they are discharged into a concrete agitator in the loading alley.

Admixtures required by the CBP are pumped directly from the delivery tanker to the storage tanks adjacent to the batching plant, and automatically dispensed in measured quantities into the concrete agitators. Approximately 400,000 L of admixture is required per annum. Water is added directly to the concrete agitators by the CBP and final adjustment is achieved via water addition at the slump stand. Approximately 38,000 kilolitres (kL) per annum is required for concrete production.

2.3.3 Office, amenities and car park

The CBP's office and car park are located in the south-eastern portion of the site. The car park is located in the southern most extent of the site adjacent to the Alexandra Canal, and has a sealed pavement with line markings and accommodates 39 vehicles. The office is located adjacent to the rail unloading area.



Plate 2.1 A train on one of the sidings moving through train unloading area unloading aggregates and sand



Plate 2.2 Elevated storage bins which receive aggregate and sand via conveyor



Plate 2.3 Elevated cement and fly ash silos above the batching plant



Plate 2.4 Alleys underneath batching plant where batched material is gravity dispensed into concrete agitators



Plate 2.5 **Concrete agitators at the slump stands after existing the batching plant (neighbouring site visible to the right of photograph)**



Plate 2.6 **Concrete washout bays**

2.4 Handling facility

The handling facility is located in the centre and north-eastern section of the site. The location and general arrangement of the handling facility is illustrated in Figure 2.1. Key components include:

- rail unloading area, for sand and aggregate material received by rail;
- elevated aggregate and sand storage bins;
- aggregate and sand stockpiles and bunkers;
- weighbridge; and
- office, amenities and car park.

2.4.1 Production and operation

The handling facility receives and temporarily stores aggregates and sand from Boral's Peppertree and Dunmore quarries before despatching it by truck to other CBPs and asphalt plants within the Sydney metropolitan area. Some aggregates and sand are also transferred for use in the CBP onsite. The majority of aggregates and sand are received by rail. Some are received by road.

The EIS that accompanied the DA for the site in 1996 did not provide an estimate of the throughput of the handling facility. Volumes of bulk construction materials received at the handling facility are presented in Table 2.3. The split between rail and road transport modes is approximate and varies from year to year. However, Boral uses rail freight for the delivery of bulk construction materials where ever practicable.

Table 2.3 Bulk construction material throughput – aggregates and sand (tpa)

Transport mode to site	Aggregates	Sand	Total
Rail	320,000	327,000	647,000
Road	15,000	97,000	112,000
Total			**759,000**

Aggregates and sand received by rail are transferred by conveyor from the train unloading area to elevated storage bins (refer to Section 2.6). From here, they are either loaded directly into trucks via conveyor for despatch offsite, or transferred to storage bunkers and stockpiles by a front end loader and/or dump truck. Aggregates and sand received by road are unloaded directly into the stockpile area and moved by front-end-loader to storage bunkers and stockpiles.

The existing storage bunkers and stockpiles provide a total stockpile capacity of around 23,000 t. The design of the storage bunkers comprise concrete retaining walls against which material is stacked. The retaining walls have a shade cloth fence mounted on top to capture dust emissions. Storage bunkers and stockpiles are fitted with a sprinkler system for additional dust suppression.

Materials stored in the stockpiles and bunkers are reclaimed by a front-end loader for loading into trucks and transport offsite. A portion of the stockpiled material is transferred to the CBP for use as required. Plates 2.7 and 2.8 show elevated storage bins, stockpiles and bunkers at the handling facility.



Plate 2.7 The handling facility's storage bins and storage bunkers



Plate 2.8 The handling facility's stockpile area

2.4.2 Weighbridge

The weighbridge is located near Driveway 1. All trucks dispatched from the handling facility at the site are weighed at the weighbridge prior to exiting.

2.4.3 Office, amenities and car park

The handling facility's office and car park are located adjacent to Burrows Road South. The car park has a sealed pavement with line markings and accommodates 27 vehicles.

2.5 Site access and traffic circulation

The site is located at the southern end of Burrows Road South. Access is via Burrows Road South which intersects with Canal Road at right angles to the north-east. The site has two driveways to Burrows Road South. Driveway 1 (or Gate 1) (see Plate 2.9) is the site's primary driveway, located in the middle of the site's boundary with Burrows Road South, and provides two-way access. Vehicles accessing both the CBP and handling facility enter the site using this driveway. Vehicles accessing the handling facility also exit via this driveway. Driveway 2 (or Gate 2) (see Plate 2.10) is located on Burrows Road South and is exit only. Trucks from the CBP exit via this driveway.

Internal traffic circulation is generally two-way along the south-eastern side of the site and one way on the north-western side of the site. Figure 2.1 illustrates traffic circulation on site.



Plate 2.9 Driveway 1 (Gate 1) looking into the site from Burrows Road South



Plate 2.10 Driveway 2 (Gate 2) looking into the site from Burrows Road South

2.6 Rail infrastructure

The rail infrastructure at the site connects to the Botany Goods Line. Boral uses rail freight for the delivery of bulk construction materials where ever practicable. The rail siding is three roads wide which run along the south-eastern side of the site (Figure 2.1). Trains are parked and shunted along the rail sidings, which have the capacity to accommodate trains with up to 34 wagons.

There are two train unloading areas; one for the CBP and one for the handling facility (see Plate 2.11 and Figure 2.1). Sand and aggregates are unloaded by bottom dump to underground bins, and are transferred via conveyor to the elevated storage bins (Plate 2.2 shows the CBP elevated storage bins and Plate 2.7 shows the handling facility's elevated storage bins). Cement/flyash that is received by rail is pneumatically transferred via a pipeline to the elevated silos above the batching plant.

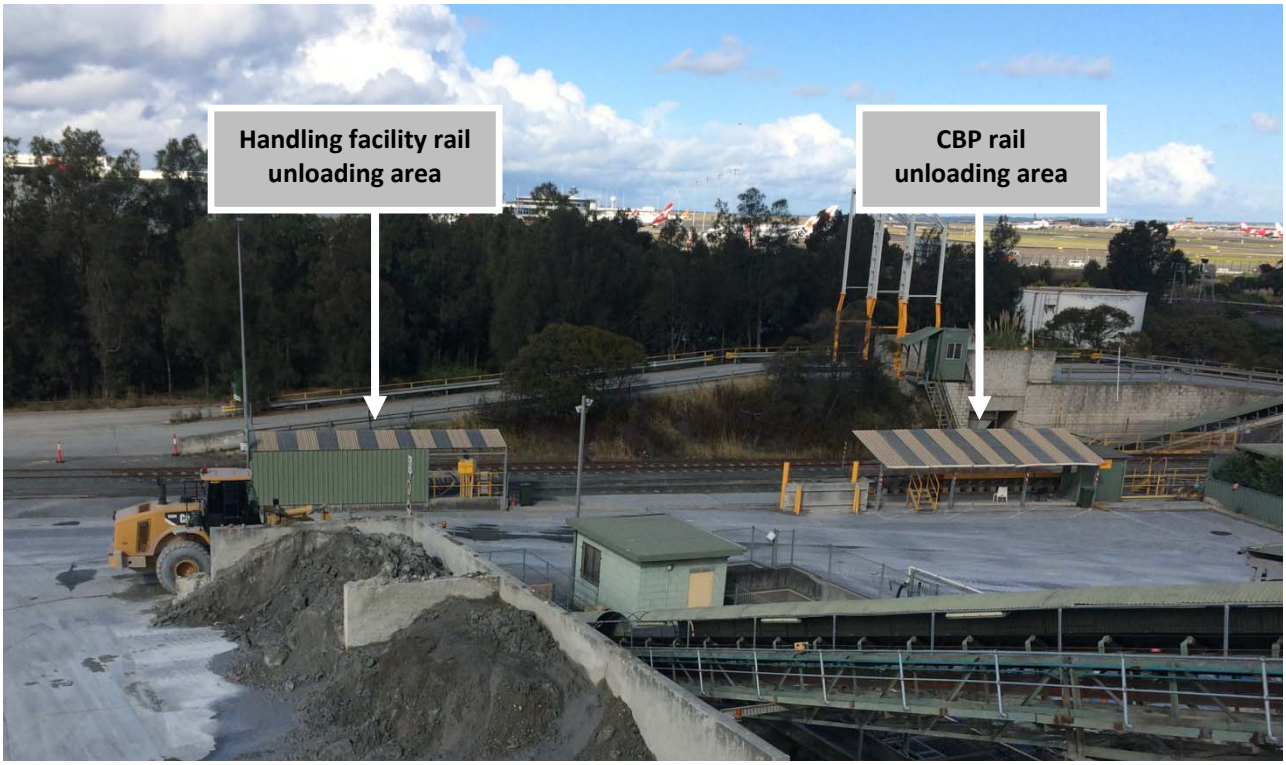


Plate 2.11 Rail unloading areas

2.7 Water management system

Surface water runoff on the site is largely captured and contained onsite. During storm events or during prolonged rain periods, water is discharged offsite.

At the CBP, drainage is via grid-covered drains sloping to the recycled water pits located adjacent to the concrete washout bays. When the recycled water pits fill, rainwater is diverted and flows into the first flush collection pit. When the first flush collection pit is full, rainwater goes directly to the stormwater drain.

Water is recycled and reused onsite for concrete production, dust suppression, cleaning of the concrete agitators, the slump stands, and washout pits. Potable water is also used when required. Recycled water from the recycle water pit is dispensed in measured quantities into the concrete agitator to be mixed with the dry materials. The plant is a net consumer of water. All excess water accumulated during the concrete batching process is recycled to minimise consumption and prevent run-off to the canal or any adjacent properties.

During high rain events (ie storms or sustained periods of rain), water from the site is discharged into the Alexandra Canal. To ensure that discharges during these events do not pollute the canal, the water management system for the CBP contains a first flush system.

3 Proposed administrative modification

3.1 Overview

There are two principle reasons for the modification: to rationalise and simplify the development consent by removing complexity and irrelevant conditions, and apply production limits to the CBP and throughput limits to the handling facility; and seek a minor increase in CBP production.

The minor increase in production at the CBP will not require any works or upgrades to the plant.

3.2 Rationalisation of development consent

The development consent for the site granted approval for the construction and operation of the CBP, handling facility and an asphalt plant at the site. The asphalt plant was constructed and operated for a period, but was subsequently decommissioned and demolished in 2002.

Since the development consent was granted, nine modifications to the consent have been approved. This has resulted in a complex and cumbersome development consent which is difficult to interpret, and relies on interpretation of numerous documents to determine what is permitted to be undertaken on the site. Furthermore, many conditions are no longer relevant as they relate either to the asphalt plant or construction of various components of the site which has long been completed. A copy of the development consent, as modified, is contained in Appendix A.

Boral seeks to simplify the development consent by removing complex and irrelevant conditions and apply production limits to the CBP and throughput limits to the handling facility. Approval is sought for the annual production limits presented in Table 3.1.

Table 3.1 Annual production limits for the site

Site component	Annual production/throughput limit
CBP – concrete production	280,000 m^3
Materials handling facility - bulk construction materials throughput	760,000 tpa

The administrative modifications to the development consent which are proposed are detailed in Appendix D.

3.3 Increase in production of CBP

As described in Section 2.2, the CBP produces approximately 254,200 m^3 of concrete per annum, which is based on combined production estimates for concrete and asphalt production (the later which is no longer produced). A production increase of approximately 10% is sought, to enable the production of 280,000 $m^3$of concrete per annum. The increase would not necessitate any modifications/alterations to the existing CBP.

The increase to 280,000 m^3 per annum would result in an additional 36-46 truck movements per day associated with the transport of concrete from the CBP. There would also be a small increase in the transport of constituent ingredients to the site (ie cement/fly ash, admixtures), which have been considered in the traffic assessment (Appendix G and Chapter 8).

3.4 Alternatives

To not proceed with the proposal (ie the 'do nothing' option) would result in Boral continuing to operate under its existing consent, which at present does not contain production limits for the CBP or throughput limits for the handling facility. As stated previously, nine modifications to the development consent have been approved since 1996, has resulted in a complex and cumbersome development consent which is difficult to interpret. It requires all of the documentation that accompanied the original DA for the site and nine subsequent applications to modify the development consent to be reviewed to determine what is permitted to be undertaken on the site.

Furthermore, many conditions are no longer relevant as they relate to the asphalt plant, construction of the CBP and the handling facility and activities which have already been completed at the site. This makes it difficult to interpret, among other aspects, the quantum of activities which are permitted under the development consent.

The 'do nothing' option would avoid capitalising on the advantages of the proposal, being that it:

- maximises efficient use of the existing CBP and handling facility and workforce;
- ideally located in terms of both proximity to infrastructure projects, with access to rail infrastructure for the supply of bulk construction materials;
- can be accommodated without any modifications or upgrades to existing infrastructure; and
- as demonstrated in this EA, would not have any significant adverse environmental impact such as air quality, noise or traffic impact.

In summary, there is a demonstrated need for increased concrete production in the locality. Given that production can be increased at the existing facility without any modifications to existing infrastructure or significant impact to the environment or amenity at surrounding areas, it is the most logical, economical, efficient, and environmentally sound outcome.

4 Statutory approval pathway

4.1 General

This chapter describes the statutory planning framework that applies to the modification, including the statutory planning approval process under the EP&A Act. An overview of the potential approval requirements under relevant Commonwealth and NSW legislation and environmental planning instruments (EPIs) is also provided.

4.2 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as matters of national environmental significance (MNES). MNES, as defined under the EPBC Act, include:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have an impact on a MNES is to be referred to the Commonwealth Department of the Environment (DoE) for determination as to whether or not it is a controlled action.

The modification will not have an impact on any MNES and therefore is not required to be referred to DoE and does not require approval from the Commonwealth Minister for the Environment.

4.3 NSW legislation

4.3.1 NSW Environmental Planning and Assessment Act 1979

i General

Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils. The EP&A Act contains three parts that impose requirements for planning approval:

- Part 4 which provides for control of 'development' that requires development consent from the relevant consent authority;

- Part 5 which provides for control of 'activities' that do not require development consent under Part 4; and
- Part 5.1 which provides for control of State significant infrastructure (SSI) that does not require approval or development consent under Part 4.

The requirement for developments that require development consent and activities and SSI that do not require development consent is set out in EPIs - state environmental planning policies (SEPPs), regional environmental plans (REPs) and local environmental plans (LEPs).

ii Land use table and requirement for development consent

The site is zoned IN1 General Industrial under the Marrickville LEP. The land use table contained in the Marrickville LEP for the IN1 General Industrial zone is as follows:

Zone IN1 General Industrial

1 Objectives of zone

- To provide a wide range of industrial and warehouse land uses.
- To encourage employment opportunities.
- To minimise any adverse effect of industry on other land uses.
- To support and protect industrial land for industrial uses.
- To protect industrial land in proximity to Sydney Airport and Port Botany.
- To enable a purpose built dwelling house to be used in certain circumstances as a dwelling house.

2 Permitted without consent

Home occupations

3 Permitted with consent

Agricultural produce industries; Depots; Dwelling houses; Freight transport facilities; Garden centres; General industries; Hardware and building supplies; Industrial training facilities; Intensive plant agriculture; Kiosks; Light industries; Markets; Neighbourhood shops; Places of public worship; Roads; Take away food and drink premises; Timber yards; Warehouse or distribution centres; Any other development not specified in item 2 or 4

4 Prohibited

Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Child care centres; Commercial premises; Community facilities; Correctional centres; Eco-tourist facilities; Educational establishments; Environmental facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Heavy industrial storage establishments; Heavy industries; Helipads; Highway service centres; Home occupations (sex services); Information and education facilities; Jetties; Marinas; Mooring pens; Moorings; Offensive industries; Open cut mining; Passenger transport facilities; Port facilities; Public administration buildings; Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Research stations; Residential

> accommodation; Respite day care centres; Restricted premises; Rural industries; Tourist and visitor accommodation; Transport depots; Veterinary hospitals; Water recreation structures; Water supply systems; Wholesale supplies

The existing land uses on the site (ie CBP and materials handling facility) and the modification (a small increase in production at the CBP) are consistent with the objectives of the IN1 General Industrial zone.

Within the IN1 General Industrial zone, general industries and freight transport facilities are permitted but only with development consent. The CBP can be defined as a general industry while the materials handling facility can be defined as a freight transport facility.

General industry is defined under the Marrickville LEP as:

> ... a building or place (other than a heavy industry or light industry) that is used to carry out an industrial activity.

An industrial activity is defined as:

> ... the manufacturing, production, assembling, altering, formulating, repairing, renovating, ornamenting, finishing, cleaning, washing, dismantling, transforming, processing, recycling, adapting or servicing of, or the research and development of, any goods, substances, food, products or articles for commercial purposes, and includes any storage or transportation associated with any such activity.

The CBP is considered to be a general industry as it involves the manufacturing of concrete which is a product used for commercial purposes.

A freight transport facility is defined under the Marrickville LEP as:

> ... a facility used principally for the bulk handling of goods for transport by road, rail, air or sea, including any facility for the loading and unloading of vehicles, aircraft, vessels or containers used to transport those goods and for the parking, holding, servicing or repair of those vehicles, aircraft or vessels or for the engines or carriages involved.

The site currently operates under Development Consent No. DA 14/96 which was granted by the then NSW Minister for Urban Affairs and Planning on 6 September 1996. The development consent enables the construction and operation of the CBP, an asphalt plant and the handling facility. The Minister was the consent authority pursuant to SEPP 34 which deemed that the site and its operations were significant to the State. As previously stated, SEPP 34 has now been repealed.

As stated in Section 2.1, since the development consent was granted, nine modifications to the consent have been approved. In most cases, the modifications have related to site layout changes. This modification (Modification 10) is proposed to:

- simplify the consent by removing complexity and irrelevant conditions; and
- seek production limits for the CBP and throughput limits for the handling facility.

In relation to the CBP, the production limit sought is 280,000 m^3 per annum. No increase in throughput for the handling facility is being sought.

iii Development consent modification process

The modification to the development consent can be considered under the repealed Part 3A of the EP&A Act. As part of the repeal by the Part 3A Repeal Act, transitional provisions were introduced (Schedule 6A of the EP&A Act) enabling 'transitional Part 3A projects' to continue to be subject to Part 3A of the EP&A Act (as in force immediately before the repeal and as modified by the Part 3A Repeal Act).

Specifically, the modification can be considered under section 75W of the EP&A Act which allows a proponent to request that the NSW Minister for Planning modify an approval for a project. Section 75W of the EP&A Act states:

> (1) In this section:
>
> **Minister's approval** means an approval to carry out a project under this Part, and includes an approval of a concept plan.
>
> **Modification of approval** means changing the terms of a Minister's approval, including:
>
> (a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and
>
> (b) changing the terms of any determination made by the Minister under Division 3 in connection with the approval.
>
> (2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.
>
> (3) The request for the Minister's approval is to be lodged with the Director- General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.
>
> (4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.

While the development consent for the site was a consent issued under Part 4 of the EP&A Act under the provisions of SEPP 34, transitional provisions within the NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) allow for a consent to be modified under section 75W of the EP&A Act as if the consent were an approval under Part 3A.

Clause 8J(8) of the EP&A Regulation states:

> For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:
>
> (a) a development consent granted by the Minister under section 100A or 101 of the Act,
>
> (b) a development consent granted by the Minister under *State Environmental Planning Policy No 34—Major Employment-Generating Industrial Development*,
>
> (c) a development consent granted by the Minister under Part 4 of the Act (relating to State significant development) before 1 August 2005 or under clause 89 of Schedule 6 to the Act,

(d) a development consent granted by the Land and Environment Court, if the original consent authority was the Minister and the consent was of a kind referred to in paragraph (c).

The development consent, if so modified, does not become an approval under Part 3A of the Act.

The development consent for the site was issued by the then NSW Minister for Urban Affairs and Planning under the provisions of SEPP 34 on 6 September 1996. Therefore, in accordance with clause 8J(8) of the EP&A Regulation, the proposed modification to the development consent can be considered under section 75W of the Act. The NSW Minister for Planning is the consent authority for modifications under section 75W of the EP&A Act. However, pursuant to section 23 of the Act, the Minister may delegate the consent authority function to a range of public officers or authorities.

When accepting an application for a modification under section 75W of the EP&A Act, the NSW Minister for Planning has to be satisfied that the proposal is a modification of the original proposal, rather than being a new project in its own right. In this regard it is noted that:

- the primary purpose of the modification is to simplify the development consent and remove redundant conditions;
- the primary function and purpose of the operations on the site would not change as a result of the modification (ie CBP and handling facility); and
- the noise, air quality and traffic assessments (see chapters 6, 7 and 8) demonstrate that the potential environmental impacts of the modification are negligible, compared to those impacts of the approved operations.

Therefore, it is considered that the modification is within the scope of section 75W of the EP&A Act.

An application for a modification under section 75W must be accompanied by an EA (this document). Before preparing an EA, an applicant must request the Secretary's (of DP&E) environmental assessment requirements (SEARs) which specify what must be addressed in an EA. Details on Boral's request for SEARs are provided below.

Once finalised, this EA may be publicly exhibited (based on the discretion of officers from DP&E). If the EA is exhibited, any person can make a written submission about the proposal (including objecting to it). DP&E may require Boral to provide a written response to any issues raised in submissions.

iv Request for SEARs

On 5 February 2016, EMM, on behalf of Boral, submitted a request for SEARs to DP&E for the proposed modification. On 12 February 2016, DP&E responded to the request and stated that formal SEARs were not required. The response stated:

> The SEARS request is quite comprehensive and it would appear that EMM have identified all the relevant key issues for assessment. As such, the Department considers it is not necessary to issue formal SEARS for the modification. Please proceed to prepare the Environmental Assessment (EA). In addition to the technical assessments you propose to prepare, please ensure that the EA includes the following information:
>
> - a detailed description of the proposed modification including:
> - a current aerial photo of the site / site layout plan.

- strategic context and site location plan identifying nearest residences, watercourses, other industry and any other key features; and
- need/justification for the proposed development.
- description of the existing environment and operations (including copies of approved plans and any other relevant drawings);
- consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments;
- identification of conditions to be modified and proposed wording of any new or modified conditions; and
- a table detailing compliance with existing conditions of the approval.

This EA has been prepared to address the relevant key issues for assessment identified in the request for SEARs (ie noise, air quality and traffic assessments) and DP&E's information requirements above.

v Environmental planning instruments

Marrickville Local Environmental Plan 2011

As previously stated, the site is located within the IN1 General Industrial zone pursuant to the Macksville LEP. Within this zone, general industries and freight transport facilities are permitted but only with development consent.

Part 4 of the Marrickville LEP contains a number of principal development standards which relate to development in the Inner West LGA, including standards on the height and floor space ratio of buildings. None of these standards apply to the site or the modification.

Part 5 and Part 6 of the Marrickville LEP contain miscellaneous provisions relating to development in the Inner West LGA, such as development near zone boundaries, development in areas subject to aircraft noise and development in the coastal zone. None of these provisions are relevant to the site or the modification. While the site is located in an area subject to aircraft noise, the modification does not trigger application of the provisions in the LEP.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development(SEPP 33) applies to NSW, including the Inner West LGA. It requires the consent authority to consider whether a proposal is a potentially hazardous or offensive development.

Consideration of SEPP 33 and whether the modification is potentially hazardous or offensive development is provided in Section 9.2. This concludes that the modification is not potentially hazardous or offensive development.

State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) applies to NSW, including the Inner West LGA. It requires that a consent authority not grant consent to the carrying out of development on land unless it has considered any potential contamination issues. Clause 7(1) of SEPP 55 states:

> A consent authority must not consent to the carrying out of any development on land unless:
>
> (a) it has considered whether the land is contaminated, and
>
> (b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
>
> (c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Consideration of potential contamination issues at the site is provided in Section 9.3. It indicates that while the site was contaminated as a result of historic filling of ash from the former Bunnerong power station and previous industrial uses, this contamination was subsequently remediated in accordance with a remediation strategy. The remediation was signed off by an accredited EPA Site Auditor.

No activities have been undertaken since the remediation was undertaken which would lead to further contamination of the site.

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) applies to NSW, including the Inner West LGA. It was introduced to simplify and provide more certainty around the approval process for infrastructure, including air transport facilities, electricity generating works, health services facilities and road and traffic facilities.

There are no provisions within the Infrastructure SEPP which relate to CBPs or materials handling facilities and so does not apply to the proposal.

4.3.2 NSW Protection of the Environment Operations Act 1997

The POEO Act is administered by EPA. It aims to protect, restore and enhance the quality of the environment, having regard for the need to maintain ecologically sustainable development (ESD). This is achieved through installing mechanisms to reduce risks to human health and prevent the degradation of the environment by regulating pollution to the land, air and waters.

An environment protection licence (EPL) is required to be obtained and held by entities that undertake activities listed under Schedule 1 of the POEO Act.

The site is not required to hold or obtain an EPL, as CBPs and handling facilities are not listed under Schedule 1 of the POEO Act.

4.3.3 Roads Act 1993

The NSW *Roads Act 1993* (Roads Act), administered by RMS regulates activities that may impact on public roads in NSW. Approval is required under the Roads Act to carry out works in, on or over a public road, including the provision or upgrade of access to that road.

The modification does not require any works to be undertaken on the site to increase production at the CBP and no changes to the site's access are required to facilitate additional truck movements. It does not involve any works in, on or over a public road.

A traffic assessment has been prepared which assesses the modification's potential impact on the local and broader road network. This assessment concludes that the modification is unlikely to have any significant impacts on the local road network.

4.3.4 National Parks and Wildlife Act 1974

The NSW *National Parks and Wildlife Act* 1974 (NP&W Act), administered by the Office of Environment and Heritage (OEH), aims to conserve nature and objects, places or features of cultural value. Generally, an Aboriginal heritage impact permit is required under section 90 of the NP&W Act to knowingly destroy, deface or damage, or knowingly cause or permit the destruction or defacement of, or damage to, a relic or Aboriginal place.

The modification does not require any works to be undertaken on the site to increase production at the CBP. No relics or Aboriginal places would be impacted by the modification.

4.3.5 Native Vegetation Act 2003

The NSW *Native Vegetation Act 2003* (NV Act) frames the way native vegetation is managed in NSW by preventing broad-scale clearing unless it improves or maintains environmental outcomes.

The modification does not require any works to be undertaken on the site to increase production at the CBP. No native vegetation would be cleared or otherwise impacted by the modification.

4.3.6 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) is administered by OEH. It aims to conserve biological diversity in NSW through the protection of threatened and endangered flora and fauna species and endangered ecological communities (EECs).

The modification does not require any works be undertaken on the site to increase production. No threatened or endangered flora or fauna species or EECs would be impacted by the modification.

4.3.7 Water Act 1912 and Water Management Act 2000

The NSW *Water Act 1912* and *Water Management Act 2000* (WM Act) regulate the use and interference with surface water (streams, creeks, rivers etc) and groundwater in NSW.

The modification does not require any works to be undertaken on the site to increase production. It will not use or interfere with any surface or groundwater sources.

5 Stakeholder engagement

5.1 Overview

Boral recognises that engagement and consultation with stakeholders is integral to the operation of the site and determination of the administrative modification.

A meeting was held between Boral and officers from DP&E on 16 December 2015 to discuss the modification.

Following the meeting, a request for formal SEARs was prepared and submitted to DP&E on 5 February 2016. The request for SEARs stated that noise, air quality and traffoc assessments would be prepared to support the EA.

It also stated that Boral would consult with the then Marrickville Council (now Inner West Council), EPA and RMS.

A stated in Section 4.3.1, on 12 February 2016, DP&E advised, via email, that formal SEARs were not required to be issued. DP&E also stated, that in addition to the technical assessments proposed to support the EA (ie noise, air quality and traffic), further details were required on:

- the proposed modification;
- a description of the existing environment and operations at the site;
- all relevant EPIs;
- conditions of the development consent proposed to be modified; and
- compliance of operations with conditions of the development consent.

Table 5.1 outlines where the details requested by DP&E are included in this EA.

Table 5.1 Details requested by DP&E to be included in the EA

Requirement	Section addressed in this EA
A detailed description of the proposed modification including:	Chapter 3
• a current aerial photo of the site / site layout plan;	Figure 2.1 and Appendix C
• strategic context and site location plan identifying nearest residences, watercourses, other industry and any other key features; and	Figure 1.3
• need/justification for the proposed development.	Chapter 4 and Chapter 10
Description of the existing environment and operations (including copies of approved plans and any other relevant drawings).	Chapter 2 and Appendix C – site survey plan
Consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments.	Chapter 4
Identification of conditions to be modified and proposed wording of any new or modified conditions.	Appendix D
A table detailing compliance with existing conditions of the approval.	Appendix D

5.2 Commonwealth government

As stated in Chapter 4, the modification is not predicted to have a significant impact on a MNES listed in the EPBC Act. Therefore DoE was not consulted regarding the modification.

5.3 State and local government

Government agencies (DP&E, RMS, Marrickville Council and EPA) have been consulted regarding the modification to seek guidance on assessment approaches and policies that apply to the site. This consultation is summarised in Table 5.2.

Table 5.2 Agency consultation

Agency	Date	Method	Issues raised
DP&E	16/12/15	Meeting	A meeting was held to discuss the approval process for the proposed changes to the site. DP&E requirements for the EA are provided in Table 5.1.
Inner West Council (formerly Marrickville Council)	04/03/16 28/06/16 20/07/16	Telephone	Details of the modification were discussed with a planning officer from Inner West Council (then Marrickville Council) by telephone. It was agreed that further consultation would not be required with Council until results of the technical assessments (noise, air quality and traffic) were available. Following the receipt of the results of the technical assessments, two telephone messages were left with the planning officer at Council. There was no response to the messages.
EPA	03/03/16	Telephone and email	Details of the modification were discussed with an officer from the EPA by telephone, including the preparation of noise and air quality assessments to support the EA. The officer from the EPA stated that it seemed all of the EPA's normal requirements were being addressed. Notwithstanding this, it was agreed that a copy of the request for SEARs document be provided to the EPA for their review to determine whether any additional information would be required to be provided to support the EA. The officer from the EPA stated that if no additional information was required to support the EA, they would wait to review the EA and provide comments, if required, to DP&E prior to determination of the modification. No additional information requirements were received from the EPA following receipt of the request for SEARs document.
RMS	03/03/16 07/03/16 10/03/16	Telephone and email	Two telephone messages were left with a relevant contact at RMS on 3 March and 7 March 2016. Correspondence was submitted to RMS on 10 March with a copy of the request for SEARs document and an offer to meet regarding the modification. The RMS did not respond or request a meeting with Boral.

5.4 Community

The closest residences are approximately 600 m from the site. No significant impacts are predicted to occur to air quality, noise levels, traffic or visual amenity due to the modification at residential assessment locations. During the public exhibition process, community members will be able to make a submission on the EA.

6 Noise assessment

6.1 Introduction

A noise assessment has been prepared by EMM to assess the potential noise impacts of the modification. The noise assessment is presented in Appendix E and the results are summarised in this chapter.

6.2 Existing environment

6.2.1 Assessment locations

The site is located in an existing industrial area. The surrounding area consists of commercial and industrial receptors. The closest residential receptors are located approximately 600 m to the north-west of the site on the opposite side of the Princes Highway. As described in Section 1.3, assessment locations have been adopted at representative residential and industrial/commercial receptors close to the site, and are identified in Figure 6.1. For the purposes of the noise assessment, residential assessment locations R1 and R2 have been considered. Assessment location R9 (Bellevue Street) has also been considered as it is identified in the site's development consent (however, it is no longer residential).

6.2.2 Background noise environment

Noise monitoring was undertaken in the vicinity of the nearest residential receptors north of the Princes Highway (see Figure 6.1). Both attended and unattended noise monitoring was completed. Attended monitoring involves noise monitoring being undertaken by a qualified and experienced acoustic engineer at the monitoring location using a hand held noise logger. Attended noise levels are generally recorded over a number of short time periods (eg 15 minutes). Unattended monitoring involves noise levels being recorded by an unattended noise logger at a monitoring location generally over an extended period of time (eg one week).

Locations were chosen to represent the existing ambient and background noise environment typical of the nearest residences to the site. The locations of attended and unattended monitoring are presented in Figure 6.1. The results from the unattended noise monitoring are presented in Table 6.1. The results are presented in the metrics of Rating Background Level (RBL) and L_{Aeq} which is the sound pressure level (ie noise level) in decibels (dB) averaged over a given period of time.

Table 6.1 Summary of existing and ambient background noise levels

Period[1]	Rating Background Level[2](dB)	Ambient $L_{Aeq, period}$ noise level[3] (dB)
Day	54	69
Evening	52	66
Night	45	62

Notes

1. *Day: 7 am - 6 pm Monday - Saturday; 8am - 6pm Sundays and public holidays; Evening: 6 pm - 10 pm; Night: all remaining periods.*
2. *Rating background level' is the overall single figure background level representing each assessment period (day/evening/night) over the whole monitoring period.*
3. *Represents the energy average noise level over the relevant period.*



Noise monitoring and assessment locations

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Figure 6.1

Observations during attended noise monitoring identified road traffic and aircraft noise as the main contributors to the ambient noise environment during day and night periods at both locations, with existing industrial noise also a contributor. Generally, the industrial noise was best described as just audible, transient events that occurred at a significantly lower level than other ambient noise sources (ie road traffic and aircraft noise).

6.3 Potential impacts

6.3.1 Method

i Assessment scenarios

Quantitative modelling of noise emissions as a result of the modification was undertaken using Brüel&Kjær Predictor Version 11.0 noise prediction software. This software calculates total noise levels at receptors from the concurrent operation of multiple noise sources. The model incorporates factors such as:

- the lateral and vertical location of plant and equipment;
- source-to-receptor distances;
- ground effects;
- atmospheric absorption;
- topography; and
- meteorological conditions.

Two scenarios were modelled to compare the difference in operating noise levels:

- Scenario 1: current operations (CBP production of 254,200 m^3); and
- Scenario 2: proposed operations (CBP production of 280,000 m^3).

Table 6.2 summarises the noise sources and associated sound power levels used in the noise model, which represent operations for a given 15 minute period.

Table 6.2 Operational plant and equipment sound power levels

Plant and equipment	Quantity	Sound power level - L_w, $L_{Aeq,15\text{-}min}$(dB)
Concrete agitator	2 (existing) 3 (proposed)	103
Concrete agitator slumping	2	111
Cement tanker	1	110
Front end loader	1	105
Water truck	1	96
Batching plant – Mixing bowl[1]	1	100
Trains	1	103
Bobcat	1	100

Table 6.2 Operational plant and equipment sound power levels

Plant and equipment	Quantity	Sound power level - L_w, $L_{Aeq,15\text{-}min}$(dB)
Forklift	1	105
Aggregate truck	1	103
Aggregate truck idling	1	97
Articulated dump truck	1	108

Notes: 1. As the batching plant has an enclosed loading facility with automatic doors, it has been afforded a 10 dB emission reduction (ie 110-10=100)

The following assumptions were adopted for the assessment:

- the front end loader, concrete agitators, cement trucks, trains, aggregate trucks, water truck, conveyors and the batch plant are assumed to operate continuously in any 15 minute period in the day, evening or night;
- the bobcat, forklift and dump truck are assumed to operate approximately 50% of the time in any 15 minute period in the day, evening or night; and
- all onsite vehicle movements are 20 kilometres per hour (km/hr) or less.

ii Operational noise criteria

Noise limits for industrial sites are normally derived from operational noise criteria applied at assessment locations. They are based on guidelines in the NSW *Industrial Noise Policy* (INP) (EPA 2000) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation. The INP guidelines for assessing industrial facilities were used for the noise assessment.

The objectives of noise assessment criteria for industry are to protect the community from excessive intrusive noise and to preserve amenity for specific land uses. The project specific noise level (PSNL) is the most stringent of either the calculated intrusive or amenity criteria. The PSNL for the daytime, evening and night periods are indicated Table 6.3.

Table 6.3 Project specific noise levels

Assessment location	Period	RBL	Intrusive criteria (dB, $L_{Aeq,15min}$)	Amenity criteria (dB, $L_{Aeq,period}$)	PSNL (dB)
All residential assessment locations	Day	54	59	60	59 $L_{Aeq,15min}$
	Evening	52	57	50	57 $L_{Aeq,15min}$ /50 $L_{Aeq,evening}$
	Night	45	50	45	50 $L_{Aeq,15min}$ /45 $L_{Aeq,night}$
Commercial Premises	When in use	-	-	65	65 $L_{Aeq,period}$
Industrial premises	When in use	-	-	70	70 $L_{Aeq,period}$

The site currently operates during the night-time period (10 pm to 7 am). Therefore, assessment of sleep disturbance is required in accordance with the INP and associated application notes. Table 6.4 provides the sleep disturbance screening criteria for the residential assessment locations.

Table 6.4 Sleep disturbance screening criteria, residential assessment locations

Assessment location	Adopted RBL (dB(A))	Sleep disturbance criteria)dBL_{Amax})
All residential assessment locations	45	60

Notes: The sleep disturbance assessment applies to residential assessment locations only.

iii Road traffic noise criteria

The principle guidance for assessing the impact of road traffic noise on receptors is in the EPA's *Road Noise Policy* (RNP) (DECCW 2011). The nearest noise sensitive receptors potentially affected by an increase in relevant road traffic noise associated with the modification are located on the Princes Highway which is classified as a freeway/arterial road. Table 6.5presents the road noise assessment criteria reproduced from Table 3 of the RNP.

Table 6.5 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria (dB(A))	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq(15\text{-}hr)}$ 60 (external)	$L_{Aeq(9\text{-}hr)}$ 55 (external)

Source: DECCW (2011).

The RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

6.3.2 Results

i Operational noise

The calculated existing and predicted future noise levels at each assessment location for each assessment period are provided in Table 6.6 and Table 6.7, respectively.

Table 6.6 Predicted site noise emissions - approved and proposed operations (day/evening)

Assessment location	Approved operations(dB)	Proposed operations(dB)	Predicted change in noise level (dB)	PSNL (dB)
	Calm	Calm		
R1	41 $L_{Aeq,15\text{-}min}$	41 $L_{Aeq,15\text{-}min}$	0	59 $L_{Aeq,15\text{-}min}$ (Day)
	37$L_{Aeq,evening}$	37$L_{Aeq,evening}$		50 $L_{Aeq,evening}$(Evening)
R2	<44 $L_{Aeq,15\text{-}min}$	<44 $L_{Aeq,15\text{-}min}$	0	59 $L_{Aeq,15\text{-}min}$ (Day)
	<40$L_{Aeq,evening}$	<40$L_{Aeq,evening}$	0	50 $L_{Aeq,evening}$(Evening)
R3	57 $L_{Aeq,period}$	57 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R4	58 $L_{Aeq,period}$	58 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R5	52 $L_{Aeq,period}$	53 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R6	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R7	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R8	49 $L_{Aeq,period}$	50 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$

Table 6.6 Predicted site noise emissions - approved and proposed operations (day/evening)

Assessment location	Approved operations(dB)	Proposed operations(dB)	Predicted change in noise level (dB)	PSNL (dB)
	Calm	Calm		
R9	44 $L_{Aeq,period}$	44 $L_{Aeq,period}$	0	70 $L_{Aeq,period}$
R10	59 $L_{Aeq,period}$	60 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$
R11	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$

Table 6.7 Predicted site noise emissions - approved and proposed operations (night)

Assessment location	Approved operations (dB, $L_{Aeq,period}$)	Proposed operations (dB, $L_{Aeq,period}$)	Predicted change in noise level (dB)	PSNL (dB, $L_{Aeq,period}$)
R1	38	38	0	45
R2	<44	<44	0	45
R3	57	57	0	65
R4	58	58	0	65
R5	53	53	0	65
R6	57	57	0	65
R7	57	57	0	65
R8	50	50	0	70
R9	44	45	+1	70
R10	59	60	+1	70
R11	56	57	+1	70

Site noise emissions during proposed operations are predicted to comply with the relevant PSNLs at all assessment locations considered as part of this assessment. The predicted noise levels demonstrate that noise emissions would not increase by more than 1 dB compared to those from the approved operations. It should be noted that changes in noise levels by 1 or 2 dB are imperceptible to humans.

This outcome satisfies the requirement set-out in the INP Application Notes, whereby noise levels from the proposed operations (with all feasible and reasonable measures in place) do not significantly increase the existing noise emissions.

Sleep disturbance was assessed by predicting L_{Amax} noise levels from the site at the nearest residential assessment locations for calm meteorological conditions. Results of this assessment are presented in Table 6.8 below.

Table 6.8 Predicted L_{Amax} noise levels during night period

Assessment location[1]	Predicted L_{Amax} noise levels, dB	L_{Amax}screening criteria, dB
	Calm	
R1	50	60
R2	51	60

Notes: 1. The sleep disturbance assessment applies to residential assessment locations only.

Noise modelling predicted that L_{Amax} noise levels would satisfy the INP sleep disturbance screening criteria at all residential assessment locations.

ii Road traffic noise

The nearest residences potentially affected by an increase in road traffic volumes as a result of the modification are located on the Princes Highway. The traffic assessment (EMM 2016) for the modification identified that the predicted total traffic volume increase as a result of increased vehicle movements would be in the order of +0.1%.

Given this small increase in additional traffic generated by the modification, there would be a negligible increase in road traffic noise levels at the nearest residential locations. Therefore, the impact of road traffic noise is predicted to be negligible and within the 2 dB allowable increase for land use developments as described in the RNP (DECCW 2011).

iii Cumulative noise

Potential cumulative noise impacts from existing and successive developments are considered by the INP procedures by ensuring that the appropriate noise criteria are established with a view to maintaining acceptable noise amenity levels at the closest residential assessment locations. Therefore, the cumulative impact of the modification with existing industrial noise sources has been assessed in the determination of the acceptable amenity levels at the assessment locations.

Based on experience with similar industrial sites, amenity noise levels for an 11 hour day, four hour evening or nine hour night can typically be up to 5 dB below the intrusive noise levels of the site due to the transient nature of noise events. For this site, it has been conservatively assumed that amenity noise levels are 4 dB below the intrusive noise level. On this basis, the highest predicted amenity noise level at residential assessment locations is38 dB $L_{Aeq,\ period}$ for both day and night periods. This is greater than 10 dB below the acceptable amenity level for an urban receiver type (see Table 6.3 above) and thus noise levels from the proposed operations is predicted to have nil or negligible effects on increasing industrial noise above the relevant criteria.

Further, the predicted amenity noise level (38 dB $L_{Aeq,\ period}$) from the site is greater than 10 dB below the measured existing ambient levels (66 $dBL_{Aeq,day}$ and 59 $dBL_{Aeq,night}$). Noise levels from the modification are therefore not predicted to increase existing ambient noise levels at any residential assessment location.

The modification would have a negligible impact on the existing ambient acoustic environment and is not predicted to increase industrial noise levels above the relevant amenity criteria at any of the residential assessment locations.

6.4 Conclusion

A noise assessment has been prepared in accordance with the methodology outlined in the INP and associated Application Notes for the assessment of noise from existing industrial premises.

The modification involves an increase in concrete production from 254,200 m^3 per annum to 280,000 m^3 per annum. A noise model was developed to compare noise levels from the approved and proposed operations. The model adopted sound power levels of key acoustically significant plant and equipment derived from a database of similar equipment.

The assessment found that operating noise from the site during both existing and proposed operations satisfies relevant PSNLs for day, evening and night periods at all assessment locations. The proposed

operations are predicted to result in an increase of no greater than 1 dB compared to those from the existing operations.

The highest predicted external maximum noise level from site is 51 dBL_{Amax}. These predicted maximum levels are below the noise levels likely to cause sleep disturbance affects. Hence, night-time operations from the project will not cause sleep disturbance at any of the residential assessment locations.

Traffic generated by the modification is not expected to generate any noticeable increase in road traffic noise levels at the nearest residential locations. This increase in traffic volume would lead to a negligible increase in road traffic noise.

The modification is predicted to have a negligible impact on the existing ambient acoustic environment and is not predicted to increase industrial noise levels above the relevant amenity criteria.

7 Air quality assessment

7.1 Introduction

An air quality assessment has been prepared by Ramboll Environ to assess the potential air quality impacts of the modification. The air quality assessment is presented in Appendix F and the results are summarised in this chapter.

7.2 Existing environment

7.2.1 Assessment locations

The assessment locations for the air quality assessment are the same as those described in Section 1.3 and Section 6.2.1 (see Figure 6.1).

7.2.2 Background air quality

The National Pollutant Inventory (NPI) database lists a large number of reporting particulate matter (PM) emission sources within 10 km of the site. The majority of sources are located in the large industrial areas approximately 5 km to the south-east of the site and are unlikely to cause significant direct cumulative impacts with emissions from the site.

Boral's recycling facility is located adjacent the north-western boundary of the site and involves the delivery, handling, crushing, stockpiling of construction materials, and dispatch of recycled product. Also adjacent the site on Burrows Road South is the Visy Recycling Facility, where curb side recyclables (glass, aluminium, paper, plastics and metal) are processed. Other activities in the surrounding area include the clean-up works at the former Alexandria Landfill site, shipping container storage facilities, several small materials recycling facilities and Sydney Airport. In addition, the following sources contribute to particulate matter emissions in the vicinity of the site:

- dust entrainment and tyre and break wear due to vehicle movements along public roads;
- petrol and diesel emission from vehicle movements along public roads;
- seasonal emissions from household wood burning fires; and
- sea salt contained in sea breezes.

More remote sources which contribute episodically to PM in the region include dust storms and bushfires.

PM concentrations 10 and 2.5 micrometers or microns or less in diameter (PM_{10} and $PM_{2.5}$) are recorded by OEH at the nearby Earlwood monitoring station, approximately 3.5 km west of the site. Daily-varying concentrations of PM_{10} and $PM_{2.5}$ have been collated for the period between 2010 and 2015 in the absence of onsite monitoring data. Both PM_{10} and $PM_{2.5}$ concentrations fluctuate on a daily basis throughout the presented period. Occasional exceedances of relevant criteria occur which are attributable to regional-scale events such as bushfires, hazard reduction burns and dust storms.

Dust deposition monitoring is undertaken at the site at three locations established at site boundary. Annual average dust deposition levels at all three perimeter dust deposition gauges were above the EPA criterion of 4 g/m^2/month during both 2014 and 2015. These dust deposition levels are influenced by

emissions generated by activities at the site and the existing and former (Bingo Recycling) neighbouring materials recycling facilities and therefore are not appropriate to estimate background dust deposition levels.

7.3 Potential impacts

7.3.1 Method

i Emissions estimation and assessment scenarios

The air quality assessment focussed on the primary particulate matter pollutants: total suspended particulates (TSP), PM_{10} and $PM_{2.5}$. Dust deposition as a result of the TSP emissions was also assessed. The assessment was in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*(DEC 2005) (the Approved Methods).

Potential dust generating activities and emission sources associated with the site's operation were identified as follows:

- delivery of aggregate and sand material to site by train and truck;
- transfer and handling of aggregate and sand at storage bins, handling facility, and within the CBP;
- transferring cement and cement supplement into silos from delivery trucks;
- CBP conveying and loading to agitator trucks;
- wheel-generated dust from trucks movements across paved surfaces;
- wind erosion from material storage bins and adjacent paved surfaces; and
- diesel combustion by trucks, mobile plant, and locomotive engines.

Two emission scenarios were developed to quantify maximum potential impacts of the modification:

- Scenario 1: current operations (CBP production of 254,200 m^3);and
- Scenario 2: proposed operations (CBP production of 280,000 m^3) under the modification.

Emissions were quantifiedusing the Australian NPI emission estimation techniques and United States Environmental Protection Agency (US-EPA) AP-42 predictive emission factor equations. Emissions from the nearby Boral Recycling facility was included in the dispersion modelling for assessment of cumulative impacts. Emissions from the Visy recycling site are not considered significant for cumulative assessment purposes and were not explicitly included.

A number of particulate matter emission controls are in place at the site. These include:

- underground unloading of material from trains fitted with water sprays;
- enclosed aggregate and sand storage silos;
- pneumatic loading of cement silos with dust filters fitted;

- dust extraction systems in the CBP;
- covered conveyors and storage bins;
- closure of agitator truck loading alleys through automatic doors;
- water sprays for stockpiles at the materials handling facility; and
- use of water cart and street sweeper on paved surfaces.

ii Dispersion methodology

The atmospheric dispersion modelling completed within this assessment used the AMS/US-EPA regulatory model (AERMOD) (US-EPA, 2004). AERMOD is designed to handle a variety of pollutant source types, including surface and buoyant elevated sources, in a wide variety of settings such as rural and urban as well as flat and complex terrain. Simulations were undertaken for the 12 month period of 2015 using the AERMET-generated file based largely on the Bureau of Meteorology's (BoM) Sydney Airport automatic weather station (AWS) meteorological monitoring dataset as input.

The dispersion modelling incorporated the local meteorology and air dispersion characteristics, including wind speed, wind direction, cloud cover, temperature, precipitation, atmospheric stability and mixing heights. Other factors considered included terrain, emission source locations, plant and equipment types and numbers, operating hours and dust controls already in place at the site.

Dispersion of emissions from the site were modelled across a 2 km by 2 km area, with a receptor grid resolution of 50 m. The results are presented as contour diagrams in Appendix F. Air quality predictions were made at 11 assessment locations, shown in Figure 6.1, selected as representative of the closest (and potentially most affected) receptors. Assessment location R1 and R2 are representative of residential receptors, while the remainder are industrial and commercial receptors.

iii Criteria

The modelling results were compared against the relevant air quality criteria so potential impacts could be assessed. The criteria are from the EPA's guidelines (DEC 2005). Aside from the dust deposition criterion, they relate to the total concentrations of air pollutants and not just the contribution from the CBP. In addition to the EPA's criteria, reference was made to the applicable air quality standards and goals in the *National Environment Protection (Ambient Air Quality) Measure* (NEPM).

The criteria used are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being. The applicable criteria and NEPM advisory reporting standards are included in Section 7.3.2.

7.3.2 Results

Dispersion simulations were undertaken to predict the concentrations of TSP, PM_{10} and $PM_{2.5}$,and dust deposition. Incremental site-related concentrations and deposition rates occurring due to the current and proposed future operations across the site were modelled for each of the assessment locations. Results are expressed as the maximum predicted concentration for each averaging period at the selected assessment locations over the modelling period.

Results from the dispersion modelling conducted for current (scenario 1) and future (scenario 2) operations at the site are presented in Table 7.1 (incremental impacts) and Table 7.2 (cumulative

impacts). With the exception of deposited dust, the criteria for all modelled pollutants are met for both incremental and cumulative concentrations. Exceedances of the EPA incremental dust deposition criterion of 2 g/m^2/month are predicted at commercial/industrial receptors R3 and R4 during Scenario 1, and receptors commercial/industrial R3, R4, R10 and R11 for Scenario 2. Exceedances of criteria are shaded and highlighted in bold text type.

No exceedances of the dust deposition criteria are predicted at residential receptors.

Table 7.1 Incremental particulate matter concentration/deposition results

Receptor	TSP Annual average (µg/m³) Criteria: n/a		PM_{10} Maximum 24-hr (µg/m³) Criteria: n/a		PM_{10} Annual average (µg/m³) Criteria: n/a		$PM_{2.5}$ Maximum 24-hr (µg/m³) Criteria: n/a		$PM_{2.5}$ Annual average (µg/m³) Criteria: n/a		Deposition Annual average (g/m^2/month) Criteria: 2	
Scenario	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
R1	0.1	0.2	0.1	0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	0.1	0.1
R2	0.2	0.3	0.2	0.3	0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	0.1
R3*	5.4	7.0	3.3	4.2	1.4	1.7	1.1	1.3	0.4	0.5	**3.0**	**3.7**
R4*	6.8	8.4	4.0	4.9	1.6	1.9	1.2	1.4	0.5	0.5	**3.7**	**4.4**
R5*	1.4	1.8	1.0	1.3	0.4	0.5	0.4	0.4	0.1	0.1	0.7	0.9
R6*	2.6	3.3	1.9	2.3	0.7	0.9	0.7	0.8	0.2	0.3	1.3	1.6
R7*	2.6	3.4	2.1	2.5	0.8	1.0	0.8	0.9	0.3	0.4	1.3	1.6
R8*	0.5	2.0	0.4	1.0	0.2	0.5	0.2	0.3	0.1	0.1	0.3	0.3
R9*	0.3	0.6	0.2	0.4	0.1	0.2	0.1	0.1	<0.1	<0.1	0.1	0.2
R10*	3.2	4.7	2.1	2.9	0.9	1.2	0.8	0.9	0.3	0.4	1.8	**2.3**
R11*	3.0	4.1	1.9	2.5	0.8	1.0	0.6	0.8	0.2	0.3	1.7	**2.1**

Notes: **Commercial/industrial receptors.*

Table 7.1 shows a minor increase in concentrations of particulate matter at all receptors, for all pollutants. The most notable increase is predicted for assessment locations R3, R4, R10 and R11. With the exception of dust deposition, the predicted increase in impacts is considered minor relative to existing air quality and applicable impact assessment criterion.

Cumulative particulate matter concentrations are presented in Table 7.2. Cumulative predictions include both modelled predictions for neighbouring emission sources and adopted recorded particulate matter concentrations. All predictions meet the relevant criteria at all assessment locations.

Table 7.2 Cumulative particulate matter concentration results

Receptor	TSP Annual Average (µg/m³) Criteria: 90		PM_{10} Maximum 24-hr (µg/m³) Criteria: 50		PM_{10} Annual average (µg/m³) Criteria: 30		$PM_{2.5}$ Maximum 24-hr (µg/m³) Criteria: 25		$PM_{2.5}$ Annual average (µg/m³) Criteria: 8	
Scenario	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
R1	38.8	38.8	43.5	43.5	18.6	18.6	20.0	20.0	6.8	6.8
R2	38.8	38.9	43.6	43.6	18.6	18.6	20.0	20.0	6.8	6.8
R3*	44.2	45.5	46.7	47.5	19.9	20.2	21.0	21.2	7.2	7.3
R4*	45.6	47.0	47.4	48.2	20.2	20.4	21.1	21.3	7.3	7.3

Table 7.2 Cumulative particulate matter concentration results

Receptor	TSP Annual Average (µg/m³) Criteria: 90		PM_{10} Maximum 24-hr (µg/m³) Criteria: 50		PM_{10} Annual average (µg/m³) Criteria: 30		$PM_{2.5}$ Maximum 24-hr (µg/m³) Criteria: 25		$PM_{2.5}$ Annual average (µg/m³) Criteria: 8	
Scenario	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
R5*	40.1	40.4	44.4	44.6	18.9	19.0	20.3	20.3	6.9	6.9
R6*	41.3	41.8	45.3	45.6	19.3	19.4	20.6	20.7	7.0	7.1
R7*	41.4	42.0	45.5	45.8	19.4	19.5	20.8	20.8	7.1	7.2
R8*	40.4	40.6	44.2	44.3	19.0	19.0	20.2	20.2	6.9	6.9
R9*	39.1	39.2	43.7	43.7	18.7	18.7	20.0	20.0	6.8	6.8
R10*	42.4	43.2	45.7	46.2	19.6	19.7	20.7	20.8	7.1	7.2
R11*	41.8	42.6	45.3	45.8	19.4	19.5	20.6	20.7	7.1	7.1

*Notes: * Commercial/industrial assessment location.*

Predicted concentrations of PM_{10} and $PM_{2.5}$ arising from operations at the site are low at all surrounding receptors, suggesting that the control of these particle size fractions is effective at managing potential particulate matter-related health impacts. However, the current dust deposition monitoring results and model predictions within this assessment suggest that the existing particulate matter mitigation measures at site may require refinement to avoid dust nuisance impacts to neighbouring commercial/industrial receptors. Analysis of the contribution to the predicted TSP concentrations and dust deposition levels at receptor R4 (directly opposite the site's entrance on Burrows Road South) from future operations is presented in Figure 7.1.

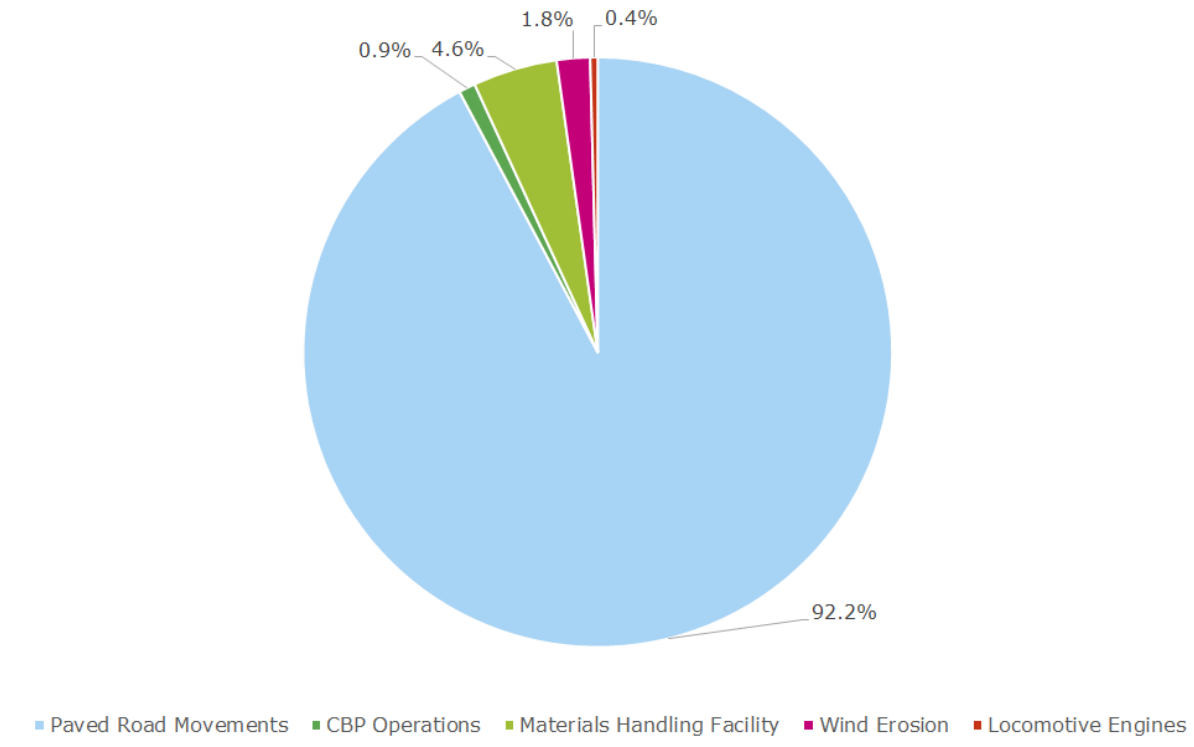


Figure 7.1 Contribution to predicted TSP/dust deposition impacts – receptor R4 – future operations

The key contributing source to TSP/dust deposition impacts from the site are emissions from truck movements along paved roads and surfaces. This also includes diesel combustion by trucks. Measures to reduce emissions on paved roads and surfaces are discussed in Section 7.4 below.

7.4 Mitigation and management

The key contributing source to predicted dust deposition exceedances at the neighbouring assessment locations is wheel-generated dust emissions from truck movements on paved surfaces. Paved surfaces at site are currently controlled through regular sweeping and water flushing. A key influencing factor to emissions from truck movements on paved surfaces is the silt loading (measured in g/m^2) of the surface.

Accordingly, Environ has recommended that priority is given to the improvement of methods employed to manage and reduce the silt loading of paved surfaces at site, as well as review of the location of existing dust deposition monitors, and the establishment of a monitor at neighbouring industrial premises on Burrows Road South (north-east of the site near receptors R3/R4).

Boral propose to increase dust control measures on the site, including undertaking more regular sweeping and dust suppression through application of water sprays. In accordance with Environ's recommendations, Boral also propose to review the location of its existing dust deposition monitors and establish an additional monitor offsite in the vicinity of receptors R3 and R4.

7.5 Conclusion

Emissions of TSP, PM_{10} and $PM_{2.5}$ were estimated for current and future proposed operations associated with the site. Atmospheric dispersion modelling predictions of calculated air pollution emissions were undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted indicated that the modification is unlikely to result in exceedances of the applicable EPA assessment criteria for TSP and PM_{10}, or the NEPM standards for $PM_{2.5}$.Accounting for the neighbouring Boral recycling facility and adopted ambient background concentrations, all other pollutants and averaging periods are below the applicable EPA assessment criterion and NEPM standards at all neighbouring receptors for both current and future operations.

Predicted dust deposition levels, an indicator of nuisance impact, were above the EPA assessment criteria for both current and future operations at industrial locations near the site. Dust deposition levels at all residential locations are predicted to be within the EPA assessment criteria.

Analysis of model predictions for dust deposition indicates that the key influencing source of emissions at the site is the generation of dust by the movement of trucks across paved surfaces (eg roads and the handling facility). Existing dust controls associated with the reduction of paved surface silt loading will be reviewed and where possible improved, including undertaking more regular sweeping and dust suppression through application of water sprays. Boral will also review the location of its existing dust deposition monitors and establish an additional monitor offsite in the vicinity of receptors R3 and R4.

8 Traffic assessment

8.1 Introduction

A traffic assessment has been prepared by EMM to assess the potential traffic and transport impacts of the modification. In addition to the minor increase in trucks travelling to and from the CBP for concrete despatch, it considers traffic generated by the ongoing site operations (both CBP and handling facility), and general background traffic on the surrounding road network. The traffic assessment is presented in Appendix G and the results are summarised in this chapter.

8.2 Existing environment

8.2.1 Site access and surrounding road network

The site's location in relation to the surrounding road networks, including B double access routes, is shown on Figure 8.1. Access to the site is from Burrows Road South, St Peters. The majority of the site traffic travels to and from the site via Burrows Road South, Canal Road, and the Princes Highway. The speed limit on Burrows Road South is 50 km/hr. On major roads in the locality, including Canal Road, Ricketty Street, and the Princes Highway, the speed limit is higher (60 km/hr).

The two intersections which are used by most of the site traffic, shown on Figure 8.1, are:

- Canal Road, Ricketty Street, Burrows Road and Burrows Road South; and
- Princes Highway, Canal Road and Mary Street.

8.2.2 Traffic volumes

The existing hourly traffic volumes for the local road network based on peak hourly traffic surveys at the two main intersections (see Figure 8.1) are summarised in Table 8.1.

Table 8.1 Summary of existing traffic volumes from intersection traffic surveys

Road	Location	Morning peak hour volume	Afternoon peak hour volume	Estimated daily traffic*	Average week day heavy vehicles*	Heavy vehicles (%)
Burrows Road South	South of Canal Road	270	274	3,300	1,000	30.3
Canal Road	West of Ricketty Street	2,635	2,490	30,800	2,100	6.8
Ricketty Street	East of Canal Road	2,959	2,789	34,500	2,300	6.7
Burrows Road	North of Canal Road	706	751	8,700	1,300	14.9
Canal Road	East of Princes Highway	2,863	2,636	33,000	1,500	4.5
Princes Highway	South of Canal Road	4,294	4,530	52,900	2,200	4.2
Princes Highway	North of Canal Road	2,111	2,704	28,900	800	2.8
Mary Street	West of Princes Highway	486	552	6,200	0	0.0

Notes: * *Average daily traffic is estimated at 12 times the average peak hourly traffic for all roads. Daily heavy vehicle numbers and their % have been extrapolated from the am and pm peak hourly heavy vehicle traffic proportions.*



RMS map of B double access routes near Burrows Road, St Peters

Boral St Peters
Modification of development consent
Environmental Assessment
Figure 8.1

8.2.3 Intersection performance

The existing morning and afternoon peak hourly traffic operations and the levels of service at the two major road intersections (see Figure 8.1) have been determined using the SIDRA intersection traffic model. The SIDRA intersection program measures the intersection capacity and performance by calculating parameters such as average vehicle delay, maximum queue length, degree of saturation and level of service, based on the RTA/RMS Guide to traffic generating developments standards (Roads and Traffic Authority, 2002) which were developed from the international Highway Capacity Manual standards.

The existing intersection levels of service (LoS) for the morning and afternoon peak hour periods have been measured according to RMS defined ranges (Table 8.2) which range from A (best) to F (worst).

Table 8.2 LoS definitions

Description	LoS	Average vehicle delay (sec)
Very good	A	<14.5
Good	B	14.5 to ≤28.5
Satisfactory	C	28.5 to ≤42.5
Near capacity	D	42.5 to ≤56.5
At capacity	E	56.5 to ≤70.5
Over capacity	F	≥70.5

The SIDRA intersection results for the two peak hours analysed are summarised in Table 8.3.

Table 8.3 Existing SIDRA intersection traffic operations summary

Intersection	Peak hour	Traffic demand flow (vehicles)[1]	Average delay (seconds)	Level of service (LoS)	Degree of saturation	Maximum queue length (m)
Canal Road, Ricketty Street, Burrows Road and Burrows Road south	7.30 to 8.30 am	3,458	48.2	D	1.000	407 (Canal Rd)
	3.15 to 4.15 pm	3,318	41.6	C	1.000	344 (Ricketty St)
Princes Highway, Canal Road and Mary Street	7.30 to 8.30 am	5,134	51.2	D	1.000	610 (Princes Highway northbound)
	3.45 to 4.45 pm	5,433	47.3	D	0.937	295 (Princes Highway southbound)

Note 1: The SIDRA intersection program automatically adds 5% to all surveyed intersection traffic volumes as a contingency measure

The peak hour traffic signal operations at both intersections are currently satisfactory, but are near capacity. The average intersection delays correspond to a Level of Service (LoS) of C (satisfactory) or D (near capacity).

The highest peak hour traffic queues occur in the directions of the main peak hourly traffic flows at each intersection, being:

- Canal Road in the east bound direction (queue length 407 m) during the morning peak and on Ricketty Street in the west bound direction (queue length 344 m) in the afternoon commuter traffic peak; and
- Princes Highway in the northbound direction (queue length 610 m) and travelling southbound (queue length 295 m) during the morning and afternoon commuter peak traffic periods, respectively.

8.2.4 Site traffic generation and distribution

A substantial proportion of bulk construction materials are transported to the site by rail, with some transport by road. All concrete and bulk materials despatched from the site are transported by road.

Daily truck traffic generation is summarised in Table 8.4 for the existing site operations. The total site car traffic for the workforce and site visitors is approximately 150 daily vehicle movements, which is not anticipated to increase.

Table 8.4 Current daily site traffic generation (heavy vehicles)

Type of material	Material quantity	Number of trucks	
		Average	Maximum
CBP			
• Product concrete (despatched by agitator trucks)	254,200 m^3 (635,000 t)	165	203
• Flyash tanker deliveries	118,000 t	6	12
• Liquid admixtures	508,000 L	0.2	1
Handling facility			
• Bulk construction materials	759,000 t[1]	70	110
Total number of trucks		**241.2**	**326**

Notes: 1. Total throughput – includes materials delivered by both road and rail.

The peak hourly traffic volumes recorded for the site for the identified morning and afternoon commuter peak hour periods(16 October 2015) were:

- 7.30-8.30 am – 57 hourly traffic movements (5 cars in, 5 cars out, 15 trucks in, 32 trucks out); and
- 3.15-4.15 pm – 42 hourly traffic movements (0 cars in, 4 cars out, 22 trucks in, 16 trucks out).

The heavy vehicle traffic distributions for the site are generally:

- approximately 40% travelling south and west via Canal Road and The Princes Highway, south of Canal Road;
- approximately 30% travelling east via Ricketty Street east of Canal Road, and
- approximately30% travelling north via Burrows Road north of Canal Road.

8.3 Impact assessment

8.3.1 Site traffic generation

Daily estimated traffic generation for site truck traffic under the modification is summarised in Table 8.5. The estimated truck traffic is based on production at the CBP of 280,000 m^3 per annum. There is no change in truck traffic generated by the handling facility.

Table 8.5 Proposed daily site traffic generation (heavy vehicles)

Type of material	Material quantity	Number of trucks	
		Average	Maximum
CBP			
• Product concrete (despatched by agitator trucks)	280,000 m^3 (700,000 t)	182	224
• Flyash deliveries	130,000 t	7	14
• Liquid admixtures	560,000 L	0.2	1
Handling facility			
• Bulk construction materials	759,000 t[1]	70	110
Total number of trucks		**259.2**	**349**

Notes: 1. Total throughput – includes materials delivered by both road and rail.

The estimated daily truck movements in Table 8.3 indicates that the proposed 10% increase in the CBP production would result in an approximate 7% increase in the overall site daily truck movements. The additional 7% truck traffic increase from the CBP would typically generate three additional peak hourly truck movements during the morning commuter traffic peak hour (7.30 to 8.30 am) and three additional peak hourly truck movements during the normal afternoon commuter traffic peak hour (3.15 to 4.15 pm) on the roads in the locality. There would be no change in the site employee or visitor car traffic during these traffic peak hours.

8.3.2 Traffic volumes

The effect of these daily traffic increases on a maximum production day, for the additional daily truck traffic movements distributed via Burrows Road South to Canal Road and other surrounding roads is presented in Table 8.6. The proposed CBP production increase of approximately 10% would generate the following additional daily truck traffic movements at the site:

- an additional 18 daily truck loads (36 daily truck movements) on an average production day; or
- an additional 23 daily truck loads (46 daily truck movements) on a maximum production day.

Table 8.6 Additional truck movements on the road network from the modification

Road	Location	Existing average*		Additional heavy vehicle movements (maximum production day)	Daily increase (%)
		Total	Heavy vehicles		
Burrows Road South	South of Canal Road	3,300	1,000	46	1.39
Canal Road	West of Ricketty Street	30,800	2,100	18	0.06
Ricketty Street	East of Canal Road	34,500	2,300	14	0.04
Burrows Road	North of Canal Road	8,700	1,300	14	0.16
Canal Road	East of Princes Highway	33,000	1,500	14	0.04
Princes Highway	South of Canal Road	52,900	2,200	14	0.03
Princes Highway	North of Canal Road	28,900	800	0	0
Mary Street	West of Princes Highway	6,200	0	0	0

*Notes: * Existing daily vehicle numbers have been determined from the am and pm peak period heavy vehicle traffic proportions.*

The additional daily truck traffic movements would be proportionately greatest on the section of Burrows Road South between the site entry and exit driveways and the intersection of Canal Road/Ricketty Street/Burrows Road/Burrows Road South.

The future daily traffic increases on Burrows Road South represent a 1.4% increase compared to existing traffic. This section of Burrows Road South has a relatively high proportion of truck traffic (approximately 30% of all traffic); and the effect of the additional truck traffic from the CBP would generally not be noticeable on this route.

On the other roads considered in Table 8.4, the daily traffic increases would be minimal (typically less than 0.1%) and would have no effect on the existing traffic conditions or traffic delays on these routes. No changes to light vehicle movements are anticipated.

8.3.3 Intersection performance

The future traffic impacts were assessed for the morning and afternoon peak hour traffic periods for the surrounding commuter traffic using a SIDRA intersection analysis at two key intersections:

- Canal Road, Ricketty Street, Burrows Road and Burrows Road South:
  - no change to LoS, which would remain LoS C (satisfactory);
  - average intersection traffic delay would increase by between 0.1 and 0.3 seconds per vehicle with the additional project traffic (three vehicle movements hourly through the intersection).
- Princes Highway, Canal Road and Mary Street:
  - no change to LoS, which would remain LoS D (near capacity);
  - average intersection traffic delay would increase by between 0 and 0.3 seconds per vehicle with the additional traffic (one vehicle movements hourly through the intersection). Due to the future dispersal of the site traffic to different approach routes, the actual project traffic

increase may only be one vehicle movement hourly through the intersection. However, to be conservative, three vehicle movements per hour has been assumed.

During the normal morning and afternoon commuter traffic peak periods at both intersections, there would be only marginal changes to average traffic delays as a result of the additional traffic generated by the proposed production increase at the CBP. There would be no measurable changes to the maximum traffic queue lengths at either intersection with the future CBP site traffic during either of the peak hourly traffic periods.

8.4 Safety and traffic management

The potential road safety related traffic impacts from the modification have primarily been considered for Burrows Road South between the site access driveways and at the intersection of Canal Road, Ricketty Street, Burrows Road and Burrows Road South.

The two existing site access driveways (Figure 2.1) are well constructed with heavy duty concrete pavements and are considered to have adequate width to accommodate all the proposed turning traffic movements by large trucks. The two driveways both have good visibility of the approaching traffic in both directions on Burrows Road South and the proposed additional truck traffic movements would have minimal effects on traffic safety at these driveways.

At the intersection of Canal Road, Ricketty Street, Burrows Road and Burrows Road South, the existing intersection visibility for left and right turning traffic from Burrows Road South is considered to be relatively good as both Burrows Road and Burrows Road South are straight and level at the intersection.

The left and right truck turning movements from the two major roads at the intersection (ie Canal Road and Ricketty Street) are controlled by the traffic signal phasing which has right turning arrows. No additional traffic safety improvements would be required at the intersection for the proposed additional CBP truck traffic movements.

8.5 Conclusion

The site is well serviced by arterial roads, with access to the Princes Highway. A substantial proportion of bulk construction materials are transported to the site by rail, with some transport by road. All concrete and bulk materials despatched from the site are transported by road.

The traffic assessment has considered traffic impacts of the modification, including the minor increase to CBP production. The throughput of the handling facility and associated traffic generation would not change.

The proposed CBP production increase would result in an approximate 7% increase in the overall site daily truck movements. The greatest increase in traffic volumes would occur on Burrows Roads South which would experience an increase of approximately 1.4% which would generally be imperceptible. Elsewhere in the locality the future average daily traffic increases from the site traffic would typically be less than 0.1%. There would be no change in the site employee or visitor car traffic.

The external road network impacts of additional traffic have been assessed at key intersections. The SIDRA intersection analysis shows that there would be only minimal changes to the existing intersection peak hour average traffic delays (of between 0.0 to 0.3 seconds per vehicle at each intersection), with no changes to the future intersection maximum traffic queue lengths or LoS, which would remain at LoS C/D and LoS D respectively.

9 Other matters

9.1 Surface water

The site is located in the Cooks River catchment. The Alexandra Canal, formerly Sheas Creek, is located immediately adjacent to the south-east boundary of the site. The Alexandra Canal is an artificial waterway extending 4.5 km from its northern most extent north near Huntley Street, Alexandria through the suburbs of St Peters and Mascot to Tempe at its junction with the Cooks River, which then discharges into Botany Bay.

Surface water runoff on the site is largely captured and contained onsite. Water is recycled and reused onsite for dust suppression, the cleaning of the concrete agitators, and the slump stands. Mains water is also used when required. The general water management principles are:

- full containment and reuse of contaminated water;
- clear delineation of clean and dirty areas;
- provision of rainwater first flush collection facilities;
- effective reuse of water for batching and mixer wash-out; and
- limiting the use of fresh water supply, where possible.

At the CBP, flows are conveyed via slopes, bunds and grid-covered drains to the recycled water pits located adjacent to the concrete washout bays (see Figure 2.1). When the recycled water pits fill, rainwater is diverted and flows into the first flush collection pit. When the first flush collection pit is full, rainwater flows directly to the stormwater drain.

During high rain events (ie storms or long sustained periods of rain), water from the site is discharged offsite via the first flush system. There are no water quality criteria within the development consent relating to water discharges from the site.

The modification, including the 10% increase in production at the CBP, is not anticipated to affect the site's surface water management system and its performance. The increase in concrete production from the CBP would result in a minor increase in water demand, which would be met by either recycled water from the site water management system, or potable water.

9.2 Hazard and risk

9.2.1 General

As stated in Section 4.3.1, SEPP 33 requires consent authorities ensure that in considering any application (including an application to modify a development consent) to carry out potentially hazardous or offensive development, they have sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact.

In determining whether a development is potentially hazardous or offensive consideration must be given to current circulars or guidelines published by DP&E relating to hazardous or offensive development.

An assessment as to whether operations on the site were potentially hazardous or offensive was undertaken as part of the EIS that accompanied the DA for the site in 1996, which included the asphalt plant. The results of this assessment indicated that site operations were not hazardous or offensive, or presented an unacceptable risk to human health or the environment. Since the assessment undertaken as part of the DA in 1996 was undertaken, DP&E has released new assessment guidelines, namely *Hazardous and Offensive Development Application Guidelines - Applying SEPP 33 (2011)* (Applying SEPP 33).

9.2.2 Potentially hazardous industry

A potentially hazardous development requires a preliminary hazard analysis (PHA) to accompany a DA or application to modify a development consent. A development is considered to be potentially hazardous if the storage of hazardous substances exceeds specific screening thresholds. Further assessment is then required to support a DA, including a risk assessment to ascertain the potential likelihood and consequence of a risk to people, property and the environment both before and after the application of mitigation measures to reduce the risk. A development can also be considered potentially hazardous based on the number of traffic movements involving hazardous materials associated with the development. If a development is found to be hazardous with respect to transportation, a route evaluation study is also required.

A PHA was prepared to accompany the DA for the site in 1996 by Alara Risk Management Services. The PHA stated that application of the criteria provided in SEPP 33 indicated that the development was not potentially hazardous or potentially offensive. In terms of the CBP, principally this was because:

- the core constituents of concrete (aggregate, sand and cement) are not classified as dangerous substances or goods; and
- the concrete additives (or admixtures) proposed to be stored on-site were not classified as dangerous substances or goods.

A preliminary risk screening analysis was undertaken to ascertain whether the modification (ie increasing production at the CBP) is considered to be a potentially hazardous development and therefore required a PHA to accompany the application. The preliminary analysis considered the storage and and/or transport of dangerous goods classes that have the potential for significant off-site impacts. A complete description of the methodology for the analysis is provided in Applying SEPP 33.

As previously stated, the core constituents of concrete (aggregate, sand and cement) are not classified as dangerous goods. The PHA undertaken in 1996 stated that the concrete additives stored at the site were not classed as dangerous goods. A site inspection was undertaken to determine whether concrete admixtures currently used and stored at the CBP are classed as dangerous goods, and if so, determine their storage method, location and capacity, and transport volumes.

The site inspection confirmed that admixtures stored on site are not classed as dangerous goods (ie Sika ViscoFlow® 12 retaining admixture and SikaRapid® -4 set accelerator). Their hazards are occupational only and associated with personnel coming into contact with the material. Spills are unlikely to cause any off-site threats to people and the environment.

Based on the preliminary risk screening analysis, the modification does not constitute a potentially hazardous development. Accordingly, no PHA is required.

9.2.3 Potentially offensive industry

A development is generally considered to be potentially offensive if it requires an EPL from the EPA in accordance with provisions of the POEO Act. If it cannot obtain the necessary EPL, it is deemed to be an offensive development. In addition, the results of noise, air quality and surface water assessments of a development can also be used to determine if that development is potentially offensive.

As stated in Section 4.2.2, CBPs are not required to be licensed under the POEO Act (ie do not require an EPL). As such, they are inherently not considered to be potentially offensive industries by the EPA. In addition, the results of the noise, air quality and technical assessments described in chapters 6, 7 and 8 indicate that the modification is not potentially offensive.

The noise assessment concludes that the site would continue to comply with the relevant noise criteria derived from the INP. The air quality assessment concludes that the modification is unlikely to result in exceedances of the applicable EPA assessment criteria for TSP and PM_{10} or the NEPM standards for $PM_{2.5}$.While predicted dust deposition levels, an indicator of nuisance impact, were predicted to be exceeded at neighbouring commercial/industrial receptors, no exceedances are predicted at the nearest residential receptors. In addition, these dust deposition levels can be reduced through the reduction of paved surface silt loadings.

Surface water at the site would be continued to be managed under current surface water management system which diverts surface water flow into recycled water detention pits, with this water being reused for onsite for concrete production, dust suppression, cleaning of the concrete agitators and the slump stands. Overflow from the site's water management system occurs during high rainfall events when storage capacity is exceeded. The modification would not result in measurable impact to the receiving environment.

9.2.4 Summary

The preliminary screening analysis indicates that the modification is not potentially hazardous development. The site, in particular the CBP, does not use or store dangerous substances or goods.

The site, including the CBP, is not required to be licenced under the POEO Act, and therefore is not inherently deemed to be potentially offensive development. In addition, the results of the noise, air quality and technical assessments described in chapters 6, 7 and 8 indicate that the modification is not potentially offensive development.

9.3 Contamination

As stated in Section 4.3.1,SEPP 55 requires consent authorities to consider the contamination status of land, and where rehabilitated, whether it is suitable for the development to be carried out.

Contamination investigations were undertaken at the site historically as part of the DA for the site in 1996, including installation of forty nine pits and fifteen hand auger bores to a maximum depth of 4.5 m below ground level (bgl). Twenty four of these locations were completed with piezometers to enable groundwater monitoring.

The results of the investigations indicated that the site was contaminated as a result of historic filling of ash from the former Bunnerong power station and previous industrial uses. The results indicated that contamination within the site can be subdivided into six categories, namely hydrocarbon, metals and ash containing soil, as well as hydrocarbons, nutrients, and metals in groundwater.

Approximately 7,800 m^3 of in situ hydrocarbon soil contamination located between the railway spur and Alexandria Canal was found to be above the relevant criteria. Of this volume, approximately 2,800 m^3 contained bitumen based hydrocarbons, with the remaining volume of approximately 5,000m^3 being non-bitumen based hydrocarbons (primarily lower fraction petroleum hydrocarbons).

The deeper hydrocarbon contaminated material was primarily contained in 1.5 m thick dredged sands, and in some cases, extended below the water table at 0.9 - 1.7 m below surface (generally 1.3 - 1.5 m).The majority of hydrocarbon contamination did not extend deeper than 2.5 m, with some penetration into the underlying silty muds originating from the pre dredged Sheas Creek(now Alexandra Canal).

Approximately 600 m^3 of metals contaminated soil was located, although it was primarily associated with the hydrocarbon contaminated material. Metals contamination was generally limited to the top0.2 m in exsitu fill, whilst the hydrocarbon affected material extends into the Botany Sands, below the water table, to a maximum of approximately 2 m bgl in isolated hot spots.

Ash from the former Bunnerong power station was deposited in 0.2 to 0.8 m thick in bands and lenses within the site, primarily in the northern and western sections.

To address the contamination, a remediation strategy was prepared to accompany the DA for the site. The remediation strategy proposed excavation of all of the in situ hydrocarbon contaminated soil and fill (approximately 7,800 m^3) and all of the metals contaminated soil and fill (approximately 600 m^3).It proposed that the bituminous material be excavated first and taken to landfill, and the underlying hydrocarbon contamination be subsequently removed to an offsite bioremediation facility.

The remediation strategy did not envisage removal of the large volume of ash containing fill as minimal tono leaching of contaminants (polycyclic aromatic hydrocarbons)was occurring.

Remediation was subsequently undertaken at the site in accordance with the remediation strategy. The remediation was signed off by an accredited EPA Site Auditor.

9.4 Historic heritage

The site adjoins the Alexandra Canal, which is listed as a heritage item on the State Heritage Register (SHR) and the Marrickville LEP. The canal is also listed on Botany Bay and Sydney City's LEPs. The listing on the SHR states:

> Alexandra Canal is of high historic, aesthetic and technical/research significance. Historically, it is a rare example of 19th century navigational canal construction in Australia, being one of only two purpose built canals in the State, with one other known example in Victoria. It has the ability to demonstrate the NSW Governments initiative to create water transport as a means of developing an industrial complex in the Alexandria and Botany areas and exploiting the use of unemployed labour to achieve its scheme.
>
> It played a seminal role in the changing pattern and evolution of the occupation and industrial uses of the local area and nearby suburbs, which included filling large areas of low lying land for development.
>
> ...

Consideration of heritage impacts was undertaken as part of the EIS that accompanied the DA for the site in 1996. This assessment was undertaken prior to the Alexandra Canal being listed on the SHR. Notwithstanding the above, the modification is not expected to have any impact on the heritage significance of the Alexandra Canal.

The site is highly modified due to years of industrial activity by both Boral and previous uses on the site and immediate surrounds. The modification would result in a small increase in truck traffic associated with concrete transport, however it would not result in any changes to the site that would affect its visual character that might affect the aesthetic significance of the Alexandra Canal. Given the nature of the site, the potential for historic heritage impacts is very low.

9.5 Indigenous heritage

The site has been highly modified by current and previous land uses, and it is unlikely that any deposits would remain on the site. No Aboriginal sites have been recorded in OEH's Aboriginal Heritage Information Management System (AHIMS).

The site is highly modified due to years of industrial activity by both Boral and previous uses on the site and immediate surrounds. The modification would result in a small increase in truck traffic associated with concrete transport, however it would not result in any additional physical impacts to the site. Given the nature of the site, the potential for Indigenous heritage impacts is very low.

9.6 Ecology

The site is predominantly hard stand and is highly modified. While there is extant vegetation surrounding the perimeter of the site, no changes to the footprint of the hard stand area is proposed. No vegetation would be removed or land disturbed as a result of the modification.

9.7 Visual

The modification would not result in any change to the appearance of the site. As previously stated, the site is located within an existing industrial precinct and has historically been used for significant industrial and commercial land uses. Therefore, it is in keeping with the surrounding land uses in the area.

9.8 Social and economic

The site has operated as a CBP and handling facility since 1996. It was originally developed to meet market demands in the Sydney CBD area, and respond to significant infrastructure projects that were planned in the Sydney metropolitan area. The development of a new operation was also identified to offset the loss of another Boral operation in Sydney at the time.

Social impacts relate to changes in amenity of the surrounding area. This EA, and in particular the assessments for noise, air quality, and traffic, demonstrate that there is likely to be minimal impact on the amenity of the surrounding environment as a result of the modification when assessed against applicable criteria and standards. The site is located within an existing industrial precinct and has historically been used for significant industrial and commercial land uses. Therefore, the modification is in keeping with the surrounding land uses in the area.

The modification would result in minor social economic benefits associated with the increase in concrete production to the local community and wider Sydney region.

10 Justification and conclusion

10.1 Need for the modification

There are two principle reasons for the modification: to simplify the development consent by removing complexity and irrelevant conditions; and to apply production limits to the CBP and throughput limits to the handling facility.

Boral has also identified an opportunity for a small increase in production at the CBP to meet increased demand for high quality specialist pre-mixed concrete in the region. This demand is principally due to the increase in approvals for medium to high density residential housing and major infrastructure projects in Sydney. In order to maintain product quality and integrity, once water is added to the dry concrete mix, a concrete agitator truck has no more than 45 minutes to deliver and pour the concrete. For this reason, concrete plants must be near their markets to ensure the concrete maintains its material properties. Close proximity is also needed to ensure that the construction schedule is not disrupted by delays to concrete deliveries.

The existing and planned developments in the Sydney metropolitan area (CBD and South East Light Rail, medium and high density residential projects, and WestConnex) will require a significant amount of concrete and construction materials for their construction. Most of these projects are located in the inner and middle ring suburbs of Sydney, and in the case of WestConnex, will be located in close proximity to the site.

The site's location in St Peters and its ability to receive construction materials by rail means it is well positioned and setup to provide construction materials to such projects.

10.2 Objects of the Environmental Planning and Assessment Act 1979

The EP&A Act provides the framework for environmental planning and assessment in NSW. The objects of the EP&A Act are listed in clause 5 as follows:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

There are four objects of the EP&A Act relevant to the modification, being:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

The CBP and handling facility would continue to facilitate the distribution of bulk construction materials and concrete to the building and construction market. The site is ideally located with access to rail infrastructure which enables efficient delivery of quarry products to the site.

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

The modification involves a minor increase in the capacity of the CBP, which is a more economically efficient use compared with developing a new CBP.

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats,

The modification would not result in impacts to native animals and plants, and would operate in a manner that generally avoids or minimises impacts to the environment.

(vii) ecologically sustainable development,

The proposal is consistent with the four ESD principles described in the EP&A Regulation. This is discussed further in Section 10.3, below.

10.3 Principles of ecologically sustainable development

Schedule 2 of the EP&A Regulation describes the four principles of ESD. Table 10.1 demonstrates how the modification is consistent with these four principles.

Table 10.1 Compliance with ESD principles

Principle	Application	Compliance
The precautionary principle	Proposals need to be carefully evaluated to ensure they avoid serious or irreversible environmental damage.	The modification avoids serious and irreversible environmental damage through the efficient use of an existing site, requiring no additional land disturbance. Potential environmental impacts from the modification would be managed to an acceptable level.

Table 10.1 Compliance with ESD principles

Principle	Application	Compliance
Inter-generational equity	The proposal needs to consider the health, diversity and productivity of the environment for future generations.	Potential environmental impacts from the modification would be managed to an acceptable level, thereby maintaining health, diversity and productivity of the environment of future generations.
Conservation of biological diversity and ecological integrity	The conservation of biodiversity and ecological integrity needs to be considered in the proposal.	The modification would not result in impacts to biodiversity or ecological integrity. There would be no disturbance to native vegetation.
Improved valuation, pricing and incentive mechanisms	The proposal needs to consider environmental factors in the valuation of assets and services.	This EA has considered environmental factors and demonstrated that potential environmental impacts from the modification would be managed to an acceptable level.

10.4 Conclusion

Boral's St Peters CBP and handling facility has been operating in accordance with its existing consent since 1996. It is a major supplier of construction materials in the Sydney region. It receives bulk construction materials (aggregate, sand and cement) predominantly by rail from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. These construction materials are used to make concrete at the CBP, or are temporarily stored at the handling facility for later distribution to other CBPs and asphalt plants within the Sydney metropolitan area. Concrete from the CBP and construction materials from the handling facility are despatched by road.

The existing development consent for the site, which was granted in 1996 by the then NSW Minister for Planning and Infrastructure, has been modified nine times, principally to change the layout of operations on the site. However, this has led to a complex and cumbersome consent that is difficult to interpret.

Accordingly, an administrative modification under section 75W of the EP&A Act to simplify the development consent (ie remove complexity) and remove irrelevant conditions is proposed. In addition, the application seeks to remove the condition restricting vehicle movements, and instead set production and throughput limits for the CBP and the handling facility. The production limit sought for the CBP will result in a 10% increase in the limits described for the CBP and asphalt plant in the EIS that accompanied the DA for the site in 1996.

Aside from the production increase, no other changes are proposed to any aspect of the approved operation. This includes no change to the existing site plant, equipment, footprint, access, materials storage and handling, operating hours or employee numbers. The proposed CBP production increase can be achieved using the existing plant and equipment at increased activity rates.

Detailed modelling and assessment for this EA focussed on investigating any potential environmental impacts from the CBP to produce more concrete. This included the potential effects of increased traffic from despatch of concrete, and increased noise and dust. Subject to implementation of the existing environmental mitigation, management and monitoring measures applied at the site, the CBP production increase would not result in significant adverse environmental impacts.

References

Department of Environment and Conservation (DEC) 2005,*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, NSW Government.

Department of Planning (DoP) 2011,*Hazardous and Offensive Development Application Guidelines: Applying SEPP 33*, NSW Government.

Environment Protection Authority (EPA) 2000,*NSW Industrial Noise Policy*, NSW Government.

EPA 2011,*Road Noise Policy*, NSW Government.

Roads and Traffic Authority (RTA) 2002, *Guide to Traffic Generating Developments*, NSW Government.

Appendix A

Development consent

NOTICE OF DETERMINATION OF DEVELOPMENT APPLICATION

Issued under the Environmental Planning and Assessment Act 1979
Section 92, and State Environmental Planning Policy No. 34 -
Major Employment Generating Industrial Development

development application

applicant name	Boral Resources (NSW) Pty Ltd
application date	9 April 1996
applicant address	Greystanes Road South Wentworthville NSW 2145
land	Burrows Road South, St Peters Lots 1 and 2 DP 441113 and Vol. 4898 Fol. 159.

determination

made on	6·9·96
determination	Consent granted to option "A" of the proposal subject to conditions shown in the attached Schedule A.
consent commences from	10.9.96
consent lapses on	10.9.2001 if works have not commenced by this date.
reasons for conditions	To ensure the impact of development is managed in a satisfactory manner.
right of appeal	If you are dissatisfied with this decision, section 97 of the Environmental Planning and Assessment Act 1979 gives you the right to appeal

to the Land and Environment Court within 12 months after the date on which you receive this notice.

Signed

signature

name Craig Knowles, MP
Minister for Urban Affairs and Planning
Minister for Housing

date 6.9.96

Mod 1 Site Rearrangements
Mod 2 Site Rearrangements
Mod 3 Butane Storage Vessel
Mod 4 Materials Handling Rearrangement
Mod 5 Bunker & other Site Rearrangements
Mod 6 Rearrangements Post Asphalt Plant Decommission
Mod 7 Bunker rearrangements
Mod 8 Rail Siding
Mod 9 Site Rearrangements

SCHEDULE A

Conditions Of Consent
Boral Concrete Batching Plant, Asphalt Plant And Associated Materials Handling Facility
Burrows Road South, St Peters –
Lots 1 & 2 DP 441113 And Vol 4898 Fol 159

DEFINITIONS

Applicant	Boral Resources (NSW) Pty Ltd and their agents and successors
Approval	Approval in writing
ARTC	Australian Rail Track Corporation Ltd
CEMP	Construction Environmental Management
Consent Authority	Minister for Planning and Infrastructure
Council	Marrickville Council
Director-General	Director-General of the Department of Planning and Infrastructure or nominee
EPA	Environment Protection Authority
NOW	NSW Office of Water
RMS	NSW Roads and Maritime Services
SACL	Sydney Airport Corporation Limited

GENERAL

1. This consent is granted under section 91 (1) of the Environmental Planning and Assessment Act, 1979 for the development of a concrete batching plant, an asphalt plant and associated materials handling facilities at Burrows Road South, St Peters.

2. The development shall be carried out in accordance with:

   a) The development application (DA 14/96), supporting Environmental Impact Statement (EIS), and the option described as "Option A" in the EIS;
   b) supplementary material prepared by S A Smits and Associates Pty Ltd, dated April 1996, June 1996, 21 September 1998, 25 September 1998, 22 March 1999, 7 May 1999, 21 May 1999, 17 November 1999, 26 November 1999 and 1 March 2000;
   c) modification application DA 14/96 (Mod 1), granted 12 May 1997 and supporting information provided by S A Smits and Associates Pty Ltd;
   d) modification application DA 14/96 (Mod 2), granted 8 December 1998 and supporting information provided by S A Smits and Associates Pty Ltd;
   e) modification application DA 14/96 Mod 03-99 (Mod 3), granted 25 June 1999 and supporting information provided by S A Smits and Associates Pty Ltd;
   f) modification application DA 14/96-M1 Mod 11-99 (Mod 4), granted 7 April 2000 and supporting information provided by S A Smits and Associates Pty Ltd;
   g) modification application DA 14/96 (Mod 5) granted 23 August 2001 and supporting information provided by S A Smits and Associates Pty Ltd;
   h) modification application MOD-10-2-2003-I (Mod 6), granted 16 May 2003 and

supporting information provided by S A Smits and Associates Pty Ltd;

i) modification application MOD-34-3-2004-i (Mod 7) granted 11 February 2004 and supporting information provided by S A Smits and Associates Pty Ltd;

j) modification application DA 14/96 Mod 8 dated 11 December 2012 and supporting information provided EMGA Mitchell McLennan (EMM);

k) details of alterations to the layout of the materials handling facility detailed in the letter from S A Smits and Associates dated 25 March 2004, including drawings numbered SEK287-C-009 revision D (11 February 2004) and SEK287-M-001 revision C (11 February 2004);

l) details of the cross-over and associated third rail siding detailed in letter from EMM dated 11 December 2012, including drawing number 2569-01;

m) modification application DA 14/96 Mod 9 dated 28 February 2013 and supporting information provided by EMM dated 28 February 2013, Boral dated 12 April 2013 and 23 April 2013 and Environ dated 15 May 2013; and

n) the conditions of this consent.

In the event of an inconsistency between the documents listed from a) to m) above, the most recent document shall prevail to the extent of the inconsistency.

3. In the event of any inconsistency between the conditions of consent and the documents referred to in Condition 2 above, the conditions of this consent prevail.

4. The applicant shall ensure that all contractors engaged to carry out work on the site are served with a copy of the conditions of this consent prior to commencement of work on the site.

5. The applicant shall consolidate into one lot and under one title all separate lots to which the development application applies. This shall be registered at the Land Titles Office prior to the release of the building approval.

CONSTRUCTION AND MAINTENANCE

6. Construction shall not commence unless the Director, Development and Environmental Services has approved the incorporation of noise attenuation measures complying with Australian Standard 2021-1994 in relation to interior design sound levels, as part of the building application. The Director, Development and Environmental Services shall not approve this unless the building application is accompanied by certification by a suitably qualified acoustical engineer-that the proposed noise attenuation measures satisfy the requirements of Australian Standard 2021-1004.

7. No lighting shall be installed on the site unless the Director, Development and Environmental Services has approved that its design, location and shielding ensures that no hazard is caused to the aircraft using Sydney Kingsford Smith airport and no injury is caused to the amenity of the surrounding area by light overspill. The Director, Development and Environmental Services shall not approve this unless he sights approval of such lighting proposals from the FAC.

8. Operations, other than of the concrete batching plant shall not commence unless the proposed upgrading of the rail siding has been carried out to the extent set-out for Option A in the EIS as modified by the revised condition 2(i). Councilor its delegate shall only approve occupation or commencement of operations if it is satisfied that the works to the rail siding are consistent with those set out for Option A in the EIS as modified.

9. The applicant shall ensure that the rail siding and ancillary works are maintained to a standard which facilitates their use for materials handling and transport to Council's satisfaction at all times.

ROADS, TRAFFIC AND PARKING

10. The applicant shall meet the cost of improvements to the signalised intersection at the comer of Canal Road and Burrows Road south to the satisfaction of the Director, Technical Services and the Roads and Traffic Authority to achieve a satisfactory level of service during the Morning and Afternoon Peaks. These contributions shall be paid to the RTA upon the written request of the RTA and be accompanied by a verified schedule of costs. Details of the proposed improvements shall be submitted to Council with the Building application.

11. The applicant shall meet the full cost of any works required to be carried out by Council, L.A.W.C., Sydney Water or the RTA in connection with drainage, crossing, alterations to kerb and guttering, footpaths and roads that may be needed as a result of the development in addition to any such works specified in other conditions.

12. The applicant shall provide and maintain off-street car and truck parking spaces to cater for peak parking demands in accordance with Marrickville Council's standards prior to commencement of the use of the site.

13. All loading and unloading associated with the development shall be carried out wholly within the property.

14. All parking spaces and turning areas shall be used exclusively for parking and not for storage or any other purpose.

15. All vehicles entering and leaving the development shall do so in a forward direction.

16. All vehicles associated with the development shall be accommodated wholly within the property and not be parked on the adjoining roads or footpaths.

17. All vehicles carrying materials to or from the site shall have their loads covered with tarpaulins or similar covers at all times so that no material is discharged onto public roads.

18. The applicant shall construct heavy duty concrete vehicle crossings at the vehicular access locations to the development.

18a. The Applicant shall ensure that the maximum traffic generated by the development does not exceed 636 vehicle movements per day.

LANDSCAPING

19. The Development shall not commence operations unless a detailed Landscape Plan in accordance with Marrickville Development Control Plan No I Landscaping, has first been approved by the Director, Technical Services. The landscape plan must satisfactorily detail landscaping of land adjacent to the Alexandra Canal as shown between points C and D on the "Preliminary Site Layout" Plan No 96113/04 Rev A, 19/02/97 (copy attached). It shall also satisfactorily detail screen planting along the site boundary shown between points A and B on that same plan. The plans shall also include the following landscape details:

a) landscape treatments such as fence, retaining walls, paving, lawn planting, outdoor, furnishings, edging details;

b) planting schedule and revegetation plan detailing location, container sizes and botanical names of all trees, shrubs and ground covers incorporating wherever possible a variety of species endemic to the area;

c) site, street and other close proximity trees shall be accurately located on the site/landscape plan and shall be identified as being either retained, trimmed, transplanted Or removed;

d) areas of cut and fill

20. The landscaping of the site shall be completed before the development commences operation and shall be maintained at all times in accordance with the approved plan or any variation to that plan which the Director, Technical Services, may approve.

REMEDIATION

21. No work or construction shall be carried out on site until the EPA approves the Environmental Auditors validation of any remediation carried out on the site. The final remediation validation report, together with the certification by an approved Environmental Auditor for Contaminated Sites shall be submitted to the Director, Development and Environmental Services prior to release of building approval.

HYDROLOGY

22. Construction shall not commence on site unless the Director, Technical Services has approved measures to ensure all roof and surface stormwater from the site of the proposed development and any catchment external to the site that presently drains into the site, shall be collected in a system of pits and pipelines/channels and major storm event surface flow paths and discarded to a Sydney Water controlled storm water drainage system. The Director, Technical Services shall not grant this approval unless a copy of the written approval of Sydney Water for the proposed drainage system is submitted in conjunction with the Building Application.

23. Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application. These plans shall detail the existing and proposed site drainage network including plans and longitudinal sections of pipeline, the location of pins, pipe invert and pit surface levels, junction details, size and class of pipes, trench conditions and details of surface flow paths together with hydrologic and hydraulic calculations that details the drainage network and the capacities of the various surface flow regimes. Where flows are in (~excess of 100 liters/second then a hydraulic grade line analysis will be required before the Director, Technical Services may give approval.

24. Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application detailing surface levels, which shall be controlled over the existing and/or proposed drainage easement or across the site of development to create a major storm event overland flow path system to cater for the 100 year AR1 event. Any overland flow from external catchments shall be anticipated and incorporated in the major event surface flow drainage system. Details of the way overland flows shall be discharged shall be included in the plan.

25. An easement for drainage in favour of and at no cost to Council, shall be created over the full length and width of the major storm event surface flow paths within the site of development. A dealing number for registration of the easement shall be obtained from the Land Titles Office prior to the occupation of the site and the Council informed in writing.

26. Buildings, plant and equipment including material storage areas shall be set at a minimum height of 500mm above the 1 % Annual Exceedance Probability (AEP) flood event for Alexandra Canal. Details of existing and proposed site levels and means of providing 500mm freeboard above the 1% AEP flood event shall be submitted to Council with the Building Application. Variations below 500mm shall only be with the written agreement of the Director, Technical Services.

27. Construction shall not commence unless the Director, Technical Services has approved a sediment control plan in conjunction with the Building Approval. The plan shall specify sediment control measures to be established and maintained in proper working order to prevent sediment discharge from the construction site.

DEMOLITION AND CONSTRUCTION

28. All demolition, construction and associated work necessary for the carrying out the development shall be restricted to between the hours of 6 am to 10 pm Mondays to Saturdays, excluding Sundays and Public Holidays. All trucks and vehicles associated with the construction, including those delivering to or removing material from the site, shall only have access to the site during these hours. All construction vehicles bringing materials to and from the site shall be loaded and unloaded wholly within the property. No waste collection skips, spoil, excavation or demolition material from the site or building materials associated with the construction of the development shall be deposited on the public road, footpath, public place or Council owned property without Council's approval. The applicant shall ensure that all contractors associated with the development are fully aware of these requirements.

28a. The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) for the project that outlines environmental management practices and procedures to be followed during construction. The Plan shall:

a) be prepared to the satisfaction of the Director-General prior to the commencement of any construction works associated with modification application DA 14/96 Mod 8;

b) include:

i. hours of construction;
ii. soil and water management measures;
iii. noise and air quality control measures; and
iv. traffic arrangements and management measures, including details on vehicle routes, access arrangements and traffic controls.

28b. Prior to the commencement of construction works associated with modification application DA 14/96 Mod 8 (Mod 8), the Proponent shall undertake preliminary testing in the area proposed to be disturbed by Mod 8 to determine whether acid sulfate soils are present.

Should the soil testing identify the presence of acid sulfate soils, the Proponent shall prepare and implement, prior to the construction of Mod 8, management measures to control the disturbance of the acid sulfate soils, to the satisfaction of the Director-General.

PLANT OPERATIONS

29. Garbage and any trade waste shall be stored in a location approved by the

Council and be disposed of in an approved manner. All liquid wastes, (other than stormwater) shall be discharged to the sewer in accordance with the requirements of the Sydney Water Corporation. In this regard, satisfactory arrangements for the disposal of trade wastes should be made with Sydney Water Corporation prior to commencement of operations.

30. Details of the 'wash down stand area' and the truck washing facility shall be submitted to Council with the building application. All vehicles associated with the development shall be cleaned in the wash down area with particular attention to the wheels prior to leaving the site.

31. All wash down areas, the truck washing facility and all other areas likely to be contaminated shall be isolated from the stormwater drainage system to the satisfaction of the Director, Technical Services, the Environment Protection Authority and Sydney Water Corporation. Details of the requirements of these authorities including any Trade Wastewater agreements which are required by Sydney Water shall be submitted to the Director, Technical Services in conjunction with the building application.

32. The refuelling area shall be covered, bunded, and drained to the sewer with Sydney Water approval, in accordance with the Environment Protection Authority Guidelines -Surface Water Management on Service Station Forecourts.

33. All materials associated with the operation of the proposal shall be stored in suitably constructed and enclosed containers or similar facilities on the premises in a neat and tidy manner and at all times to Council's satisfaction. Details of the storage containers/facilities shall be submitted with the building application.

DUST

33a. The Applicant shall maintain the premises in a condition which minimises the emission of dust.

33b. No stockpile on site should exceed a height of 4m above ground level or the combined height of the concrete barrier and green mesh fencing, whichever is the lesser.

NOISE

33c. The Applicant shall ensure that the noise from the development does not exceed the noise limits presented in Table 1.

Table 1: Development Noise Limits (dBA)

Day and Night $LA_{eq\ (15\ minute)}$	Location
42	Bellevue Street
44	Yelverton Street

Notes:
Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

PUBLIC UTILITIES

34. The cost of any augmentation of any public utility services (not being a service provided by Council) required as a result of the development shall be borne by the provider or the applicant.

SECTION 94

35. Pursuant to Section 94 of the Environmental Planning and Assessment Act and Marrickville Contributions Plan 1993, the applicant shall make a monetary contribution of $50,077.80 towards the implementation of a traffic management scheme for Sub-Arterial roads. The contribution shall be in cash or an unendorsed bank cheque and shall be forwarded to Council before approved building plans and specifications are released.

ENVIRONMENTAL MANAGEMENT AND MONITORING

36. The Applicant shall prepare an Environmental Management and Monitoring Plan. Construction may not commence unless the plan has been approved by the Director-General, following approval by Sydney Water, Council, the EPA and the Department of Land and Water Conservation. The Plan shall show how odour, dust, noise and water impacts will be measured, monitored, managed and mitigated and it shall be prepared in consultation with the EPA, LAWC, Sydney Water and Council. The Plan is to include (but not be limited to) the following:

a. Odour

The management of odour inside and outside the site boundary, including a staged response program to mitigate any nuisance.

b. Dust

The management of dust impacts, including the impacts of construction works and operation of the development.

The presentation of background dust data for the period from notification of consent to commencement of construction/demolition is to be included as a baseline measure in any dust management plan.

c. Noise

The management of any vibration transmitted to a place of another land user; any sound level at any point on the boundary of the site greater than the levels specified in Australian Standard 1055-1989; any "offensive noise" as defined in the Noise Control Act 1975.

(iv) Water

The management of polluted waters including the details of the pollution control systems, silt arrestors and separator pits intended to collect and dispose of any polluted water.

The management of stormwater collection and discharge from the asphalt plant holding tanks and concrete plant including details of first flush tanks from the designated 'dirty' area.

The requirements of any Trade Waste Agreement with Sydney Water.

A maintenance programme for cleaning oil skimmer pits, stormwater pits and traps.

Any other environmental management or pollution control matter raised by Council, Sydney Water, the Department of Land and Water Conservation or the EPA during the consultation process.

EMERGENCY PROCEDURES

37. Operation shall not commence on the site until a Plan for the management of people, plant, equipment and materials in the event of fire, flood or explosion including evacuation procedures has been approved by the WorkCover Authority and a copy of this approval forwarded to the Director, Development and Environmental Services

SIGNAGE

38. Details of all site signage including:

    a. street signage at the Burrows Road south frontage; and

    b. internal road signage

    shall be submitted fodhe approval of the Director, Technical Services in conjunction with the Building Application.

RAIL QUARRY PRODUCT DELIVERY

39. The applicant shall use rail freight for quarry product delivery to the extent set out for Option A in the EIS wherever reasonably practicable. The applicant shall submit to Council quarterly reports on rail quarry product delivery tonnage and road quarry product delivery tonnage indicating how rail has been used during that quarter.

    The report should include justification where rail has not been used to the extent set out for Option A in the EIS. Justification can include and take into account relevant environmental, logistical, social or economic circumstances and factors.

40. Council may require at the applicant's expense, an independent audit of rail use for quarry product delivery if it considers that the report has not justified that rail use has been used wherever reasonably practicable.

41. The first report to Council shall be submitted 6 months after commencement of operations of the development.

SAFETY STUDIES

42. Prior to introduction of butane to the site, the applicant shall confirm in writing to the Director-General that all recommendations made, including the development of a Safety Management System, in the preliminary hazard analysis prepared as part of the modification application dated 19 March 1999 to use butane gas, have been implemented. The Safety Management System should be developed in accordance with the principles detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory paper No.9, "Safety Management".

43. At least one month prior to the commencement of construction of the butane system (except for construction of those preliminary works that are outside the scope of the hazard studies), or within such further period as the Director-General may agree, the Applicant shall prepare and submit for the approval of the Director-General the studies set out under subsections (a) and (b). Construction, other than of preliminary works, shall not commence until approval has been given by the Director-General and, with respect to the fire safety study, approval has also been given by the Commissioner of the NSW Fire Brigades.

a. FIRE SAFETY STUDY

A fire safety study for the butane system. This study shall cover all aspects detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.2, "Fire Safety Study Guidelines" and the New South Wales Government's "Best Practice Guidelines for Contaminated Water Retention and Treatment Systems". The study shall also be submitted for approval, to the NSW Fire Brigades.

b. HAZARD AND OPERABILITY STUDY

A Hazard and Operability Study for the butane system, chaired by an independent qualified person approved by the Director-General prior to the commencement of the study. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.8, "HAZOP Guidelines".

HAZARD AUDIT

44. No later than two months after the commencement of operation of the butane system, or within such further period as the Director-General may agree, the Applicant shall carry out a comprehensive hazard audit of the butane system and within one month of the audit submit a report to the Director-General. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.5, "Hazard Audit Guidelines". The report shall include a program for the implementation of the recommendations made in the audit, with firm completion dates. The audit shall be carried out at the applicant's expense by a duly qualified independent person or team approved by the Director-General prior to

commencement of the audit. Further audits shall be carried out every three years or as determined by the Director-General and a report of each audit shall within a month of the ' audit be submitted to the Director-General.

45. The Applicant shall update the following reports, studies and documents, as may be required from time to time, to reflect alterations to the site layout that may be approved:

a) Landscape Plan (condition 19);
b) Environmental Management and Monitoring Plan (condition 36);
c) Emergency Procedures (condition 37);
d) Safety Management System (condition 42); and
e) Fire Safety Study (condition 43(a)).

Following an update to any of the reports, studies and documents above, the Applicant shall provide written confirmation to the Director-General that the reports, studies and documents are consistent with relevant requirements, as detailed in this consent.

46. The Applicant shall obtain all relevant Part 4A Certificates as described under section 109C of the Act for relevant structures and buildings on the site.

Note: In accordance with clause 30 of the *Environmental Planning and Assessment (Savings and Transitional) Regulation 1998*, the Minister for Urban Affairs and Planning, as the consent authority that determined the original development application under the unamended Act is taken as the appointed certifying authority for all aspects of the development.

47. All demolition shall be conducted in accordance with the provisions of AS2601 as required by clause 92(1)(b) of the *Environmental Planning and Assessment Regulation 2000*.

INCIDENT REPORTING

48. The Applicant shall notify the Director-General and any other relevant agencies of any incident or potential incident with actual or potential significant off-site impacts on people or the biophysical environment associated with the development as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of this incident, the Applicant shall provide the Director-General and any relevant agencies with a detailed report on the incident.

The Applicant shall notify the Director-General and any other relevant agencies of any incident associated with the development as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant shall provide the Director-General and any relevant agencies with a detailed report on the incident.

The applicant is further advised that the following points have been raised by Council or agencies, and should be taken into account under appropriate statutes and regulation during construction and operation of the proposal.

A Building Application shall be submitted to Council in the prescribed manner, including plans and specifications to comply with the provisions of the Building Code of Australia.

Details of all finished surface materials, including colour and texture to be used in construction shall be submitted to Council's satisfaction prior to the release of the stamped approved building plans.

A detailed plan showing the height, colour and material of all fencing within the development shall be submitted to the Council's satisfaction prior to release of the stamped approved building plans.

Approval is required under Section 68 of the Local Government Act 1993 to demolish the existing structures on the subject site. The applicant shall ensure all relevant approvals and permits should be obtained before commencement of demolition.

Any person/organisation undertaking demolition should obtain all necessary permits and should comply with all of the requirements of Council, the WorkCover Authority and Environment Protection Authority prior to the commencement of demolition works and during demolition works.

The demolition of existing buildings/improvements on the site shall be carried out in accordance with the following and any other requirements or permits:

(a) The requirements of Australian Standard AS 2601-1991 with specific reference to health and safety of the public, health and safety of site personnel, protection of adjoining buildings, and protection of the immediate environment.

(b) The Worksafe Code of Practice for Removal of Asbestos and the requirements of the WorkCover Authority and the Environment Protection Authority.

(c) All building materials arising from the demolition being disposed of in an approved manner in accordance with the requirements of the Environment Protection Authority.

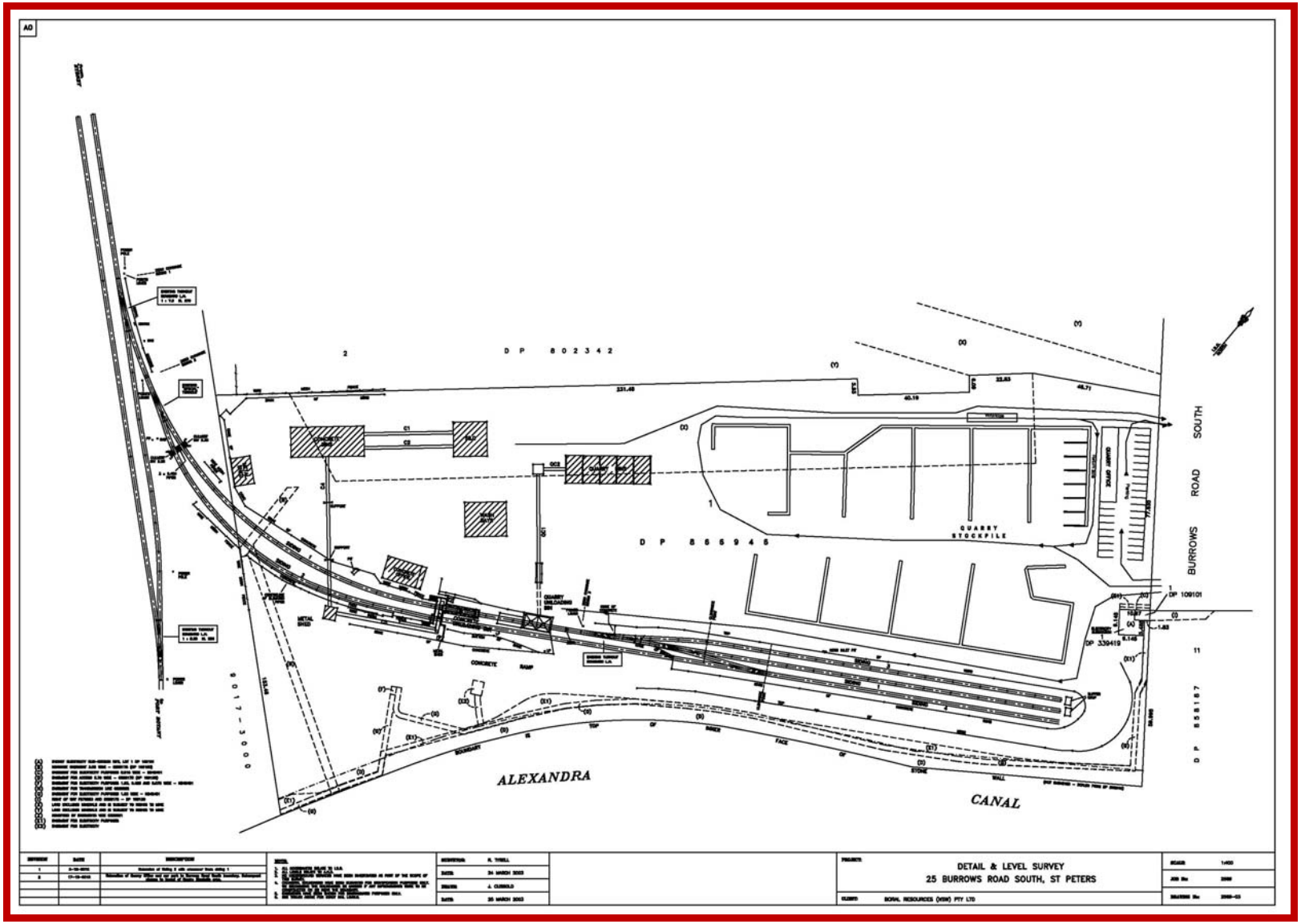
(d) Sanitary drainage, storm water drainage, water, electricity and telecommunications being disconnected in accordance with the requirements of the responsible authorities.

The applicant shall meet the statutory requirements of all public authorities having statutory responsibilities in respect of the development, and shall negotiate with all authorities having an interest in the proposed development with a view to meeting any requirements related to the proposed development.

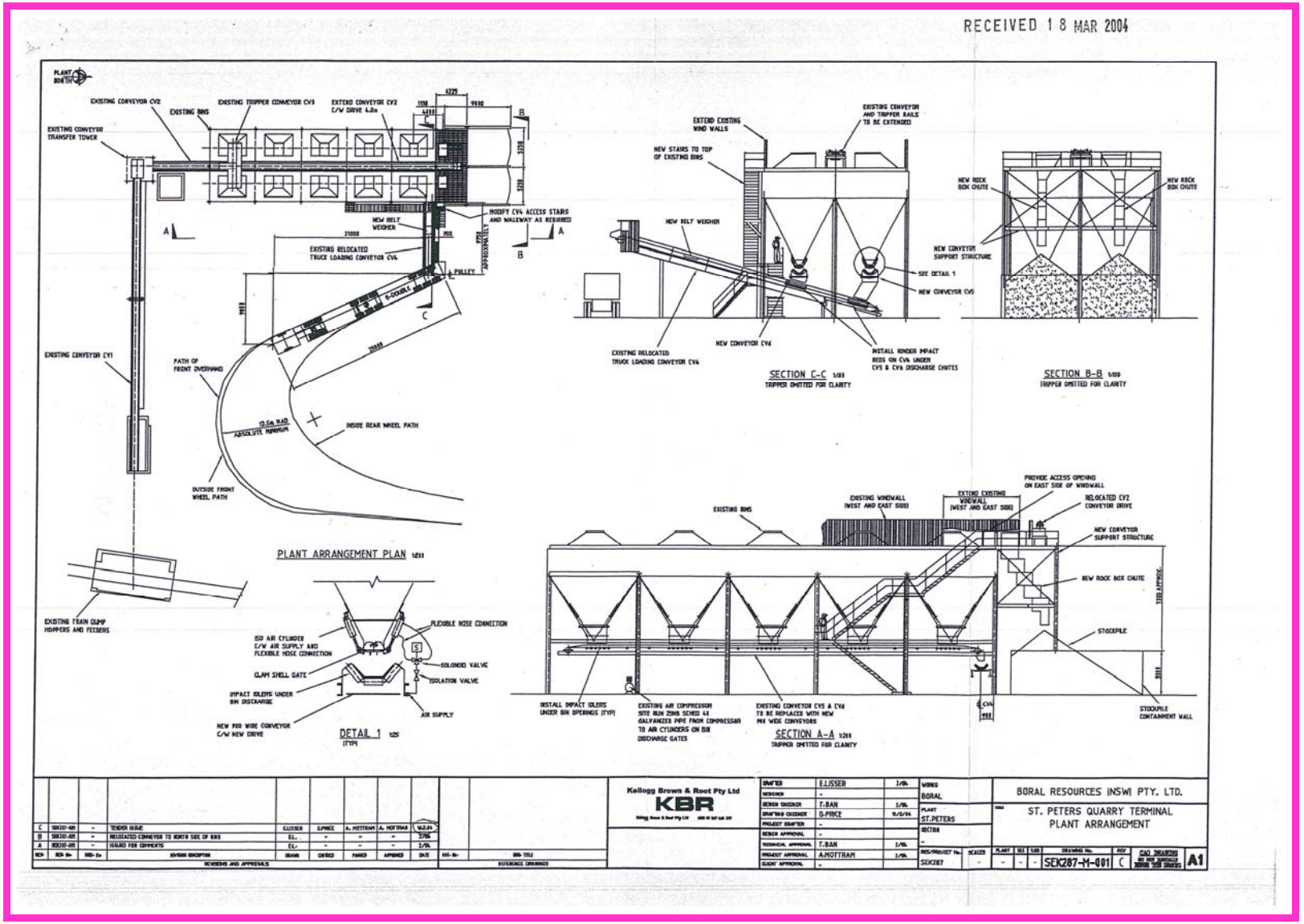
The applicant shall obtain and comply with all necessary approvals and licenses for the development, including (but not restricted to) approvals or licenses from Sydney Water, the EPA, LA WC and the F AC. Any relevant information shall be submitted to the EPA to form the basis of, approvals and to comply with the relevant provisions of the Clean Waters Act, the Clean Air Act and the Noise Act.

The applicant shall comply with the requirements of the RT A and Council regarding the use and any routes of 'B-Double' trucks.

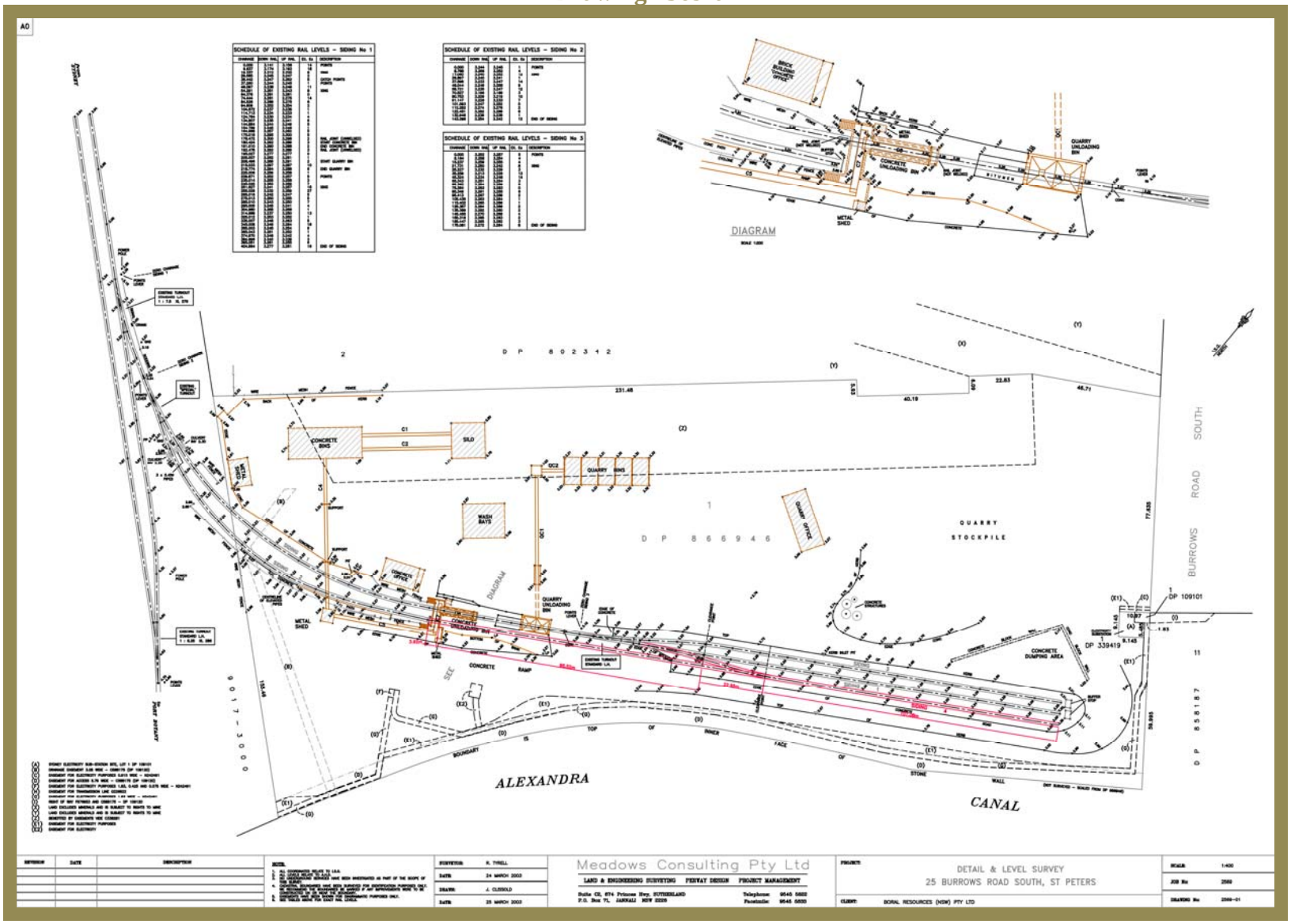
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ALEXANDRA
CANAL
DETAIL & LEVEL SURVEY
25 BURROWS ROAD SOUTH, ST PETERS
BORAL RESOURCES (NSW) PTY LTD
R. TYDELL
24 MARCH 2003
J. CUSHILD
25 MARCH 2003

SEK287-M-001 revision C



Drawing 2569-01



Appendix B

Correspondence from DP&E

From:	Sally.Munk@planning.nsw.gov.au
To:	Brett McLennan;
cc:	Joanna.Bakopanos@planning.nsw.gov.au;
Subject:	FW: Boral St Peters
Date:	Friday, 12 February 2016 11:01:41 AM
Attachments:	image001.png image002.png 20160129_Request_SEARs_Final_05Feb16.pdf

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Hi Brett

I refer to your email and request for SEARS for the Boral St Peters project below. Joanna has asked me to review the documentation and respond to you.

The SEARS request is quite comprehensive and it would appear that EMM have identified all the relevant key issues for assessment. As such, the Department considers it is not necessary to issue formal SEARS for the modification. Please proceed to prepare the Environmental Assessment (EA). In addition to the technical assessments you propose to prepare, please ensure that the EA includes the following information:

- a detailed description of the proposed modification including:
  - a current aerial photo of the site / site layout plan.
  - strategic context and site location plan identifying nearest residences, watercourses, other industry and any other key features; and
  - need/justification for the proposed development.
- description of the existing environment and operations (including copies of approved plans and any other relevant drawings);
- consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments;
- identification of conditions to be modified and proposed wording of any new or modified conditions; and
- a table detailing compliance with existing conditions of the approval.

Please submit a DRAFT EA by email to me for review. Once the Department is satisfied with the documentation, I will place the Final EA on the Department's website and consult with other relevant agencies, including the EPA, RMS, ARTC and Marrickville Council.

Please contact me if you have any questions regarding any of the above.

Thanks
Sally

Sally Munk
Senior Environmental Planner (Part-time: Wed, Thurs & Friday)
Industry Assessments
Department of Planning & Environment
Level 3, Room 311 | 23-33 Bridge Street | GPO Box 39 SYDNEY NSW 2001
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Please consider the environment before printing this email.

From: Brett McLennan [mailto:bmclennan@emmconsulting.com.au]
Sent: Friday, 5 February 2016 4:21 PM
To: Joanna Bakopanos
Cc: McKittrick, Judy; Jackson, Kate
Subject: Boral St Peters

Hi Joanna,

As discussed, attached is the document requesting SEARs for a modification of the development consent for the Boral St Peters site.

Don't hesitate to contact me should you require any additional information or have any queries regarding the request for SEARs.

Regards,

Brett

Brett McLennan | Director

T 02 9493 9500 | **D** 02 9493 9502 | **M** 0488 939 500 | **F** 02 9493 9599

Ground Floor, Suite 01, 20 Chandos Street, St Leonards NSW 2065
PO Box 21, St Leonards NSW 1590



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planning | environment | acoustics | ecology | heritage| groundwater |soils, closure, rehab | gis

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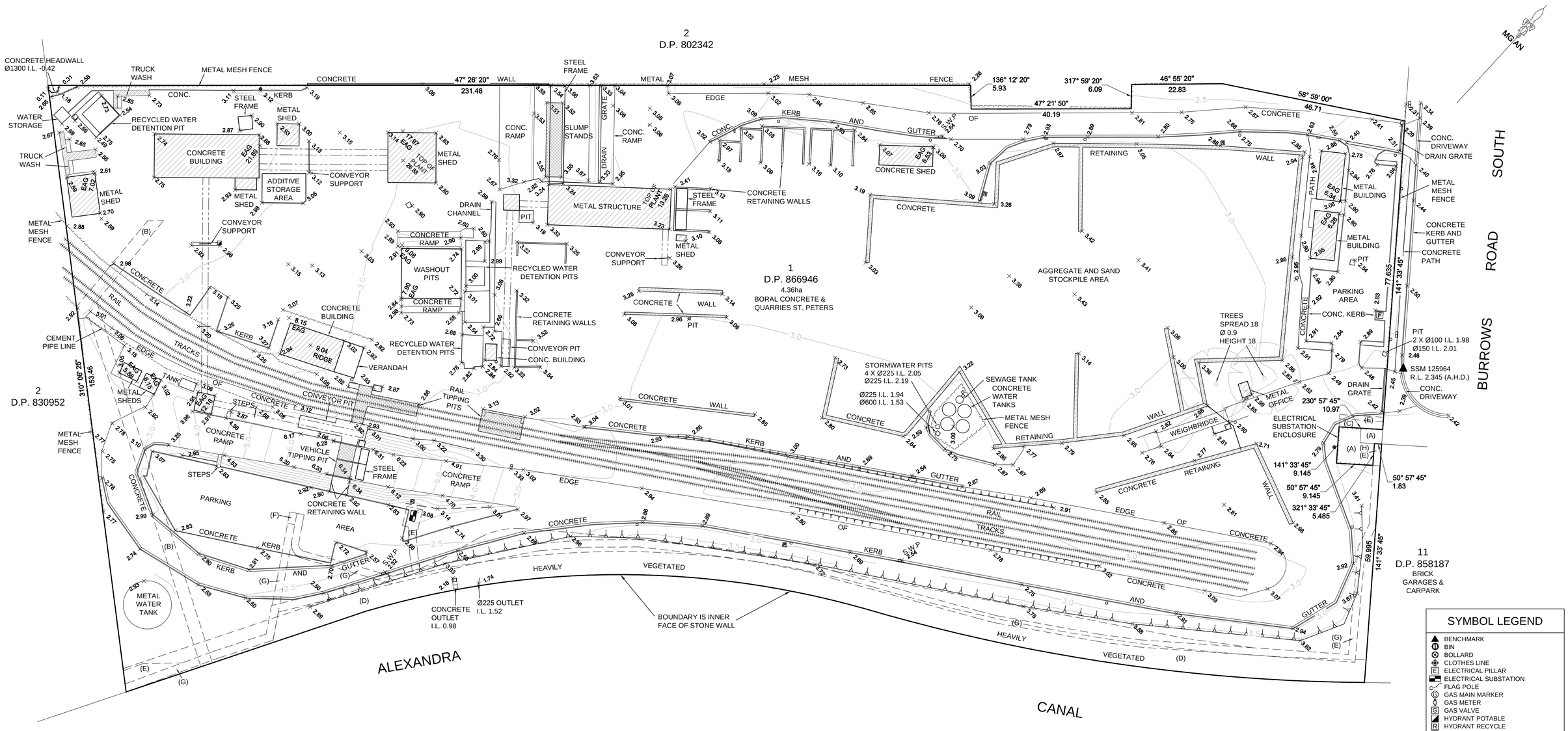
Please note that EMGA Mitchell McLennan Pty Limited has changed its name to EMM Consulting Pty Limited (simply refer to us as EMM). Email and website addresses have been changed to reflect this. All other details including ABN, bank details etc remain unchanged.

P *Please consider the environment before printing my email.*

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Appendix C

Plan of existing layout of the site



IMPORTANT NOTES

1 THE LEVELS AND SURVEY DETAIL SHOWN HEREON HAVE BEEN DETERMINED BY TRIGONOMETRICAL METHODS AND ARE WITHIN THE GENERALLY ACCEPTED ACCURACY FOR SUCH A SURVEY.

2 ANY UTILITIES SHOWN HEREON HAVE BEEN PREPARED FROM A COMBINATION OF FIELD SURVEY AND OFFICE CALCULATION. THE PLAN MAY NOT SHOW THE FULL EXTENT OF ABOVE GROUND STRUCTURES OR SUB SURFACE UTILITIES AND SHOULD NOT BE USED FOR LOCATING SUB SURFACE PIPES, CABLES, CONDUITS OR STRUCTURES. PRIOR TO ANY EXCAVATION OR CONSTRUCTION IT IS RECOMMENDED A FULL DIAL BEFORE YOU DIG SEARCH BE UNDERTAKEN BY CONTACTING DBYD ON PH. 1100 OR WWW.1100.COM.AU.

3 THE RELATIONSHIP OF IMPROVEMENTS TO PROPERTY BOUNDARIES IS DIAGRAMMATIC ONLY. IF ANY WORK IS PLANNED WHICH RELIES ON CRITICAL SETBACKS FROM ANY BOUNDARY IT IS IMPERATIVE THAT FURTHER SURVEY WORK BE CARRIED OUT TO DETERMINE PROPERTY BOUNDARIES. DO NOT RELY ON SCALED DIMENSIONS.

4 THE LOT DIMENSIONS SHOWN HEREON HAVE BEEN COMPILED FROM PLANS SUPPLIED BY LAND AND PROPERTY INFORMATION NSW.

5 THE SPREAD OF THE CROWN OF THE TREES SHOWN HEREON IS DIAGRAMMATIC ONLY BASED ON THE AVERAGE SPREAD OBSERVED ON SITE. IT IS RECOMMENDED THAT TREE SPREADS BE VERIFIED BY SITE INSPECTION SHOULD A DEVELOPMENT PROPOSAL BE AFFECTED BY TREES.

6 ALL LEVELS MUST BE REFERRED BACK TO THE BENCHMARK SSM 125964 R.L. 2.347 (A.H.D.)
THE ORIGIN OF THIS LEVEL IS S.C.I.M.S.

7 THE CONTOUR INTERVAL IN METRES IS 0.5

THE ABOVE NOTES ARE AN INTEGRAL PART OF THIS PLAN

(A) AUSGRID SUB-STATION SITE, LOT 1 D.P. 109101 & LOT 1 D.P. 339419
(B) DRAINAGE EASEMENT 3.05 WIDE - C588175
(C) EASEMENT FOR ELECTRICITY PURPOSES 0.915 WIDE - N242491
(D) EASEMENT FOR ACCESS 5.79 WIDE - C588175
(E) RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES 1.83, 2 & 4 WIDE & VARIABLE - AJ71566
(F) EASEMENT FOR ELECTRICITY PURPOSES 1.83, 0.425 & 0.075 WIDE - N242491
(G) EASEMENT FOR ELECTRICITY PURPOSES 1.83 WIDE - N242491
(H) EASEMENT FOR TRANSMISSION LINE - G226822

DIAL BEFORE YOU DIG www.1100.com.au

Scale 1:500 (A1) Scale 1:1000 (A3) 0 10 20 30 40 50 metres

SYMBOL LEGEND

- BENCHMARK
- BIN
- BOLLARD
- CLOTHES LINE
- ELECTRICAL PILLAR
- ELECTRICAL SUBSTATION
- FLAG POLE
- GAS MAIN MARKER
- GAS METER
- GAS VALVE
- HYDRANT POTABLE
- HYDRANT RECYCLE
- FIRE HYDRANT
- LIGHTPOLE
- PHONE BOX
- POWER POLE
- PVC RISER
- SEWER INSPECTION POINT
- SEWER MANHOLE
- SEWER VENT
- SEWER MAINTENANCE SHAFT
- SIGN
- STOP VALVE POTABLE
- STOP VALVE RECYCLE
- TELSTRA PILLAR
- TELSTRA PIT SINGLE
- TELSTRA PIT DOUBLE
- TRAFFIC LIGHTS
- TRAFFIC LIGHTS CONTROL BOX
- TREE STUMP
- WATER AIR VALVE
- WATER METER
- SUBSOIL FLUSHING POINT
- SURVEY MARK (CONC. BLOCK)
- SURVEY MARK (D.H. & W.)
- SURVEY MARK (G.I.P.)
- SURVEY MARK (PEG)
- SURVEY MARK (S.S.M. & P.M.)
- SURVEY MARK (TRAVERSE STATION)
- TOP OF GUTTER LEVEL
- RIDGE LEVEL
- FLOOR LEVEL
- CHIMNEY LEVEL
- PARAPET LEVEL
- TOP OF BATTER

No.	AMENDMENT DESCRIPTION	BY	DATE
B	AMEND SOME LABELS	C.P.	3/05/16
A	FIRST ISSUE	B.W.	5/04/16

mepstead & ASSOCIATES
REGISTERED SURVEYORS AND DEVELOPMENT CONSULTANTS
Sydney
10/4 Central Avenue, Thornleigh N.S.W. 2120
Phone 02 9875 4500 **Fax** 02 9875 4833
Postal
PO BOX 208, Pennant Hills N.S.W. 1715
Internet
mepstead@mepstead.com.au
www.mepstead.com.au

Designed:	Scale: 1:500	Principal: BORAL	Drg. No. 5444-DET1_B
Drawn: B.W.	Datum: A.H.D.	Project: PLAN OF DETAIL & LEVELS OVER LOT 1 IN D.P. 866946 KNOWN AS No. 25-27 BURROWS ROAD SOUTH, ST. PETERS.	Sheet No. 1 of 1 sheets
Checked: C.P.	Date: 5/04/16		Our Ref: 5444
L.G.A: MARRICKVILLE	A1		

Appendix D

Review of development consent and proposed changes to conditions of consent

Condition	Comment	Suggested amendment to condition
General		
1. This consent is granted under section 91 (1) of the Environmental Planning and Assessment Act, 1979 for the development of a concrete batching plant, an asphalt plant and associated materials handling facilities at Burrows Road South, St Peters.	This condition formed part of the original development consent.	No change
2. The development shall be carried out in accordance with: a) The development application (DA 14/96), supporting Environmental Impact Statement (EIS), and the option described as "Option A" in the EIS; b) supplementary material prepared by S A Smits and Associates Pty Ltd, dated April 1996, June 1996, 21 September 1998, 25 September 1998, 22 March 1999, 7 May 1999, 21 May 1999, 17 November 1999, 26 November 1999 and 1 March 2000; c) modification application DA 14/96 (Mod 1), granted 12 May 1997 and supporting information provided by S A Smits and Associates Pty Ltd; d) modification application DA 14/96 (Mod 2), granted 8 December 1998 and supporting information provided by S A Smits and Associates Pty Ltd; e) modification application DA 14/96 Mod 03-99 (Mod 3), granted 25 June 1999 and supporting information provided by S A Smits and Associates Pty Ltd; f) modification application DA 14/96-M1 Mod 11-99 (Mod 4), granted 7 April 2000 and supporting information provided by S A Smits and Associates Pty Ltd; g) modification application DA 14/96 (Mod 5) granted 23 August 2001 and supporting information provided by S A Smits and Associates Pty Ltd; h) modification application MOD-10-2-2003-I (Mod 6), granted 16 May 2003 and supporting information provided by S A Smits and Associates Pty Ltd; i) modification application MOD-34-3-2004-i (Mod 7) granted 11 February 2004 and supporting information	This condition formed part of the original development consent and was subsequently modified to reference each modification and supporting documents. It has resulted in 13 documents and plans being referenced. EMM's review of all 13 documents and plans listed within this condition indicates that the site operates generally in accordance with these documents and plans. However, as stated in Section 3.2 of the EA, the requirement for the site to be operated in accordance with the 13 documents and plans listed within this condition has resulted in a complex and cumbersome development consent which is difficult to interpret. It relies on interpretation of all 13 documents and plans to determine what is permitted to be undertaken on the site. Also, many conditions are no longer relevant as they relate either to the asphalt plant or construction of various components of the site which has long been completed. It is recommended that the development consent is simplified by removing complexity and irrelevant conditions and apply production limits to the CBP and throughput limits to the handling facility. For Condition 2, it is recommended that reference to all 13 documents and plans be replaced with reference to the EA prepared for this proposed modification.	The development shall be carried out in accordance with: a) modification DA 14/96 (Mod 10) dated [DATE TO BE INSERTED] and supporting information provided by EMM Consulting dated 28 February 2013 [DATE TO BE INSERTED]~~The development application (DA 14/96), supporting Environmental Impact Statement (EIS), and the option described as "Option A" in the EIS;~~ ~~b) supplementary material prepared by S A Smits and Associates Pty Ltd, dated April 1996, June 1996, 21 September 1998, 25 September 1998, 22 March 1999, 7 May 1999, 21 May 1999, 17 November 1999, 26 November 1999 and 1 March 2000;~~ ~~c) modification application DA 14/96 (Mod 1), granted 12 May 1997 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~d) modification application DA 14/96 (Mod 2), granted 8 December 1998 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~e) modification application DA 14/96 Mod 03-99 (Mod 3), granted 25 June 1999 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~f) modification application DA 14/96-M1 Mod 11-99 (Mod 4), granted 7 April 2000 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~g) modification application DA 14/96 (Mod 5) granted 23 August 2001 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~h) modification application MOD-10-2-2003-I (Mod 6), granted 16 May 2003 and supporting information provided by S A Smits and Associates Pty Ltd;~~

Condition	Comment	Suggested amendment to condition
provided by S A Smits and Associates Pty Ltd; j) modification application DA 14/96 Mod 8 dated 11 December 2012 and supporting information provided EMGA Mitchell McLennan (EMM); k) details of alterations to the layout of the materials handling facility detailed in the letter from S A Smits and Associates dated 25 March 2004, including drawings numbered SEK287-C-009 revision D (11 February 2004) and SEK287-M-001 revision C (11 February 2004); l) details of the cross-over and associated third rail siding detailed in letter from EMM dated 11 December 2012, including drawing number 2569-01; m) modification application DA 14/96 Mod 9 dated 28 February 2013 and supporting information provided by EMM dated 28 February 2013, Boral dated 12 April 2013 and 23 April 2013 and Environ dated 15 May 2013; and n) the conditions of this consent. In the event of an inconsistency between the documents listed from a) to m) above, the most recent document shall prevail to the extent of the inconsistency.		~~i) modification application MOD-34-3-2004-i (Mod 7) granted 11 February 2004 and supporting information provided by S A Smits and Associates Pty Ltd;~~ ~~j) modification application DA 14/96 Mod 8 dated 11 December 2012 and supporting information provided EMGA Mitchell McLennan (EMM);~~ ~~k) details of alterations to the layout of the materials handling facility detailed in the letter from S A Smits and Associates dated 25 March 2004, including drawings numbered SEK287-C-009 revision D (11 February 2004) and SEK287-M-001 revision C (11 February 2004);~~ ~~l) details of the cross-over and associated third rail siding detailed in letter from EMM dated 11 December 2012, including drawing number 2569-01;~~ ~~m) modification application DA 14/96 Mod 9 dated 28 February 2013 and supporting information provided by EMM dated 28 February 2013, Boral dated 12 April 2013 and 23 April 2013 and Environ dated 15 May 2013; and~~ ~~n~~b) the conditions of this consent. ~~In the event of an inconsistency between the documents listed from a) to m) above, the most recent document shall prevail to the extent of the inconsistency.~~
3. In the event of any inconsistency between the conditions of consent and the documents referred to in Condition 2 above, the conditions of this consent prevail.	This condition formed part of the original development consent. It is recommended this condition be amended to reflect recommended changes to Condition 2.	In the event of any inconsistency between the conditions of consent and the document~~s~~ referred to in Condition 2 above, the conditions of this consent prevail.
4. The applicant shall ensure that all contractors engaged to carry out work on the site are served with a copy of the conditions of this consent prior to commencement of work on the site.	This condition formed part of the original development consent. It is assumed that the intention of this condition is for all contractors to be aware of the conditions of the consent to ensure they adhere to, or are complaint with, the conditions. It is not practical to implement. The site management is responsible for ensuring the site operates in accordance with relevant approvals, not contractors. It is recommended that this condition be deleted.	~~The applicant shall ensure that all contractors engaged to carry out work on the site are served with a copy of the conditions of this consent prior to commencement of work on the site.~~

Condition	Comment	Suggested amendment to condition
5. The applicant shall consolidate into one lot and under one title all separate lots to which the development application applies. This shall be registered at the Land Titles Office prior to the release of the building approval.	This condition formed part of the original development consent. The site has been consolidated into one allotment and as the condition is no longer relevant, it should be deleted.	~~The applicant shall consolidate into one lot and under one title all separate lots to which the development application applies. This shall be registered at the Land Titles Office prior to the release of the building approval.~~
Construction and maintenance		
6. Construction shall not commence unless the Director, Development and Environmental Services has approved the incorporation of noise attenuation measures complying with Australian Standard 2021-1994 in relation to interior design sound levels, as part of the building application. The Director, Development and Environmental Services shall not approve this unless the building application is accompanied by certification by a suitably qualified acoustical engineer that the proposed noise attenuation measures satisfy the requirements of Australian Standard 2021-1004.	This condition formed part of the original development consent. A report by Richard Heggies and Associates (1 July 1997) confirming compliance with AS 2021-1994 and AS 2021-1004 was forwarded to Council. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~Construction shall not commence unless the Director, Development and Environmental Services has approved the incorporation of noise attenuation measures complying with Australian Standard 2021-1994 in relation to interior design sound levels, as part of the building application. The Director, Development and Environmental Services shall not approve this unless the building application is accompanied by certification by a suitably qualified acoustical engineer that the proposed noise attenuation measures satisfy the requirements of Australian Standard 2021-1004.~~
7. No lighting shall be installed on the site unless the Director, Development and Environmental Services has approved that its design, location and shielding ensures that no hazard is caused to the aircraft using Sydney Kingsford Smith airport and no injury is caused to the amenity of the surrounding area by light overspill. The Director, Development and Environmental Services shall not approve this unless he sights approval of such lighting proposals from the FAC.	This condition formed part of the original development consent. A letter was received from Federal Airports Corporation (the former Sydney Airport Corporation Limited) (27 June 1997) confirming that the appropriated guidelines were met with respect to lighting in the vicinity of an airport. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted and replaced with a condition which states that: Lighting on the site is not to cause hazard to aircraft using Sydney Kingsford Smith airport. Any change in lighting on the site must be undertaken in accordance with Sydney Airport Corporation Limited.	~~No lighting shall be installed on the site unless the Director, Development and Environmental Services has approved that its design, location and shielding ensures that no hazard is caused to the aircraft using Sydney Kingsford Smith airport and no injury is caused to the amenity of the surrounding area by light overspill. The Director, Development and Environmental Services shall not approve this unless he sights approval of such lighting proposals from the FAC.~~ Lighting on the site is not to cause hazard to aircraft using Sydney Kingsford Smith airport. Any change in lighting on the site must be undertaken in accordance with Sydney Airport Corporation Limited.
8. Operations, other than of the concrete batching plant shall not commence unless the proposed upgrading of the rail siding has been carried out to the extent set-out for Option A in the EIS as modified by the revised condition 2(i). Councillor its delegate shall only approve occupation or commencement of operations if it is satisfied that the works to the rail siding are consistent with those set out for Option A in the EIS as modified.	This condition was modified as part of MOD 2. This condition is no longer relevant to the site and its operations. Operations on the site (ie the materials handling facility and CBP) predominantly utilise aggregates, sand and cement received by rail. It is recommended that this condition be deleted.	~~Operations, other than of the concrete batching plant shall not commence unless the proposed upgrading of the rail siding has been carried out to the extent set-out for Option A in the EIS as modified by the revised condition 2(i). Councillor its delegate shall only approve occupation or commencement of operations if it is satisfied that the works to the rail siding are consistent with those set out for Option A in the EIS as modified.~~

Condition	Comment	Suggested amendment to condition
9. The applicant shall ensure that the rail siding and ancillary works are maintained to a standard which facilitates their use for materials handling and transport to Council's satisfaction at all times.	This condition formed part of the original development consent. Historically, Marrickville Council (Now Inner West Council) has had very little, if any, involvement in compliance management of the site. It is recommended that this condition be modified to remove reference to Council.	The applicant shall ensure that the rail siding and ancillary works are maintained to a standard which facilitates their use for materials handling and transport ~~to Council's satisfaction~~ at all times.
Roads, traffic and parking		
10. The applicant shall meet the cost of improvements to the signalised intersection at the comer of Canal Road and Burrows Road south to the satisfaction of the Director, Technical Services and the Roads and Traffic Authority to achieve a satisfactory level of service during the Morning and Afternoon Peaks. These contributions shall be paid to the RTA upon the written request of the RTA and be accompanied by a verified schedule of costs. Details of the proposed improvements shall be submitted to Council with the Building application.	This condition formed part of the original development consent. In a letter dated 23 October 1996, the Roads and Traffic Authority (the former Roads and Maritime Services) confirmed that the works undertaken at the intersection of Canal Road/Burrows Road North were satisfactory and acceptable to the authority. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~The applicant shall meet the cost of improvements to the signalised intersection at the comer of Canal Road and Burrows Road south to the satisfaction of the Director, Technical Services and the Roads and Traffic Authority to achieve a satisfactory level of service during the Morning and Afternoon Peaks. These contributions shall be paid to the RTA upon the written request of the RTA and be accompanied by a verified schedule of costs. Details of the proposed improvements shall be submitted to Council with the Building application.~~
11. The applicant shall meet the full cost of any works required to be carried out by Council, L.A.W.C., Sydney Water or the RTA in connection with drainage, crossing, alterations to kerb and guttering, footpaths and roads that may be needed as a result of the development in addition to any such works specified in other conditions.	This condition formed part of the original development consent. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~The applicant shall meet the full cost of any works required to be carried out by Council, L.A.W.C., Sydney Water or the RTA in connection with drainage, crossing, alterations to kerb and guttering, footpaths and roads that may be needed as a result of the development in addition to any such works specified in other conditions.~~
12. The applicant shall provide and maintain off-street car and truck parking spaces to cater for peak parking demands in accordance with Marrickville Council's standards prior to commencement of the use of the site.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. Boral provides off-street car and truck parking for all employees, contractors in accordance with the condition. Notwithstanding the above, it is recommended that the condition be amended to remove reference to Marrickville Council and prior to commencement of the use of the site.	The applicant shall provide and maintain off-street car and truck parking spaces to cater for peak parking demands ~~in accordance with Marrickville Council's standards prior to commencement of the use of the site~~.
13. All loading and unloading associated with the development shall be carried out wholly within theproperty.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. All loading and unloading is undertaken on the site in accordance with the condition. No changes are recommended to this condition.	No change

Condition	Comment	Suggested amendment to condition
14. All parking spaces and turning areas shall be used exclusively for parking and not for storage or any other purpose.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. All parking spaces and turning areas are used on site for such in and not any other purpose in compliance with the condition. No changes are recommended to this condition.	No change
15. All vehicles entering and leaving the development shall do so in a forward direction.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. All vehicles enter and leave the site in a forward direction in compliance with the condition. No changes are recommended to this condition.	No change
16. All vehicles associated with the development shall be accommodated wholly within the propertyand not be parked on the adjoining roads or footpaths.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. All vehicles associated with the site and its operations are parked and accommodated onsite in accordance with this condition. No changes are recommended to this condition.	No change.
17. All vehicles carrying materials to or from the site shall have their loads covered with tarpaulins orsimilar covers at all times so that no material is discharged onto public roads.	This condition formed part of the original development consent. It is relevant to management of the site and its current operations. All trucks carrying construction materials to and from the site are covered in compliance with this condition. No changes are recommended to this condition.	No change.
18. The applicant shall construct heavy duty concrete vehicle crossings at the vehicular access locations to the development.	This condition formed part of the original development consent. Heavy duty vehicle crossings were constructed at both the southern and northern entry and exit points. This was addressed in July 1997 with Marrickville Council as a part of the original Building Application. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~The applicant shall construct heavy duty concrete vehicle crossings at the vehicular access locations to the development.~~
18a. The Applicant shall ensure that the maximum traffic generated by the development does not exceed 636 vehicle movements per day.	This condition was added as part of MOD 9. Peak hourly traffic movements for the morning and afternoon commuter peak traffic periods for the locality were recorded during a traffic survey on Thursday 16 October 2015. The results indicate that the site generated 57 and 42 traffic movements in the morning and afternoon peaks, respectively. Using this figure and extrapolating it for 24 hours indicates that the site would not generate more than 636 vehicle movements per day.	~~The Applicant shall ensure that the maximum traffic generated by the development does not exceed 636 vehicle movements per day.~~ The Applicant shall ensure that the annual production of the concrete batching plant does not exceed 280,000 cubic metres (m^3) and the annual throughput of the construction materials handling facility does not exceed 760,000 tonnes.

Condition	Comment	Suggested amendment to condition
	In addition, data provided by Boral indicates that the site currently generates an average of about 482 truck movements per day. Analysis indicates that application of this condition as part of MOD 9 only considers vehicle movements associated with the CBP and asphalt plant as originally approved, not the handling facility. While the asphalt plant has been demolished and does not generate vehicle movements, vehicle movements associated with the handling facility are much higher than those that were generated by the asphalt plant. As such, the condition places an unreasonable restriction on the amount of concrete and construction materials that the site can despatch. In addition, this is the only condition which regulates production of the CBP and throughput of the handling facility. Production and throughput at other sites containing similar facilities are generally regulated by conditions capping or limiting production and throughput. It is recommended this condition be deleted and replaced with a condition restricting production at the CBP and throughput of the handling facility.	
Landscaping		
19. The development shall not commence operations unless a detailed Landscape Plan in accordance with Marrickville Development Control Plan No 1 - Landscaping, has first been approved by the Director, Technical Services. The landscape plan must satisfactorily detail landscaping of land adjacent to the Alexandra Canal as shown between points C and D on the "Preliminary Site Layout" Plan No 96113/04 Rev A, 19/02/97. It shall also satisfactorily detail screen planting along the site boundary shown between points A and B on that same plan. The plans shall also include the following landscape details: a) landscape treatments such as fence, retaining walls, paving, lawn planting, outdoor furnishings, edging details; b) planting schedule and revegetation plan detailing location, container sizes and botanical names of all trees, shrubs and groundcovers incorporating wherever possible a variety of species endemic to the area; c) site, street and other close proximity trees such be	This condition was contained in the original consent and then modified as part of MOD 1. A landscape plan was supplied to Marrickville Council in July 1997, as a part of the Building Application documentation. The landscape plan maintained a 10 m wide landscaping strip along the canal, as requested by Council in a meeting on 13 May 1997. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~The development shall not commence operations unless a detailed Landscape Plan in accordance with Marrickville Development Control Plan No 1 - Landscaping, has first been approved by the Director, Technical Services. The landscape plan must satisfactorily detail landscaping of land adjacent to the Alexandra Canal as shown between points C and D on the "Preliminary Site Layout" Plan No 96113/04 Rev A, 19/02/97. It shall also satisfactorily detail screen planting along the site boundary shown between points A and B on that same plan. The plans shall also include the following landscape details:~~ ~~a) landscape treatments such as fence, retaining walls, paving, lawn planting, outdoor furnishings, edging details;~~ ~~b) planting schedule and revegetation plan detailing location, container sizes and botanical names of all trees, shrubs and groundcovers incorporating wherever possible a variety of species endemic to the area;~~ ~~c) site, street and other close proximity trees such be accurately located on the site/landscape plan and shall be identified as being either retained, trimmed, transplanted~~

Condition	Comment	Suggested amendment to condition
accurately located on the site/landscape plan and shall be identified as being either retained, trimmed, transplanted or removed; and d) areas of cut and fill.		~~or removed; and~~ ~~d) areas of cut and fill.~~
20. The landscaping of the site shall be completed before the development commences operation and shall be maintained at all times in accordance with the approved plan or any variation to that plan which the Director, Technical Services, may approve.	This condition formed part of the original development consent. Vegetation screens have been planted along the site frontage to Alexandria Canal and Burrows Road. It is recommended that this condition be modified to remove reference to the need for the landscaping to be completed before development commences at the site.	The landscaping of the site s~~hall be completed before the development commences operation and~~ shall be maintained at all times ~~in accordance with the approved plan or any variation to that plan which the Director, Technical Services, may approve~~.
Remediation		
21. No work or construction shall be carried out on site until the EPA approves the Environmental Auditors validation of any remediation carried out on the site. The final remediation validation report, together with the certification by an approved Environmental Auditor for Contaminated Sites shall be submitted to the Director, Development and Environmental Services prior to release of building approval.	This condition formed part of the original development consent. A report titled 'Remediation and validation of the Boral concrete and quarries stockpile areas St Peters, NSW, January 1997' prepared by Environmental and Earth Sciences was provided to Council in July 1997 as a part of the Building Application documentation. This condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~No work or construction shall be carried out on site until the EPA approves the Environmental Auditors validation of any remediation carried out on the site. The final remediation validation report, together with the certification by an approved Environmental Auditor for Contaminated Sites shall be submitted to the Director, Development and Environmental Services prior to release of building approval.~~
Hydrology		
22. Construction shall not commence on site unless the Director, Technical Services has approvedmeasures to ensure all roof and surface stormwater from the site of the proposed development and any catchment external to the site that presently drains into the site, shall be collected in a system of pits and pipelines/channels and major storm event surface flow paths and discarded to a Sydney Water controlled storm water drainage system. The Director, Technical Services shall not grant this approval unless a copy of the written approval of Sydney Water for the proposed drainage system is submitted in conjunction with the Building Application.	This condition formed part of the original development consent. A report on stormwater drainage and site levels was provided to Council in July 1997 as a part of the Building Application documentation. Details of surface water controls are contained within Section 9.1 of the EA. All stormwater from the site is directed into stormwater detention system in compliance with this condition. It is recommended that this condition be amended to remove reference to requirements for approvals for surface water controls.	~~Construction shall not commence on site unless the Director, Technical Services has approved measures~~The proponent must ~~to~~ ensure all roof and surface stormwater from the site ~~of the proposed development~~ and any catchment external to the site that presently drains into the site, shall be collected in a system of pits and pipelines/channels and major storm event surface flow paths and discarded to a Sydney Water controlled storm water drainage system. ~~The Director, Technical Services shall not grant this approval unless a copy of the written approval of Sydney Water for the proposed drainage system is submitted in conjunction with the Building Application.~~
23. Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application. These plans shall detail the existing and proposed site drainage network including plans and longitudinal sections of pipeline, the location of pins, pipe	This condition formed part of the original development consent. A report on stormwater drainage and site levels and the waste water recycling system was provided to Council in July 1997 as a part of the Building Application documentation.	~~Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application. These plans shall detail the existing and proposed site drainage network including plans and longitudinal sections of pipeline, the location of pins, pipe invert and pit surface levels,~~

Condition	Comment	Suggested amendment to condition
invert and pit surface levels, junction details, size and class of pipes, trench conditions and details of surface flow paths together with hydrologic and hydraulic calculations that details the drainage network and the capacities of the various surface flow regimes. Where flows are in (~excess of 100 litres/second then a hydraulic grade line analysis will be required before the Director, Technical Services may give approval.	It is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~junction details, size and class of pipes, trench conditions and details of surface flow paths together with hydrologic and hydraulic calculations that details the drainage network and the capacities of the various surface flow regimes. Where flows are in (~excess of 100 litres/second then a hydraulic grade line analysis will be required before the Director, Technical Services may give approval.~~
24. Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application detailing surface levels, which shall be controlled over the existing and/or proposed drainage easement or across the site of development to create a major storm event overland flow path system to cater for the 100 year AR1 event. Any overland flow from external catchments shall be anticipated and incorporated in the major event surface flow drainage system. Details of the way overland flows shall be discharged shall be included in the plan.	This condition formed part of the original development consent. A report on stormwater drainage and site levels was provided to Council in July 1997 as a part of the Building Application documentation. It is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~Construction shall not commence unless the Director, Technical Services has approved plans in conjunction with the building application detailing surface levels, which shall be controlled over the existing and/or proposed drainage easement or across the site of development to create a major storm event overland flow path system to cater for the 100 year AR1 event. Any overland flow from external catchments shall be anticipated and incorporated in the major event surface flow drainage system. Details of the way overland flows shall be discharged shall be included in the plan.~~
25. An easement for drainage in favour of and at no cost to Council, shall be created over the full length and width of the major storm event surface flow paths within the site of development. A dealing number for registration of the easement shall be obtained from the Land Titles Office prior to the occupation of the site and the Council informed in writing.	This condition formed part of the original development consent. An easement for drainage has been created in accordance with the condition - refer to the survey plan of the existing layout of the site at Appendix C of the EA shows a drainage easement registered on the site's title - refer to "(B) DRAINAGE EASEMENT 3.05 WIDE - C588175". Notwithstanding the above, the condition is not considered to be relevant to the site and its operations. It is recommended that this condition be deleted.	~~An easement for drainage in favour of and at no cost to Council, shall be created over the full length and width of the major storm event surface flow paths within the site of development. A dealing number for registration of the easement shall be obtained from the Land Titles Office prior to the occupation of the site and the Council informed in writing.~~
26. Buildings, plant and equipment including material storage areas shall be set at a minimum height of 500mm above the 1 % Annual Exceedance Probability (AEP) flood event for Alexandra Canal. Details of existing and proposed site levels and means of providing 500mm freeboard above the 1% AEP flood event shall be submitted to Council with the Building Application. Variations below 500mm shall only be with the written agreement of the Director, Technical Services.	This condition formed part of the original development consent. It is recommended that this condition be modified to remove reference to the need for details of existing and proposed site levels and means of providing 500mm freeboard above the 1% AEP flood event be provided to Council with the Building Application. It is also recommended that any variation to the provision of buildings, plant and equipment including material storage areas below 500 mm freeboard above the 1% AEP flood event be only undertaken with the written agreement of the Secretary.	Buildings, plant and equipment including material storage areas shall be set at a minimum height of 500mm above the 1 % Annual Exceedance Probability (AEP) flood event for Alexandra Canal.~~ Details of existing and proposed site levels and means of providing 500mm freeboard above the 1% AEP flood event shall be submitted to Council with the Building Application.~~ Variations below 500mm shall only be with the written agreement of the ~~Director, Technical Services~~Secretary.

Condition	Comment	Suggested amendment to condition
27. Construction shall not commence unless the Director, Technical Services has approved a sediment control plan in conjunction with the Building Approval. The plan shall specify sediment control measures to be established and maintained in proper working order to prevent sediment discharge from the construction site.	This condition formed part of the original development consent. A sediment control plan was provided to Council in July 1997 as a part of the Building Application documentation. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~Construction shall not commence unless the Director, Technical Services has approved a sediment control plan in conjunction with the Building Approval. The plan shall specify sediment control measures to be established and maintained in proper working order to prevent sediment discharge from the construction site.~~
Demolition and construction		
28. All demolition, construction and associated work necessary for the carrying out the development shall be restricted to between the hours of 6 am to 10 pm Mondays to Saturdays, excluding Sundays and Public Holidays. All trucks and vehicles associated with the construction, including those delivering to or removing material from the site, shall only have access to the site during these hours. All construction vehicles bringing materials to and from the site shall be loaded and unloaded wholly within the property. No waste collection skips, spoil, excavation or demolition material from the site or building materials associated with the construction of the development shall be deposited on the public road, footpath, public place or Council owned property without Council's approval. The applicant shall ensure that all contractors associated with the development are fully aware of these requirements.	This condition formed part of the original development consent. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~All demolition, construction and associated work necessary for the carrying out the development shall be restricted to between the hours of 6 am to 10 pm Mondays to Saturdays, excluding Sundays and Public Holidays. All trucks and vehicles associated with the construction, including those delivering to or removing material from the site, shall only have access to the site during these hours. All construction vehicles bringing materials to and from the site shall be loaded and unloaded wholly within the property. No waste collection skips, spoil, excavation or demolition material from the site or building materials associated with the construction of the development shall be deposited on the public road, footpath, public place or Council owned property without Council's approval. The applicant shall ensure that all contractors associated with the development are fully aware of these requirements.~~
28a. The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) for the project that outlines environmental management practices and procedures to be followed during construction. The Plan shall: a) be prepared to the satisfaction of the Director-General prior to the commencement of any construction works associated with modification application DA 14/96 Mod 8; b) include: i. hours of construction; ii. soil and water management measures; iii. noise and air quality control measures; and	This condition was included within the consent as part of MOD 8. The CEMP was forwarded to DP&E on 27 March 2013, in accordance with this condition. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) for the project that outlines environmental management practices and procedures to be followed during construction. The Plan shall:~~ ~~a) be prepared to the satisfaction of the Director-General prior to the commencement of any construction works associated with modification application DA 14/96 Mod 8;~~ ~~b) include:~~ ~~i. hours of construction;~~ ~~ii. soil and water management measures;~~ ~~iii. noise and air quality control measures; and~~ ~~iv. traffic arrangements and management measures, including details on vehicle routes, access~~

Condition	Comment	Suggested amendment to condition
iv. traffic arrangements and management measures, including details on vehicle routes, access arrangements and traffic controls.		~~arrangements and traffic controls.~~
28b. Prior to the commencement of construction works associated with modification application DA 14/96 Mod 8 (Mod 8), the Proponent shall undertake preliminary testing in the area proposed to be disturbed by Mod 8 to determine whether acid sulfate soils are present. Should the soil testing identify the presence of acid sulfate soils, the Proponent shall prepare and implement, prior to the construction of Mod 8, management measures to control the disturbance of the acid sulfate soils, to the satisfaction of the Director-General.	This condition was included within the consent as part of MOD 8. An acid sulfate soils (ASS) sampling report was forwarded to DP&E on 27 March 2013 confirming a very low potential for ASS on the site and that no further management actions were considered necessary. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~Prior to the commencement of construction works associated with modification application DA 14/96 Mod 8 (Mod 8), the Proponent shall undertake preliminary testing in the area proposed to be disturbed by Mod 8 to determine whether acid sulfate soils are present.~~ ~~Should the soil testing identify the presence of acid sulfate soils, the Proponent shall prepare and implement, prior to the construction of Mod 8, management measures to control the disturbance of the acid sulfate soils, to the satisfaction of the Director-General~~.
Plant operations		
29. Garbage and any trade waste shall be stored in a location approved by the Council and be disposed of in an approved manner. All liquid wastes, (other than stormwater) shall be discharged to the sewer in accordance with the requirements of the Sydney Water Corporation. In this regard, satisfactory arrangements for the disposal of trade wastes should be made with Sydney Water Corporation prior to commencement of operations.	This condition formed part of the original development consent. With the exception of general office waste and return concrete waste, the site does not generate any trade waste. Also, with the exception of sewage, no liquid wastes, are required to be discharged to the sewer. Accordingly, this condition is not considered to be relevant to the site and its operations. It is recommended that this condition be deleted.	~~Garbage and any trade waste shall be stored in a location approved by the Council and be disposed of in an approved manner. All liquid wastes, (other than stormwater) shall be discharged to the sewer in accordance with the requirements of the Sydney Water Corporation. In this regard, satisfactory arrangements for the disposal of trade wastes should be made with Sydney Water Corporation prior to commencement of operations.~~
30. Details of the 'wash down stand area' and the truck washing facility shall be submitted to Council with the building application. All vehicles associated with the development shall be cleaned in the wash down area with particular attention to the wheels prior to leaving the site.	This condition formed part of the original development consent. Details addressing the requirements of this condition were provided to Marrickville Council in July 1997 as a part of the Building Application documentation. This condition, in EMM's opinion, is both impractical and impossible to comply with. Firstly, most trucks do not require cleaning as their condition both on entering and exiting the site are the same as trucks using the local road network. In addition, due to the volume of trucks using the site, it is impractical for all trucks to be washed. The basis of this condition is to ensure that cement and quarry materials are not tracked onto the external road network. As such, it is recommended that this condition be amended to ensure that trucks leaving the site do not track cement and quarry materials onto the external road network.	~~Details of the 'wash down stand area' and the truck washing facility shall be submitted to Council with the building application. All vehicles associated with the development shall be cleaned in the wash down area with particular attention to the wheels prior to leaving the site.~~ The proponent must ensure that vehicles exiting the site do not track cement and quarry materials onto the external road network.

Condition	Comment	Suggested amendment to condition
31. All wash down areas, the truck washing facility and all other areas likely to be contaminated shall be isolated from the stormwater drainage system to the satisfaction of the Director, Technical Services, the Environment Protection Authority and Sydney Water Corporation. Details of the requirements of these authorities including any Trade Wastewater agreements which are required by Sydney Water shall be submitted to the Director, Technical Services in conjunction with the building application.	This condition formed part of the original development consent. Details addressing the requirements of this condition were provided to Marrickville Council in July 1997 as a part of the Building Application documentation. All water from washdown areas and the truck washing facility is directed into a water recycling facility which collects and treats water before being reused onsite. It is recommended that this condition be modified to remove reference to approval requirements from the Director, Technical Services, the Environment Protection Authority and Sydney Water Corporation.	All wash down areas, the truck washing facility and all other areas likely to be contaminated shall be isolated from the stormwater drainage system ~~to the satisfaction of the Director, Technical Services, the Environment Protection Authority and Sydney Water Corporation. Details of the requirements of these authorities including any Trade Wastewater agreements which are required by Sydney Water shall be submitted to the Director, Technical Services in conjunction with the building application~~.
32. The refuelling area shall be covered, bunded, and drained to the sewer with Sydney Water approval, in accordance with the Environment Protection Authority Guidelines -Surface Water Management on Service Station Forecourts.	This condition formed part of the original development consent. Refuelling no longer occurs on-site as the site does not contain any fuel storages or tanks. Accordingly, this condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~The refuelling area shall be covered, bunded, and drained to the sewer with Sydney Water approval, in accordance with the Environment Protection Authority Guidelines -Surface Water Management on Service Station Forecourts.~~
33. All materials associated with the operation of the proposal shall be stored in suitably constructed and enclosed containers or similar facilities on the premises in a neat and tidy manner and at all times to Council's satisfaction. Details of the storage containers/facilities shall be submitted with the building application.	This condition formed part of the original development consent. All materials stored on site are appropriately stored and contained in silos, pits, bunkers and the like. While the condition is relevant to ongoing operations, as previously mentioned in relation to Condition 9, Council has had very little, if any, involvement in compliance management of the site. Therefore, it is recommended that this condition be modified to remove reference to approval requirements to Council.	All materials associated with the operation of the proposal shall be stored in suitably constructed and enclosed containers or similar facilities on the premises in a neat and tidy manner and at all times ~~to Council's satisfaction. Details of the storage containers/facilities shall be submitted with the building application~~.
Dust		
33a. The Applicant shall maintain the premises in a condition which minimises the emission of dust.	This condition was included within the consent as part of MOD 9. It is relevant to management of the site and its current operations. The site is managed to minimise the emission of dust. Management measures include, but are not limited to, covered conveyors, water sprays and sprinklers, use of a water cart and pavement and street sweeping. The air quality assessment prepared to accompany this modification (see Chapter 7 and Appendix B) indicates that existing emissions of TSP, PM10 and PM2.5 are below relevant EPA criteria. However, the air quality assessment also indicates that existing dust deposition levels, an indicator of nuisance impacts, are above EPA criteria. This is	No changes are recommended to this condition.

Condition	Comment	Suggested amendment to condition
	attributable to the generation of dust associated with the movement of vehicles across the paved surfaces of the site. It is recommended that existing dust controls associated with the reduction of paved surface silt loading are reviewed andwhere possible improved. It is recommended that Boral gives priority to the improvement ofmethods employed to manage and reduce the silt loading of paved surfaces at site.	
33b. No stockpile on site should exceed a height of 4m above ground level or the combined height of the concrete barrier and green mesh fencing, whichever is the lesser.	This condition was included within the consent as part of MOD 9. It is relevant to management of the site and its current operations. Stockpiles are maintained at about the combined height of the concrete barrier and mesh fencing.	No changes are recommended to this condition.
Noise		
33c. The Applicant shall ensure that the noise from the development does not exceed the noise limits presented in Table 1.	This condition was included within the consent as part of MOD 9. It is relevant to management of the site and its current operations. Noise monitoring indicates that noise generated by operations at the site meet the limits at the locations referenced in Table 1 of the consent.	No changes are recommended to this condition.
Public utilities		
34. The cost of any augmentation of any public utility services (not being a service provided by-Council) required as a result of the development shall be borne by the provider or the applicant.	This condition formed part of the original development consent. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~The cost of any augmentation of any public utility services (not being a service provided by-Council) required as a result of the development shall be borne by the provider or the applicant.~~
Section 94		
35. Pursuant to Section 94 of the Environmental Planning and Assessment Act and Marrickville Contributions Plan 1993, the applicant shall make a monetary contribution of $50,077.80 towards the implementation of a traffic management scheme for Sub-Arterial roads. The contribution shall be in cash or an unendorsed bank cheque and shall be forwarded to Council before approved building plans and specifications are released.	This condition formed part of the original development consent. This condition is no longer relevant to the site and its operations and it is recommended that this condition be deleted.	~~Pursuant to Section 94 of the Environmental Planning and Assessment Act and Marrickville Contributions Plan 1993, the applicant shall make a monetary contribution of $50,077.80 towards the implementation of a traffic management scheme for Sub-Arterial roads. The contribution shall be in cash or an unendorsed bank cheque and shall be forwarded to Council before approved building plans and specifications are released.~~

Condition	Comment	Suggested amendment to condition
Environmental management and monitoring		
36. The Applicant shall prepare an Environmental Management and Monitoring Plan. Construction may not commence unless the plan has been approved by the Director-General, following approval by Sydney Water, Council, the EPA and the Department of Land and Water Conservation. The Plan shall show how odour, dust, noise and water impacts will be measured, monitored, managed and mitigated and it shall be prepared in consultation with the EPA, LAWC, Sydney Water and Council. The Plan is to include (but not be limited to) the following: a. Odour The management of odour inside and outside the site boundary, including a staged response program to mitigate any nuisance. b. Dust The management of dust impacts, including the impacts of construction works and operation of the development. The presentation of background dust data for the period from notification of consent to commencement of construction/demolition is to be included as a baseline measure in any dust management plan. c. Noise The management of any vibration transmitted to a place of another land user; any sound level at any point on the boundary of the site greater than the levels specified in Australian Standard 1055-1989; any "offensive noise" as defined in the Noise Control Act 1975. (iv) Water The management of polluted waters including the details of the pollution control systems, silt arrestors and separator pits intended to collect and dispose of any polluted water. The management of stormwater collection and discharge from the asphalt plant holding tanks and concrete plant including details of first flush tanks from the designated 'dirty' area.	This condition formed part of the original development consent. It is generally relevant to the site and its operations. An Environmental Management and Monitoring Plan was provided to Marrickville Council in July 1997 as a part of the Building Application documentation. Given that the asphalt plant has been decommissioned and removed, there are no nuisance odour sources at the site. As such, it is recommended that any reference of requirements relating to odour are removed from the condition. It is also recommended that this condition be modified to remove references to construction and approval requirements from relevant agencies,and any references to the Noise Control Act 1975 be amended to reference the INP.	The Applicant shall prepare an Environmental Management and Monitoring Plan. ~~Construction may not commence unless the plan has been approved by the Director-General, following approval by Sydney Water, Council, the EPA and the Department of Land and Water Conservation.~~ The Plan shall show how ~~odour,~~ dust, noise and water impacts will be measured~~, monitored, managed and mitigated and it shall be prepared in consultation with the EPA, LAWC, Sydney Water and Council~~. The Plan is to include (but not be limited to) the following: ~~a. Odour~~ ~~The management of odour inside and outside the site boundary, including a staged response program to mitigate any nuisance.~~ a. Dust The management of dust impacts, including the impacts of ~~construction works and~~ operation of the development. The presentation of background dust data for the period from notification of consent to commencement of construction/demolition is to be included as a baseline measure in any dust management plan. b. Noise The management of any vibration transmitted to a place of another land user; any sound level at any point on the boundary of the site greater than the levels specified in the NSW EPA's Industrial Noise Policy ~~Australian Standard 1055-1989; any "offensive noise" as defined in the Noise Control Act 1975~~. c. Water The management of polluted waters including the details of the pollution control systems, silt arrestors and separator pits intended to collect and dispose of any polluted water. The management of stormwater collection and discharge from the ~~asphalt plant holding tanks and~~ concrete plant including details of first flush tanks from the designated 'dirty' area. ~~The requirements of any Trade Waste Agreement with Sydney Water.~~ A maintenance programme for cleaning oil skimmer pits,

Condition	Comment	Suggested amendment to condition
The requirements of any Trade Waste Agreement with Sydney Water. A maintenance programme for cleaning oil skimmer pits, stormwater pits and traps. Any other environmental management or pollution control matter raised by Council, Sydney Water, the Department of Land and Water Conservation or the EPA during the consultation process.		stormwater pits and traps. ~~Any other environmental management or pollution control matter raised by Council, Sydney Water, the Department of Land and Water Conservation or the EPA during the consultation process.~~
Emergency procedures		
37. Operation shall not commence on the site until a Plan for the management of people, plant, equipment and materials in the event of fire, flood or explosion including evacuation procedures has been approved by the WorkCover Authority and a copy of this approval forwarded to the Director, Development and Environmental Services.	This condition formed part of the original development consent. The Emergency Procedures for the site were provided to Marrickville Council in July 1997 as a part of the Building Application documentation. The WorkCover Authority advised Boral at the time that they no longer provide approval for such documents. The condition is no longer relevant to, or required for, the current operations on the site, as the need for an emergency procedures plan would have largely been driven by risks posed by the asphalt plant (which has been decommissioned and removed from the site). It is recommended that this condition be deleted.	~~Operation shall not commence on the site until a Plan for the management of people, plant, equipment and materials in the event of fire, flood or explosion including evacuation procedures has been approved by the WorkCover Authority and a copy of this approval forwarded to the Director, Development and Environmental Services.~~
Signage		
38. Details of all site signage including: a) street signage at the Burrows Road south frontage; and a) internal road signage shall be submitted for the approval of the Director, Technical Services in conjunction with the Building Application.	This condition formed part of the original development consent. Street signage designs were included in the 'General Drawing' section of the Building Application documentation submitted to Marrickville Council in July 1997. The condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~Details of all site signage including:~~ ~~b) street signage at the Burrows Road south frontage; and~~ ~~internal road signage shall be submitted for the approval of the Director, Technical Services in conjunction with the Building Application.~~
Rail quarry product delivery		
39. The applicant shall use rail freight for quarry product delivery to the extent set out for Option A in the EIS wherever reasonably practicable. The applicant shall submit to Council quarterly reports on rail quarry product delivery tonnage and road quarry product delivery tonnage indicating how rail has been used during that quarter. The report should include justification where rail has not been used to the extent set out for Option A in the EIS.	This condition formed part of the original development consent. Quarterly reports are not submitted to Marrickville Council which outline quarry product delivery tonnage by both road and rail for each quarter. Notwithstanding the above it is clear that rail is predominantly used to deliver materials to the site which has resulted in a significant reduction of truck movements to and from the site. As stated in	~~The applicant shall use rail freight for quarry product delivery to the extent set out for Option A in the EIS wherever reasonably practicable. The applicant shall submit to Council quarterly reports on rail quarry product delivery tonnage and road quarry product delivery tonnage indicating how rail has been used during that quarter.~~ ~~The report should include justification where rail has not been used to the extent set out for Option A in the EIS. Justification~~

Condition	Comment	Suggested amendment to condition
Justification can include and take into account relevant environmental, logistical, social or economic circumstances and factors.	Section 2.4.1 of the EA, while the split between rail and road transport modes is approximate and varies from year to year, Boral uses rail freight for the delivery of bulk construction materials where ever practicable. Typically, the site receives about 647,000 tpa of construction materials by rail, compared to 112,000 tpa by road. The condition is not relevant to the site and its operations. It is recommended that this condition be deleted.	~~can include and take into account relevant environmental, logistical, social or economic circumstances and factors.~~
40. Council may require at the applicant's expense, an independent audit of rail use for quarry product delivery if it considers that the report has not justified that rail use has been used wherever reasonably practicable.	This condition formed part of the original development consent. Council has not commissioned or undertaken an independent audit of rail use, particularly given Boral has not provided quarterly reports required by Condition 39. Notwithstanding the above, given it is recommended that Condition 39 be deleted, it is also recommended that this condition be deleted.	~~Council may require at the applicant's expense, an independent audit of rail use for quarry product delivery if it considers that the report has not justified that rail use has been used wherever reasonably practicable.~~
41. The first report to Council shall be submitted 6 months after commencement of operations of the development.	Refer to comment on Condition 39. The condition is not relevant to the site and its operations. It is recommended that this condition be deleted.	~~The first report to Council shall be submitted 6 months after commencement of operations of the development.~~
Safety studies		
42. Prior to introduction of butane to the site, the applicant shall confirm in writing to the Director-General that all recommendations made, including the development of a Safety Management System, in the preliminary hazard analysis prepared as part of the modification application dated 19 March 1999 to use butane gas, have been implemented. The Safety Management System should be developed in accordance with the principles detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory paper No.9, "Safety Management".	This condition was included in the development consent as part of MOD 3. Butane is no longer stored and used on site. The use of butane was for heating associated with the asphalt plant, which has been decommissioned and demolished and no longer in operation. The condition is no longer relevant to the site and its operations. It is recommended that this condition be deleted.	~~Prior to introduction of butane to the site, the applicant shall confirm in writing to the Director-General that all recommendations made, including the development of a Safety Management System, in the preliminary hazard analysis prepared as part of the modification application dated 19 March 1999 to use butane gas, have been implemented. The Safety Management System should be developed in accordance with the principles detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory paper No.9, "Safety Management".~~
43. At least one month prior to the commencement of construction of the butane system (except for construction of those preliminary works that are outside the scope of the hazard studies), or within such further period as the Director-General may agree, the Applicant shall prepare and submit for the approval of the Director-General the studies set out under subsections (a) and (b). Construction, other than of preliminary works, shall not commence until approval has	As above The condition is no longer relevant to the site and its operations as the asphalt operations have been decommissioned and demolished. It is recommended that this condition be deleted.	~~At least one month prior to the commencement of construction of the butane system (except for construction of those preliminary works that are outside the scope of the hazard studies), or within such further period as the Director-General may agree, the Applicant shall prepare and submit for the approval of the Director-General the studies set out under subsections (a) and (b). Construction, other than of preliminary works, shall not commence until approval has been given by the~~

Condition	Comment	Suggested amendment to condition
been given by the Director-General and, with respect to the fire safety study, approval has also been given by the Commissioner of the NSW Fire Brigades. a. FIRE SAFETY STUDY A fire safety study for the butane system. This study shall cover all aspects detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.2, "Fire Safety Study Guidelines" and the New South Wales Government's "Best Practice Guidelines for Contaminated Water Retention and Treatment Systems". The study shall also be submitted for approval, to the NSW Fire Brigades. b. HAZARD AND OPERABILITY STUDY A Hazard and Operability Study for the butane system, chaired by an independent qualified person approved by the Director-General prior to the commencement of the study. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.8, "HAZOP Guidelines".		~~Director-General and, with respect to the fire safety study, approval has also been given by the Commissioner of the NSW Fire Brigades.~~ ~~a. FIRE SAFETY STUDY~~ ~~A fire safety study for the butane system. This study shall cover all aspects detailed in the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.2, "Fire Safety Study Guidelines" and the New South Wales Government's "Best Practice Guidelines for Contaminated Water Retention and Treatment Systems". The study shall also be submitted for approval, to the NSW Fire Brigades.~~ ~~b. HAZARD AND OPERABILITY STUDY~~ ~~A Hazard and Operability Study for the butane system, chaired by an independent qualified person approved by the Director-General prior to the commencement of the study. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.8, "HAZOP Guidelines".~~
Hazard audit		
44. No later than two months after the commencement of operation of the butane system, or within such further period as the Director-General may agree, the Applicant shall carry out a comprehensive hazard audit of the butane system and within one month of the audit submit a report to the Director-General. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.5, "Hazard Audit Guidelines". The report shall include a program for the implementation of the recommendations made in the audit, with firm completion dates. The audit shall be carried out at the applicant's expense by a duly qualified independent person or team approved by the Director-General prior to commencement of the audit. Further audits shall be carried out every three years or as determined by the Director-General and a report of each audit shall within a month of the ' audit be submitted to the Director-General.	As above. The condition is no longer relevant to the site and its operations as the asphalt operations have been decommissioned and demolished. It is recommended that this condition be deleted.	~~No later than two months after the commencement of operation of the butane system, or within such further period as the Director-General may agree, the Applicant shall carry out a comprehensive hazard audit of the butane system and within one month of the audit submit a report to the Director-General. The study shall be carried out in accordance with the Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No.5, "Hazard Audit Guidelines". The report shall include a program for the implementation of the recommendations made in the audit, with firm completion dates. The audit shall be carried out at the applicant's expense by a duly qualified independent person or team approved by the Director-General prior to commencement of the audit. Further audits shall be carried out every three years or as determined by the Director-General and a report of each audit shall within a month of the ' audit be submitted to the Director-General.~~

Condition	Comment	Suggested amendment to condition
45. The Applicant shall update the following reports, studies and documents, as may be required from time to time, to reflect alterations to the site layout that may be approved: a) Landscape Plan (condition 19); b) Environmental Management and Monitoring Plan (condition 36); c) Emergency Procedures (condition 37); d) Safety Management System (condition 42); and e) Fire Safety Study (condition 43(a)). Following an update to any of the reports, studies and documents above, the Applicant shall provide written confirmation to the Director-General that the reports, studies and documents are consistent with relevant requirements, as detailed in this consent.	This condition was included in the development consent as part of MOD 7. As stated above, given the decommissioning and demolition of the asphalt plant, the emergency procedures plan, the safety management system and the fire safety study are no longer relevant or required for the site. It is recommended that this condition be amended to remove reference to the landscape plan, emergency procedures plan, the safety management system, the fire safety study, and the landscape plan. It is also recommended that reference to the Director-General be replaced with a reference to the Secretary.	The Applicant shall update the following reports, studies and documents, as may be required from time to time, to reflect alterations to the site layout that may be approved: ~~a) Landscape Plan (condition 19);~~ ~~b~~a) Environmental Management and Monitoring Plan (condition 36); ~~c) Emergency Procedures (condition 37);~~ ~~d) Safety Management System (condition 42); and~~ ~~e) Fire Safety Study (condition 43(a))~~. Following an update to any of the reports, studies and documents above, the Applicant shall provide written confirmation to the Secretary ~~Director-General~~ that the reports, studies and documents are consistent with relevant requirements, as detailed in this consent.
46. The Applicant shall obtain all relevant Part 4A Certificates as described under section 109C of the Act for relevant structures and buildings on the site.	This condition was included in the development consent as part of MOD 7. It is still relevant for the management and operations for the site.	Nil.
47. All demolition shall be conducted in accordance with the provisions of AS2601 as required by clause 92(1)(b) of the Environmental Planning and Assessment Regulation 2000.	This condition was included in the development consent as part of MOD 7. No demolition of buildings or structures are proposed at the site, and therefore this condition is considered to be no longer relevant. It is recommended that this condition be deleted.	~~All demolition shall be conducted in accordance with the provisions of AS2601 as required by clause 92(1)(b) of the Environmental Planning and Assessment Regulation 2000.~~

Condition	Comment	Suggested amendment to condition
Incident reporting		
48. The Applicant shall notify the Director-General and any other relevant agencies of any incident or potential incident with actual or potential significant off-site impacts on people or the biophysical environment associated with the development as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of this incident, the Applicant shall provide the Director-General and any relevant agencies with a detailed report on the incident. The Applicant shall notify the Director-General and any other relevant agencies of any incident associated with the development as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant shall provide the Director-General and any relevant agencies with a detailed report on the incident.	This condition was included in the development consent as part of MOD 7. It is still relevant to the site and its operations. No changes are recommended to this condition.	Nil.

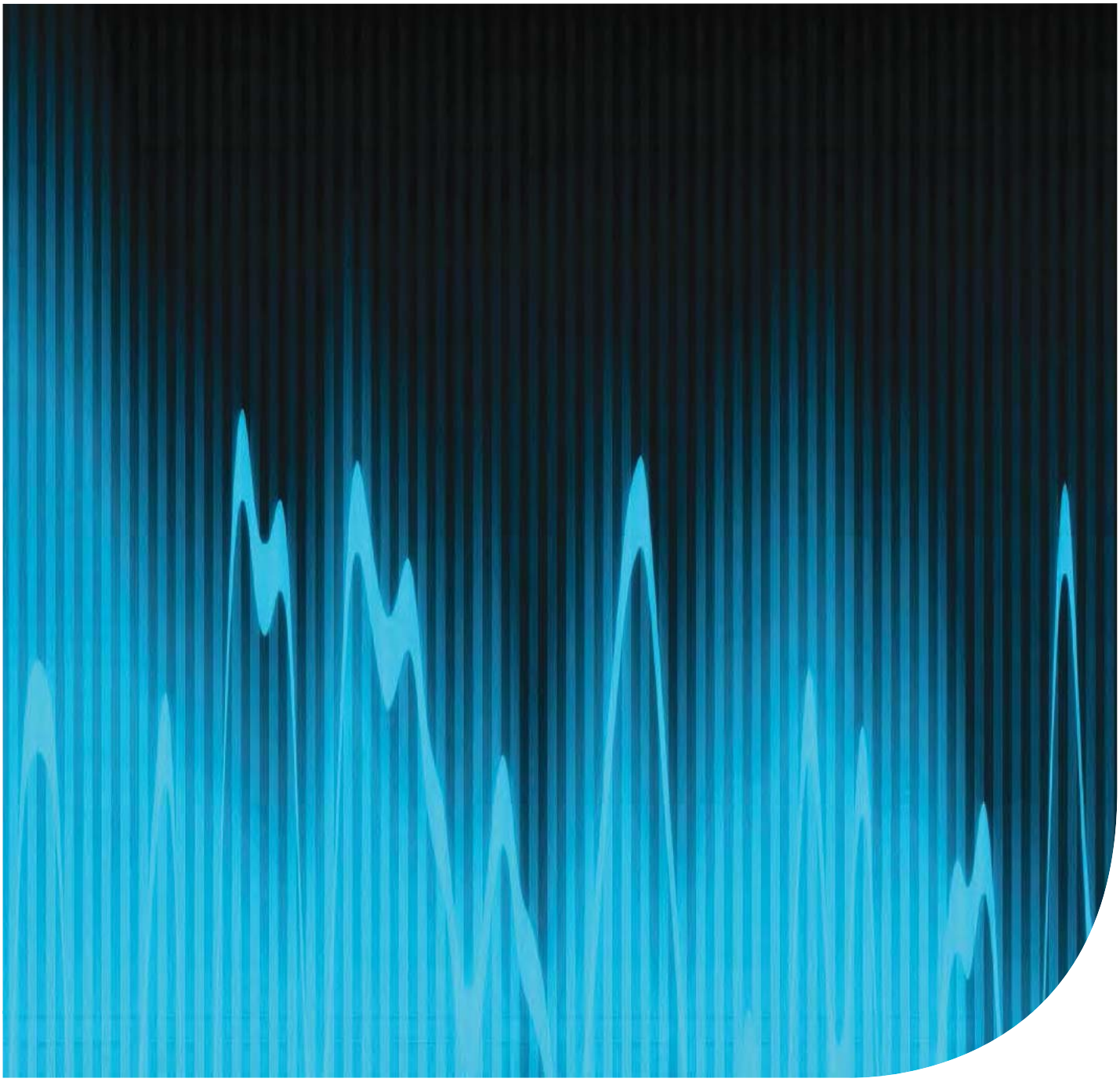
Appendix E

Noise assessment

Boral St Peters
Concrete batching plant and quarry materials handling facility

Noise assessment

Prepared for Boral Resources (NSW) Pty Limited| July 2016



Noise assessment

Modification of development consent | Boral St Peters

Prepared for Boral Resources (NSW) Pty Ltd | 20 July 2016

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Noise assessment

Final

Report J15100BRP1 | Prepared for Boral Resources (NSW) Pty Ltd | 20 July 2016

Prepared by	**Lucas Adamson**	Approved by	**Najah Ishac**
Position	Acoustic Consultant	Position	Director
Signature		Signature	
Date	20 July 2016	Date	20 July 2016

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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1 Introduction

Boral Resources (NSW) Pty Ltd (Boral) owns and operates a concrete batching plant (CBP) and construction materials handling facility (the handling facility) at 25 Burrows Road South, St Peters (the site).

On 6 September 1996, the then NSW Minister for Urban Affairs and Planning granted development consent to Boral under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of the CBP and the handling facility at the site. The development consent also permitted Boral to construct and operate an asphalt plant. This plant was constructed and operated, but was subsequently decommissioned and demolished in 2002.

A modification to the site's development consent is proposed. It is largely an administrative modification of the development consent under section 75W of the EP&A Act to simplify it (ie remove complexity) and remove irrelevant conditions. In addition, the application seeks to set production and throughput limits for the CBP and the handling facility and remove the condition restricting daily vehicle movements. The production limit sought for the CBP will result in a 10% increase in the combined production rates of the CBP and asphalt plant described in the environmental impact statement (EIS) that accompanied the development application (DA) for the site in 1996, noting that the asphalt plant no longer operates. This application is referred to as the administrative modification (the modification).

This report presents the results and findings of a noise assessment which has been prepared to accompany the modification with reference to the *NSW Industrial Noise Policy* (Environment Protection Authority (EPA) 2000) (INP), including the associated Application Notes, and the *NSW Road Noise Policy* (RNP) (EPA 2011).

This noise assessment also evaluates the existing level of noise from the site in accordance with the methodology outlined in the INP and associated Application Notes for the assessment of noise from existing industrial premises.

1.1 Glossary of acoustic terms

A number of technical terms are required for the discussion of noise. These are explained in Table 1.1.

Table 1.1 Glossary of acoustic terms

Term	Description
dB(A)	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.
L_1	The noise level exceeded for 1% of a measurement period.
L_{10}	A noise level which is exceeded 10% of the time. It is approximately equivalent to the average of maximum noise levels.
L_{90}	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
L_{eq}	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period. The $L_{eq,15min}$ descriptor refers to an Leq noise level measured over a 15-minute period.
L_{max}	The maximum root mean squared sound pressure level received at the microphone during a measuring interval.

Table 1.1 Glossary of acoustic terms

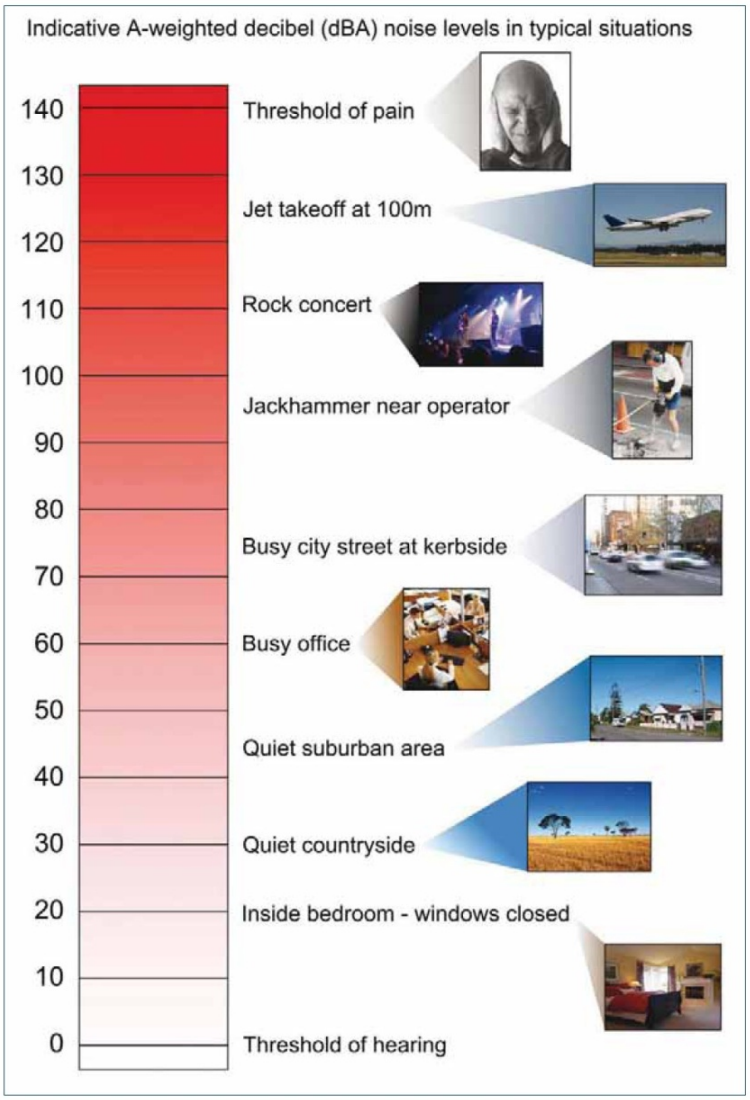
Term	Description
L_{min}	The minimum root mean squared sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period.
Sound power level	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 decibels, the unit of noise measurement. Table 1.2 gives an indication as to what an average person perceives about changes in noise levels.

Table 1.2 Perceived change in noise

Change in noise level (dB)	Perceived change in noise
1 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 1.1.



Source: *Road Noise Policy (Department of Environment, Climate Change and Water (DECCW) 2011).*

Figure 1.1 Common noise levels

2 Project and site description

2.1 Background

The site is located within the Inner West local government area (LGA). The south-eastern boundary of the site adjoins the Alexandra Canal. The Sydney International Airport is located about 300 metres (m) to the south of the site. The nearest private residences are located about 600 m to the north-west of the site on the opposite side of the Princes Highway.

The site's location and local context can be seen in Figure 2.1.

The site has two existing land uses; a CBP and a construction materials handling facility. Both uses predominantly receive bulk construction materials (aggregate, sand and cement) by rail from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. There are two train unloading areas on one of four rail sidings; one unloading area for the CBP and one for the handling facility. Trains are parked and shunted in the rail sidings. Some fly ash and special admixtures used in the CBP are delivered to the site by road.

The existing layout of the site can be seen in Figure 2.2.

2.1.1 Concrete batching plant

The CBP is located in the south-western section of the site.

Aggregates and sand are stored in large elevated bins, and cement and fly ash are stored in large elevated silos located above the batching plant. Aggregates and sand are transferred from the CBP train unloading area to the storage bins by conveyor.

The batching plant mixes the aggregates, sand, cement and admixtures, and gravity dispenses the batched product into concrete agitators. Once the concrete agitators are full they proceed to the slump stands where water is added. The concrete agitators blend all ingredients and the end product (concrete) is then transported by road to customers.

2.1.2 Handling facility

The handling facility is located in the centre and north-eastern section of the site. The handling facility receives and temporarily stores aggregates and sand from Boral's Peppertree and Dunmore quarries and cement from Berrima Cement Plant before despatching it by truck to other CBPs and asphalt plants within the Sydney metropolitan area.

The aggregates and sand are transferred from the handling facility's train unloading area to storage bins by conveyor. They are then loaded into trucks and despatched offsite or transferred to storage bunkers or stockpiles by the trucks.

2.2 The proposal

A modification to the site's development consent is proposed. It is largely an administrative modification of the development consent. In addition, the application seeks to set production and throughput limits for the CBP and the handling facility and remove a condition restricting daily vehicle movements.

The CBP currently produces an estimated 254,200 cubic metres (m^3) of concrete per annum. A future site production increase of approximately 10% is sought, to enable the production of 280,000 m^3 of concrete per annum. This increase would not necessitate any modifications/alterations to the existing CBP infrastructure and production equipment or an increase in rail movements.

2.3 Current noise limits

Noise assessment criteria for the site are stipulated in the sites development consent. The noise assessment criteria are specified for day and night periods at locations which are considered to be representative of residences potentially impacted by the site. The condition regarding noise is reproduced as follows:

33c. The Applicant shall ensure that the noise from the development does not exceed the noise limits presented in Table 1.

Table 1: Development Noise Limits (dBA)

Day and Night LAeq (15 minute)	**Location**
42	Bellevue Street
44	Yelverton Street

Notes:
Noise generated by the development is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

It is of note that the location in Bellevue Street is no longer a residential premise.



Noise monitoring and assessment locations

Boral St Peters
Modification of development consent
Noise Assessment
Figure 2.1



Site Layout

Boral St Peters
Modification of development consent
Noise Assessment
Figure 2.2

3 Existing environment

3.1 Noise sensitive receivers

The site is located within an industrial precinct. The closest residential properties are approximately 600 m to the north-west of the site on the opposite side of the Princes Highway. The Sydney International Airport is located about 300 m to the south of the site. Otherwise surrounding land uses are industrial, with the site directly bounded by industrial properties on the north and east. The site's location in its regional setting and local context can be seen in Figure 2.1.

Nearest representative noise sensitive locations to the site have been identified and are provided in Table 3.1 hereafter referred to in this report as assessment locations. The assessment locations are shown in Figure 2.1.

Table 3.1 Assessment locations

ID	Type[1]	Address
R1	Residential	10 Terry Street, Tempe
R2	Residential	383 Princes Highway, Sydenham (Corner of Yelverton Street and Princes Highway)
R3	Commercial/Industrial	2 Burrows Road South, St Peters
R4	Commercial	19 Burrows Road South, St Peters
R5	Commercial	293 Coward Street, Mascot
R6	Commercial	291 Coward Street, Mascot
R7	Commercial	283 Coward Street, Mascot
R8	Industrial	Bellevue Street, Tempe
R9	Industrial	Bellevue Street, Tempe
R10	Industrial	6-10 Burrows Road South, St Peters
R11	Commercial/Industrial	4 Burrows Road South, St Peters

Notes: 1. As defined in the INP.

3.2 Unattended noise monitoring

3.2.1 Methodology

Unattended noise monitoring was conducted to establish the existing ambient noise environment surrounding the site. This was done using Acoustic Research Laboratories (ARL) NGARA environmental noise logger. The noise logger was located at 11 Yelverton Street (NM1 - serial number 87-81-13). The location was chosen to represent the existing ambient and background noise environment typical of the nearest residences to the site. The noise logger was in place from 10 to 24 March 2016 (14 Days). The location of the noise logger is presented in Figure 2.1.

It is noted that the location of the noise logger was selected after inspection of the site, giving due consideration to other noise sources which may influence the readings (eg domestic air-conditioners), the proximity of neighbouring sensitive locations to the site, and security issues for the noise monitoring device.

The noise logger was programmed to record statistical noise level indices continuously in 15 minute intervals in accordance with the requirements of the INP, 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. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Weather data for the survey period was obtained from the Bureau of Meteorology's (BoM) Sydney Airport Automatic Weather Station (AWS) (Station ID 066037). The wind speed and the rainfall data was used to exclude noise data during periods of any rainfall and/or wind speed in excess of 5 metres per second (m/s) (approximately 9 knots) at the logger microphone in accordance with INP methods. Daily results from the unattended noise monitoring are provided graphically in Appendix 0.

3.2.2 Unattended noise monitoring results

The results from the unattended noise monitoring are presented in Table 3.2. The results are presented in the metrics of Rating Background Level (RBL) and L_{Aeq}. The RBL is an overall single value background level representing each assessment period (ie day, evening or night) over the whole monitoring period. It is an INP term and is used to represent the background noise level when assessing industrial noise. The L_{Aeq} is the A-weighted energy average noise level, and it represents the equivalent continuous sound pressure level over a given period.

Table 3.2 Summary of existing and ambient background noise levels

Monitoring [ocation (refer to Figure 2.1)	Period[1]	RBL[2], dB	Ambient $L_{Aeq, period}$ noise level[3], dB
NM1 (11 Yelverton Street)	Day	54	69
	Evening	52	66
	Night	45	62

Notes *1. Day: 7 am - 6 pm Monday - Saturday; 8 am - 6 pm Sundays and public holidays; Evening: 6 pm - 10 pm; Night: all remaining periods.*

2. RBL is the overall single figure background level representing each assessment period (day/evening/night) over the whole monitoring period.

3. Represents the energy average noise level over the relevant period.

3.3 Attended noise monitoring

3.3.1 Methodology

In addition to unattended noise monitoring, operator attended noise measurements were conducted to quantify and qualify the existing noise sources including the existing industrial noise contribution during the day and night periods. The attended noise monitoring was conducted during the day on 10 March 2016 and night on 23 March 2016. It is of note that an attended measurement was also taken at R9, which is listed in the current consent conditions, although it is no longer a residential receptor. The attended noise monitoring locations are shown in Figure 2.1.

Monitoring was undertaken using a Bruel & Kjær 2250 integrating sound level meter (serial number 3008201), and in accordance with AS 1055-1997 *Description and Measurement of Environmental Noise, Parts 1, 2 and 3*.

Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. Certificates can be seen in Appendix B.

3.3.2 Attended noise monitoring results

The attended noise monitoring results are summarised in Table 3.3.

Table 3.3 Attended noise measurements March 2016

Location	Time	Period	Noise measurement, dB			Existing industrial noise contribution, dB	Comments and typical maximum levels
			L_{Aeq}	L_{A90}	L_{Amax}	$L_{Aeq\ (15\ min)}$	
84 Terry Street (R1)	12:30	Day	58	46	78	<40	Road traffic noise from the Princes Highway was the dominant source (45-50 dB). No existing industrial noise contribution observed. Occasional aircraft over flight noise (71-78 dB). Intermittent bird foliage noise (45-46 dB).
	22:47	Night	42	39	70	<40	Road traffic noise from the Princes Highway was the dominant source (40 dB). Occasional train noise from south of monitoring location (44-48 dB). Occasional car pass by noise in Terry Street (50-55 dB).
11 Yelverton Street (R2)	11:45	Day	67	60	84	40-42	Road traffic noise from the Princes Highway was the dominant noise source (55-65 dB). Occasional transient noise from nearby industrial site audible between breaks in road traffic. Occasional aircraft over flight noise (80-85 dB).
	13:42	Day	74	67	87	<40	Road traffic noise from the Princes Highway was the dominant noise source (65-70 dB). No existing industrial noise contribution observed. Occasional aircraft over flight noise (80-84 dB).
	22:25	Night	77	54	94	42	Road traffic noise from the Princes Highway was the dominant noise source (55-65 dB). Very occasional transient noise audible from an industrial site (40-45 dB per noise event). Occasional aircraft over flight noise (85-94 dB). Insect noise constant (roughly 50 dB).
Bellevue Street (R9)	12:55	Day	75	52	96	n/a	Road traffic noise from the Princes Highway was the dominant source (45-50 dB). Occasional aircraft over flight noise (71-78 dB). Intermittent bird foliage noise (45-46 dB).

Observations during attended measurements identified road traffic and aircraft noise as the main contributors to the ambient noise environment during day and night periods at both locations, with an existing industrial noise also a contributor. Generally, the identified industrial noise was best described as just audible transient events that occurred at a significantly lower level than other ambient noise sources (ie road traffic and aircraft noise).

3.4 Meteorology

Noise propagation over distance can be significantly affected by the prevailing weather conditions. Of most interest are source to receiver winds, the presence of temperature inversions and drainage flow effects, as these conditions can enhance received noise levels. To account for these phenomena, the INP specifies meteorological analysis procedures to determine the prevalent weather conditions.

3.4.1 Prevailing winds

The INP recommends consideration of wind effects if they are a "feature" of the area. The INP defines "feature" as the presence of source-to-receiver winds at speeds up to 3 m/s (measured at 10 m above ground level), 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 INP states that where wind is identified to be a feature of the area then assessment of noise impacts should consider the highest wind speed below 3 m/s, which is considered to prevail for at least 30% of the time.

A thorough review of the vector components of the 15-minute wind data was undertaken using data from the 2015 calendar year from the BoM Sydney Airport AWS. The analysis shows that the frequency of occurrence of winds up to 3 m/s do not trigger the 30% INP assessment requirement for any assessment period (ie day, evening or night).

3.4.2 Temperature inversions

Temperature inversions (ie where atmospheric temperature increases with altitude) typically occur during the night-time period in the winter months and can also increase (ie focus) noise levels at surrounding assessment locations. As per the INP, temperature inversions are to be assessed when they are found to occur for 30% of the time (about two nights per week) or greater during the winter months. The INP also states that the assessment of the impact of temperature inversions be confined to the night-time noise assessment period where temperature inversions occur.

An analysis of sigma theta data from the Sydney Airport AWS shows that the frequency of F or G class temperature inversions for the night assessment period does not trigger the 30% INP assessment requirement. Therefore, temperature inversion conditions have not been assessed.

3.4.3 Drainage winds

The INP states that a default wind drainage value should be applied where sources are at a higher altitude than the assessment location with no intervening topography. All assessment locations are at a similar or higher elevation than the subject site. Therefore, drainage winds have not been adopted in this assessment.

3.4.4 Assessed meteorological conditions

Predicted operational noise levels from the site have been calculated based on the meteorological parameters shown in Table 3.4.

Table 3.4 Weather conditions considered in noise modelling

Assessment period	Meteorological condition	Air temperature	Relative humidity	Wind speed[1]	Direction	Stability category (temperature gradient)
Day/Evening	Calm	20°C	70%	0 m/s	n/a	D class
Night	Calm	10°C	90%	0 m/s	n/a	D class

Note 1. Based on the 10th percentile wind speed of all winds present for 30% of the time during the relevant period.

4 Assessment criteria

4.1 Industrial noise

Noise from industrial sites or processes (eg onsite truck movements, trains unloading, concrete processing etc) in NSW are regulated by the local council, Department of Planning and Environment (DP&E) and/or the NSW Environment Protection Authority (EPA) and usually have a licence and/or approval conditions stipulating noise limits. These limits are normally derived from operational noise criteria applied at assessment locations. They are based on INP guidelines (EPA 2000) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation.

The INP guidelines for assessing industrial facilities have been used for this assessment. With respect to the criteria, the guidelines state:

> They are not mandatory, and an application for a noise producing development is not determined purely on the basis of compliance or otherwise with the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development.

The objectives of noise assessment criteria for industry are to protect the community from excessive intrusive noise and to preserve amenity for specific land uses.

To ensure these objectives are met, the EPA provides two separate criteria: intrusiveness criteria and amenity criteria. The fundamental difference being intrusiveness criteria apply over 15 minutes in any period (day, evening or night), whereas the amenity criteria apply to the entire assessment period (day, evening or night).

4.1.1 Intrusiveness

The intrusiveness criteria require that $L_{Aeq(15\text{-}min)}$ noise levels from the subject site during the relevant operational periods (ie day, evening and night) do not exceed the RBL by more than 5 dB.

Table 4.1 presents the intrusive noise criteria determined for the site based on the adopted RBLs.

Table 4.1 Intrusive noise criteria

Location	Period[1]	Adopted RBL, dB(A)	Intrusive criteria dB, $L_{Aeq(15\text{-}min)}$
All residential assessment locations	Day	54	59
	Evening	52	57
	Night	45	50

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

4.1.2 Amenity

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

Residential assessment locations potentially affected by the modification have been categorised in the INP (EPA 2000) urban amenity category. The corresponding recommended amenity criteria for the Project are given in Table 4.2.

Table 4.2 Amenity criteria

Assessment location	Indicative area	Time period	Recommended noise level dB, $L_{Aeq,period}$	
			Acceptable	Maximum
All residential areas	Urban	Day	60	65
		Evening	50	55
		Night	45	50
Commercial Premises	All	When in use	65	70
Industrial Premises	All	When in use	70	75

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

If existing industrial noise approaches the acceptable amenity criteria in Table 4.2, the criteria for the project is to be adjusted to ensure the total industrial level does not exceed the expectable amenity criteria. This is achieved by applying modification factors to the recommended criteria which are reproduced from Table 2.2 of the INP in Table 4.3 below.

Table 4.3 Modification to Acceptable noise level (ANL)* to account for existing levels of industrial noise

Total existing L_{Aeq} noise level from industrial noise sources	Maximum L_{Aeq} noise level for noise from new sources alone, dB
≥ Acceptable noise level plus 2 dB	If existing noise level is likely to decrease in future acceptable noise level minus 10 dB
	If existing noise level is unlikely to decrease in future existing noise level minus 10 dB
Acceptable noise level plus 1 dB	Acceptable noise level minus 8 dB
Acceptable noise level	Acceptable noise level minus 8 dB
Acceptable noise level minus 1 dB	Acceptable noise level minus 6 dB
Acceptable noise level minus 2 dB	Acceptable noise level minus 4 dB
Acceptable noise level minus 3 dB	Acceptable noise level minus 3 dB
Acceptable noise level minus 4 dB	Acceptable noise level minus 2 dB
Acceptable noise level minus 5 dB	Acceptable noise level minus 2 dB
Acceptable noise level minus 6 dB	Acceptable noise level minus 1 dB
< Acceptable noise level minus 6 dB	Acceptable noise level

*Notes: * ANL = recommended acceptable L_{Aeq} noise level for the specific receiver, area and time of day from Table 4.2*

4.1.3 Project specific noise level

The project specific noise level (PSNL) is the most stringent of either the calculated intrusive or amenity criteria. The PSNL for the daytime, evening and night periods are indicated Table 4.4.

Table 4.4 Project specific noise levels

Assessment location	Period	RBL	Intrusive criteria, (dB, $L_{Aeq,15min}$)	Amenity criteria, (dB, $L_{Aeq,period}$)	PSNL, (dB)
All residential assessment locations	Day	54	59	60	59 $L_{Aeq,15min}$
	Evening	52	57	50	57 $L_{Aeq,15min}$ /50 $L_{Aeq,evening}$
	Night	45	50	45	50 $L_{Aeq,15min}$ /45 $L_{Aeq,night}$
Commercial premises	When in use	-	-	65	65 $L_{Aeq,period}$
Industrial premises	When in use	-	-	70	70 $L_{Aeq,period}$

4.2 Applying INP criteria to existing noise sources

The INP also provides guidance on the application of noise criteria to existing sources of noise such as the St Peters site:

> The application of the criteria to existing sources of noise would occur where significant modifications (such as to warrant serious and/or ongoing development consent or EPA approval) are made to existing developments or where complaints are received. In applying the policy to existing operations it is acknowledged that the scope for applying reasonable and feasible mitigation measures to existing noise sources is usually far more limited than for new developments. Careful consideration of noise impacts and the feasible and reasonable mitigation measures available at these sites may result in less stringent noise limits than would ideally apply. Sometimes the resultant noise limits will be above the criteria.

The INP Application Notes state that if PSNLs are not achieved from existing operations, a preliminary review of feasible and reasonable mitigation measures should be undertaken to identify potential opportunities to reduce existing operational noise levels.

The INP Application Notes state that if the existing premises cannot achieve PSNLs after the feasible and reasonable noise mitigation review, the proposed modification should not significantly increase the existing noise emissions.

This assessment has adopted the procedures outlined in the INP Application Notes for existing industrial sites.

4.3 Sleep disturbance criteria

The subject site currently operates during the night-time period (10 pm to 7 am). Therefore, assessment of sleep disturbance is required in accordance with the INP and associated application notes.

The operational criteria described in Section 4.1, which consider the average noise emission of a source over 15 minutes, are appropriate for assessing noise from generally steady-state sources, such as conveyor noise. However transient noise from sources such as truck movements is intermittent (rather than continuous) and needs to be assessed using the L_1 or L_{max} noise metrics.

The INP Application Notes (last updated June 2013) recognise that the current sleep disturbance criteria is not ideal. The assessment of potential sleep disturbance is complex and poorly understood and the EPA believes that there is insufficient information to determine a suitable alternative criteria.

Prior to the EPA determining a standard method to assess the potential for sleep disturbance, the INP guideline suggests that $L_{A1(1min)}$ level of 15 dBA above the RBL is a suitable screening criteria for the night-

time period. Guidance regarding potential for sleep disturbance is also provided in the *NSW Road Noise Policy* (RNP) (DECCW 2011). The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{max}) below 50 to 55 dBA are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{max}) of 65 to 70 dBA, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external L_{Amax} noise levels in the order of 60 to 65 dB calculated at the facade of a residence are unlikely to cause sleep disturbance affects.

The descriptors L_{max} and L_1 may be considered interchangeable; this approach is accepted by the EPA.

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

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

Table 4.5 provides the sleep disturbance screening criteria for the residential assessment locations.

Table 4.5 Sleep disturbance screening criteria, residential assessment locations

Assessment location	Adopted RBL, dB(A)	Sleep disturbance criteria dB, L_{Amax}
All residential assessment locations	45	60

Notes: 1. The sleep disturbance assessment applies to residential assessment locations only.

4.4 Road traffic noise criteria

The principle guidance for assessing the impact of road traffic noise on receptors is in the RNP. The nearest noise sensitive receptors potentially affected by an increase in relevant road traffic noise associated with the project are located on the Princes Highway which is classified as a freeway/arterial road.

Table 4.6 presents the road noise assessment criteria reproduced from Table 3 of the RNP.

Table 4.6 Road traffic noise assessment criteria for residential land uses

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

Source: EPA (2011).

The RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

5 Operational noise assessment

5.1 Noise modelling method

This section presents the methods and base parameters used to model and assess the sites predicted noise emissions.

Quantitative modelling of noise emissions was undertaken using Brüel & Kjær Predictor Version 11.0 noise prediction software. This software calculates total noise levels at receptors from the concurrent operation of multiple noise sources. The model incorporates factors such as:

- the lateral and vertical location of plant and equipment;
- source-to-receptor distances;
- ground effects;
- atmospheric absorption;
- topography; and
- meteorological conditions.

Two scenarios were modelled to compare the difference in operating noise levels between the current approved operation and the proposed operations.

5.1.1 Plant and equipment sound power levels

Table 5.1 summarises the operational noise sources and associated sound power levels used in the noise model. The equipment items and quantities are based on the current equipment inventory provided by Boral. The sound power levels are based on an EMM database of similar plant and equipment.

Table 5.1 Operational plant and equipment sound power levels

Plant and equipment	Quantity	Sound power level - L_w, $L_{Aeq,15\text{-}min}$, dB
Concrete agitator	2 (existing) 3 (proposed)	103
Concrete agitator slumping	2	111
Cement tanker	1	110
Front end loader	1	105
Water truck	1	96
Batching plant – Mixing bowl[1]	1	100
Trains	1	103
Bobcat	1	100
Forklift	1	105
Aggregate truck	1	103
Aggregate truck idling	1	97
Articulated dump truck	1	108

Notes: 1. As the batching plant has an enclosed loading facility with automatic doors, it has been afforded a 10 dB emission reduction (ie 110-10=100)

5.1.2 Operating assumptions

In addition to the sound power levels and quantities provided, main operating assumptions adopted for a worst-case 15 minute period are as follows:

- the front end loader, concrete agitators, cement trucks, trains, aggregate trucks, water truck, conveyors and the batch plant are assumed to operate continuously in any 15 minute period in the day, evening or night;
- the bobcat, forklift and dump truck are assumed to operate approximately 50% of the time in any 15 minute period in the day, evening or night;
- all onsite vehicle movements are 20 kilometres per hour (km/hr) or less; and
- it has been conservatively assumed that amenity noise levels are 4 dB below the intrusive noise level.

5.2 Noise modelling results

The calculated existing and predicted future noise levels at each assessment location for each assessment period are provided in Table 5.2 and Table 5.3, respectively.

Table 5.2 Predicted site noise emissions - approved and proposed operations (day/evening)

Assessment location	Existing operations, dB	Proposed operations, dB	Predicted change in noise level (dB)	PSNL, dB
	Calm	Calm		
R1	41 $L_{Aeq,15\text{-}min}$	41 $L_{Aeq,15\text{-}min}$	0	59 $L_{Aeq,15\text{-}min}$ (Day)
	37 $L_{Aeq,evening}$	37 $L_{Aeq,evening}$		50 $L_{Aeq,evening}$ (Evening)
R2	<44 $L_{Aeq,15\text{-}min}$	<44 $L_{Aeq,15\text{-}min}$	0	59 $L_{Aeq,15\text{-}min}$ (Day)
	<40 $L_{Aeq,evening}$	<40 $L_{Aeq,evening}$	0	50 $L_{Aeq,evening}$ (Evening)
R3	57 $L_{Aeq,period}$	57 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R4	58 $L_{Aeq,period}$	58 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R5	52 $L_{Aeq,period}$	53 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R6	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R7	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	65 $L_{Aeq,period}$
R8	49 $L_{Aeq,period}$	50 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$
R9	44 $L_{Aeq,period}$	44 $L_{Aeq,period}$	0	70 $L_{Aeq,period}$
R10	59 $L_{Aeq,period}$	60 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$
R11	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$

Table 5.3 Predicted site noise emissions - approved and proposed operations (night-time)

Assessment location	Existing operations, dB	Proposed operations, dB	Predicted change in noise level (dB)	PSNL, dB
	Calm	Calm		
R1	38 $L_{Aeq,period}$	38 $L_{Aeq,period}$	0	45 $L_{Aeq,period}$
R2	<44 $L_{Aeq,period}$	<44 $L_{Aeq,period}$	0	45 $L_{Aeq,period}$
R3	57 $L_{Aeq,period}$	57 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R4	58 $L_{Aeq,period}$	58 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R5	53 $L_{Aeq,period}$	53 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R6	57 $L_{Aeq,period}$	57 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R7	57 $L_{Aeq,period}$	57 $L_{Aeq,period}$	0	65 $L_{Aeq,period}$
R8	50 $L_{Aeq,period}$	50 $L_{Aeq,period}$	0	70 $L_{Aeq,period}$
R9	44 $L_{Aeq,period}$	45 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$
R10	59 $L_{Aeq,period}$	60 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$
R11	56 $L_{Aeq,period}$	57 $L_{Aeq,period}$	+1	70 $L_{Aeq,period}$

Site noise emissions during proposed operations are predicted to comply with the relevant PSNLs at all assessment locations considered as part of this assessment. It is of note that results of the operator attended noise surveys undertaken at the residential assessment locations R1 and R2 indicate that existing operational noise levels from the site were inaudible at the time of measurement.

It is of note that the intrusive criteria for assessment locations R1 and R2 are deemed to be conservative. As seen in Figure 2.1, these assessment locations are situated on the Princes Highway. Observations from attended noise monitoring determined that traffic on the Princes Highway was the dominant noise source. Since the unattended noise monitoring was conducted at a residence approximately 40 metres to the north of assessment location R2 (ie further away from the Princes Highway), this would be conducive to significantly lower ambient and background noise levels and hence, intrusive criteria.

Significantly, and of most relevance to the proposal, is that the predicted noise levels demonstrate that operational noise emission will not increase by more than 1 dB compared to those from the existing approved operations. This outcome satisfies the requirement set-out in the INP Application Notes, whereby noise levels from the proposed operations (with all feasible and reasonable measures in place) "do not significantly increase the existing noise emissions". A 1-2 dB change in sound levels is deemed ‘typically indiscernible’ to the human ear. Thus, an increase of 1-2 dB is unlikely to be perceivable to nearby residences and it is unlikely that the changes in project noise emissions would cause adverse impacts at any assessment location.

5.3 Sleep disturbance assessment

The predicted L_{Amax} noise levels from the site at the nearest residential assessment locations are presented in Table 5.4 for calm meteorological conditions. The predictions are for the night period only (10 pm to 7 am) coinciding with the typical sleep period and in accordance with the INP.

Typical maximum noise level events include the front end loader scraping concrete and/or loading aggregate trucks. This noise event has been given an L_{Amax} of 126 dB and represent the likely highest maximum noise level events from the site.

Table 5.4 Predicted L_{Amax} noise levels during night period

Assessment location[1]	Predicted L_{Amax} noise levels, dB	L_{Amax} screening criteria, dB
	Calm	
R1	50	60
R2	51	60

Notes: 1. The sleep disturbance assessment applies to residential assessment locations only.

Noise modelling predicts that L_{Amax} noise levels will satisfy the INP sleep disturbance screening criteria at both residential assessment locations.

5.4 Road traffic noise assessment

The nearest residences potentially affected by an increase in road traffic volumes as a result of the modification are located on the Princes Highway. The traffic assessment (EMM 2016) for the modification states that the predicted total traffic volume increase will be in the order of +0.1% with an associated increase in heavy vehicles in the order of +0.1%.

Given this relatively small increase in proposed traffic volumes, there would be a negligible increase in road traffic noise levels at the nearest residential locations. Therefore, the impact of road traffic noise associated with the modification is predicted to be negligible and within the 2 dB allowable increase for land use developments as described in the RNP (DECCW 2011).

5.5 Cumulative noise assessment

Potential cumulative noise impacts from existing and successive developments are considered by the INP procedures by ensuring that the appropriate noise criteria are established with a view to maintaining acceptable noise *amenity* levels at the closest residential assessment locations. Therefore, the cumulative impact of the modification with existing industrial noise sources has been assessed in the determination of the acceptable amenity levels at the assessment locations.

Based on experience with similar industrial sites, amenity noise levels for an 11 hour day, four hour evening or nine hour night can typically be up to 5 dB below the intrusive noise levels of the site due to the transient nature of noise events. For this site, it has been conservatively assumed that amenity noise levels are 4 dB below the intrusive noise level. On this basis, the highest predicted amenity noise levels at residential assessment locations are 38 dB $L_{Aeq,\ period}$ for both day-time and night-time periods. This is greater than 10 dB below the acceptable amenity level for an urban receiver type and thus is predicted to have nil or negligible effects on increasing industrial noise above the relevant criteria.

Further, the predicted amenity noise level from the site is greater than 10 dB below the measured existing ambient $L_{Aeq,day}$ of 66 dB and $L_{Aeq,night}$ of 59 dB which is primarily due to traffic on the Princes Highway. Hence, noise levels from the modification are not predicted to increase existing ambient noise levels at any assessment location.

On this basis, the modification is predicted to have a negligible impact on the existing ambient acoustic environment and is not predicted to increase industrial noise levels above the relevant amenity criteria.

6 Conclusion

EMM has completed a noise assessment for the modification. This noise assessment has been prepared in accordance with the methodology outlined in the INP and associated Application Notes for the assessment of noise from existing industrial premises.

The subject of the modification is an increase in concrete production from 254,200 m^3 per annum to 280,000 m^3 per annum. This increase would not necessitate any modifications/alterations to the existing CBP infrastructure, production equipment or approved facility footprint.

A noise model was developed to compare noise levels from existing approved and proposed operations. The model adopted sound power levels of key acoustically significant plant and equipment derived from a database of similar equipment.

The assessment found that operating noise from the site during both existing and proposed operations satisfies relevant INP PSNLs for day, evening and night periods at all assessment locations. The proposed operations are predicted to result in an increase of no greater than 1 dB compared to those from the existing operations.

The INP Application Notes state that if PSNLs are not achieved from existing operations, a preliminary review of feasible and reasonable mitigation measures should be undertaken to identify potential opportunities to reduce existing operational noise levels. The INP Application Notes state that if the existing premises cannot achieve PSNLs after the feasible and reasonable noise mitigation review, the proposed modification should not significantly increase the existing noise emissions.

The proposed increase in throughput will not change existing hours of operation or require any modifications or additions to existing site infrastructure at the facility. Hence, there will be no significant change to the level of operational noise emissions from the site. The modification is therefore in keeping with the INP application notes in that “the proposed modification should not significantly increase the existing noise emissions” Further, noise levels from the modification are predicted to be significantly less than existing ambient noise levels at the assessment locations which are primarily due to road traffic noise. Noise levels from the modification are therefore not expected to cause adverse impacts at any assessment location.

Sleep disturbance from operation of the modification during the night period has been assessed. The highest predicted external maximum noise level from site is 51 dB L_{Amax}. These predicted maximum levels are below the noise levels likely to cause sleep disturbance affects. Hence, it is unlikely that night-time operations from the project will cause sleep disturbance at the residential assessment locations.

Traffic generated by the modification is not expected to generate any noticeable increase in road traffic noise levels at the nearest residential locations. This increase in traffic volume would lead to a negligible increase in road traffic noise. Therefore, the impact of road traffic noise associated with the modification is predicted to be negligible and within the 2 dB allowable increase for land use developments as described in the RNP (DECCW 2011).

A review of cumulative industrial noise from the modification together with other industrial noise sources in the vicinity was also conducted. The modification is predicted to have a negligible impact on the existing ambient acoustic environment and is not predicted to increase industrial noise levels above the relevant amenity criteria.

References

Australian Standard AS 1055-1997, *Acoustics - Description and Measurement of Environmental Noise – Parts 1, 2 and 3.*

EMM Consulting Pty Ltd (EMM) 2016, *St Peters Traffic Impact Assessment*.

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

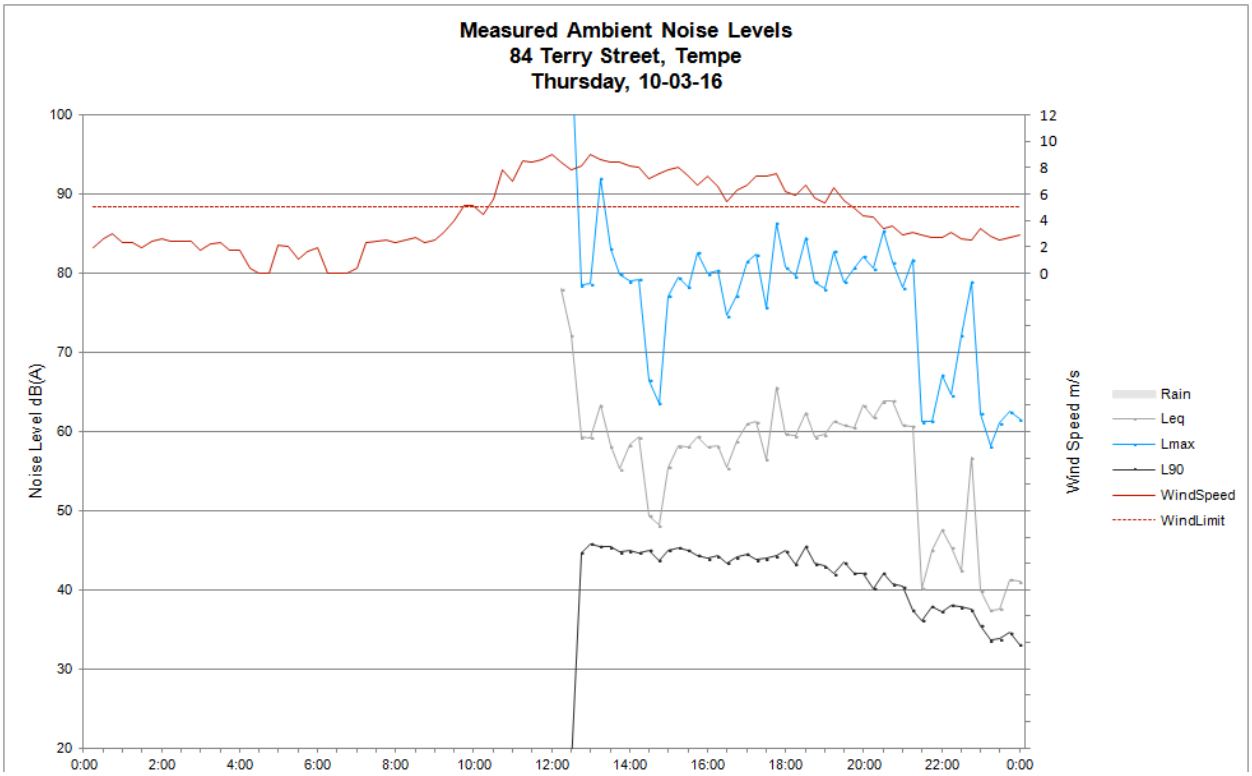
NSW Environmental Protection Authority (EPA) 2000, *Industrial Noise Policy.*

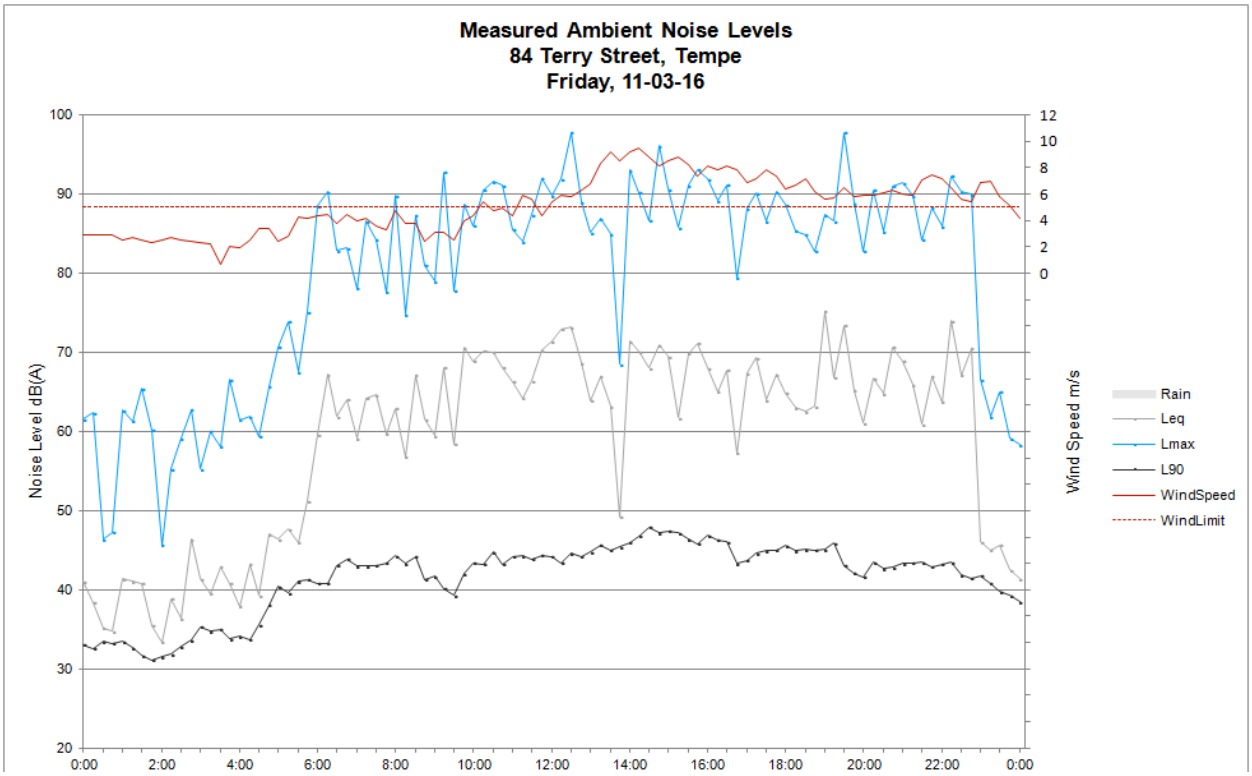
Appendix A

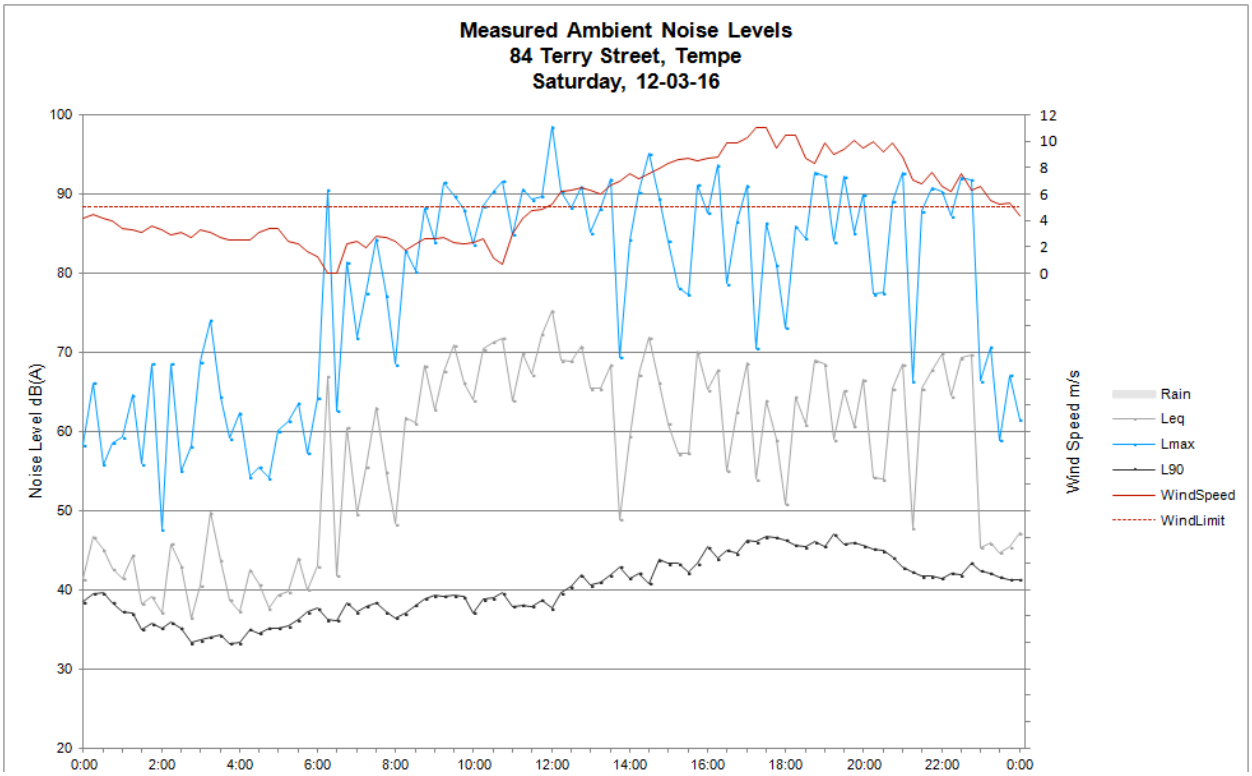
Unattended noise monitoring results

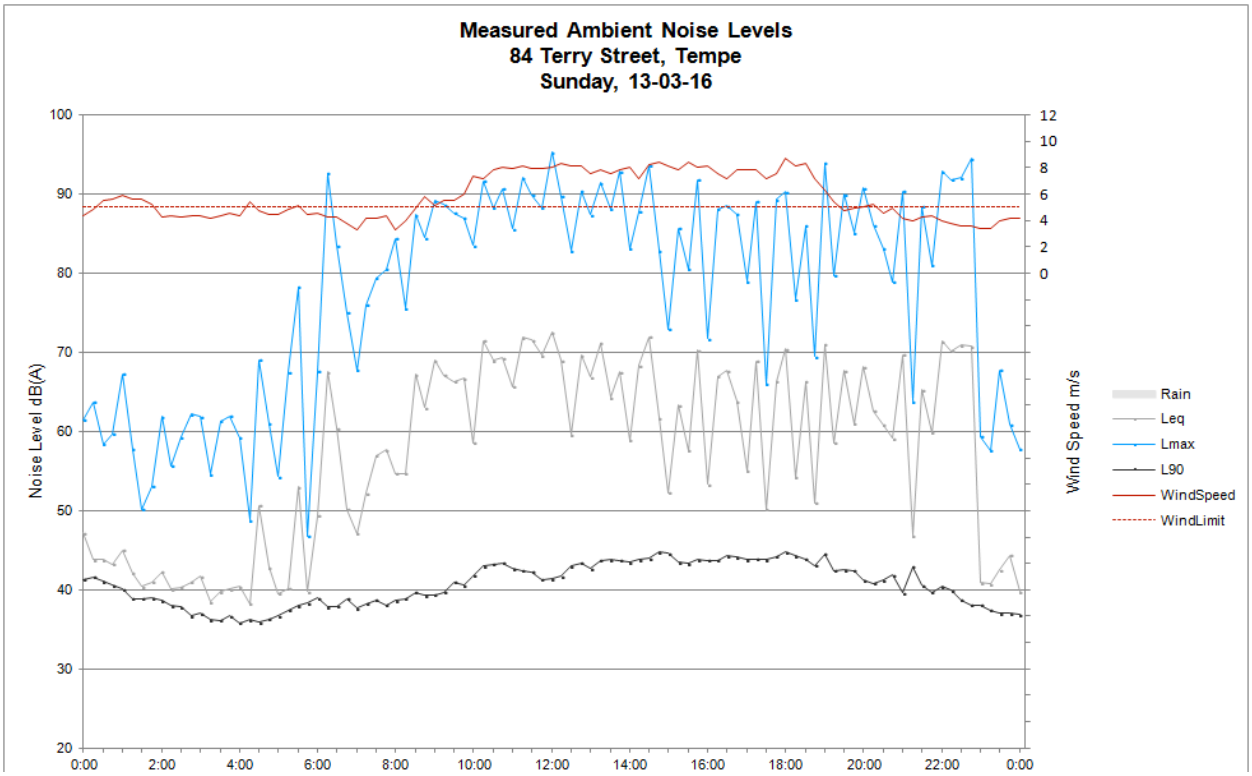
Table 0.1 Ambient noise monitoring summary – 84 Terry Street, Tempe

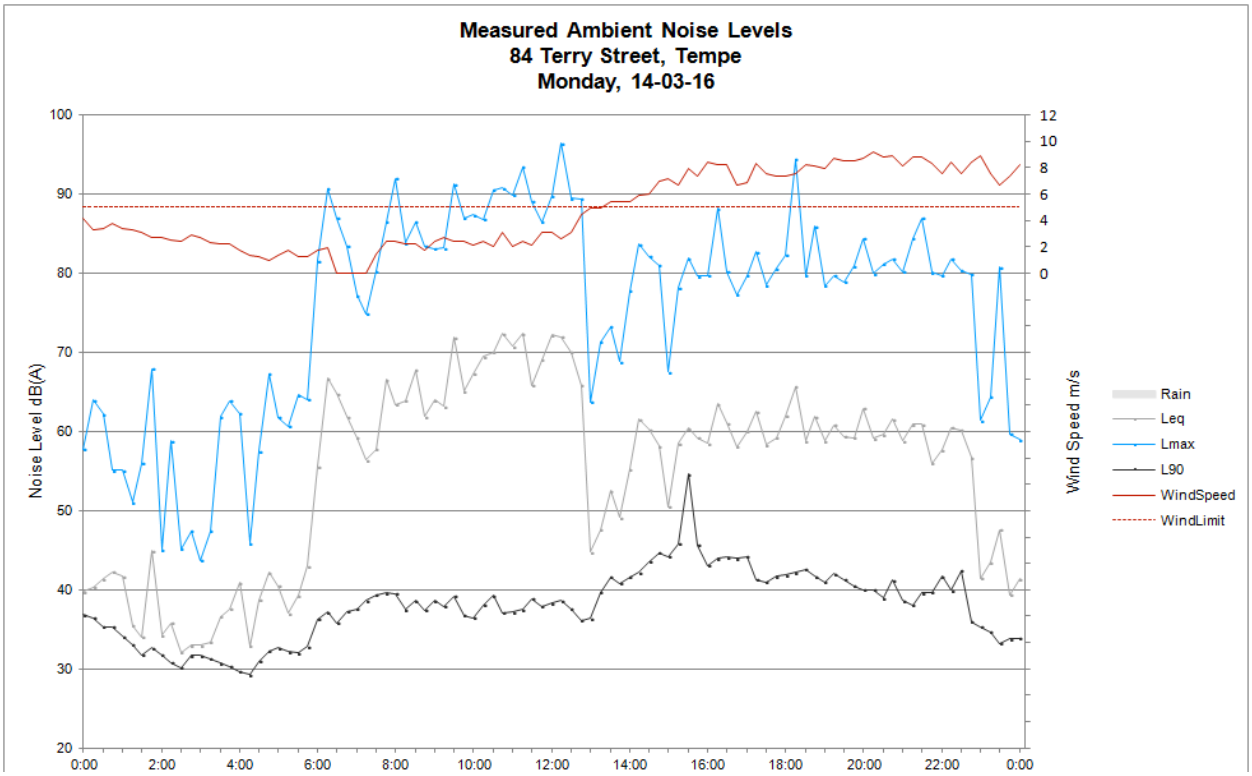
Date	ABL Day	ABL Evening	ABL Night	L_{eq} 11hr Day	L_{eq} 4hr Evening	L_{eq} 9hr Night
Thursday, 10-03-16	0	37	32	0	61	55
Friday, 11-03-16	42	42	34	68	68	61
Saturday, 12-03-16	0	42	36	0	66	59
Sunday, 13-03-16	39	40	30	67	66	61
Monday, 14-03-16	37	39	0	66	61	0
Tuesday, 15-03-16	43	41	35	63	62	55
Wednesday, 16-03-16	42	39	32	62	62	56
Thursday, 17-03-16	41	38	32	68	66	61
Friday, 18-03-16	41	36	32	67	65	54
Saturday, 19-03-16	38	38	30	63	60	54
Sunday, 20-03-16	0	0	0	0	0	0
Monday, 21-03-16	0	40	0	0	61	0
Tuesday, 22-03-16	0	38	32	0	62	55
Wednesday, 23-03-16	37	37	32	61	67	62
Summary Values						
RBL	41	39	32	-	-	-
Average Leq	-	-	-	66	64	59

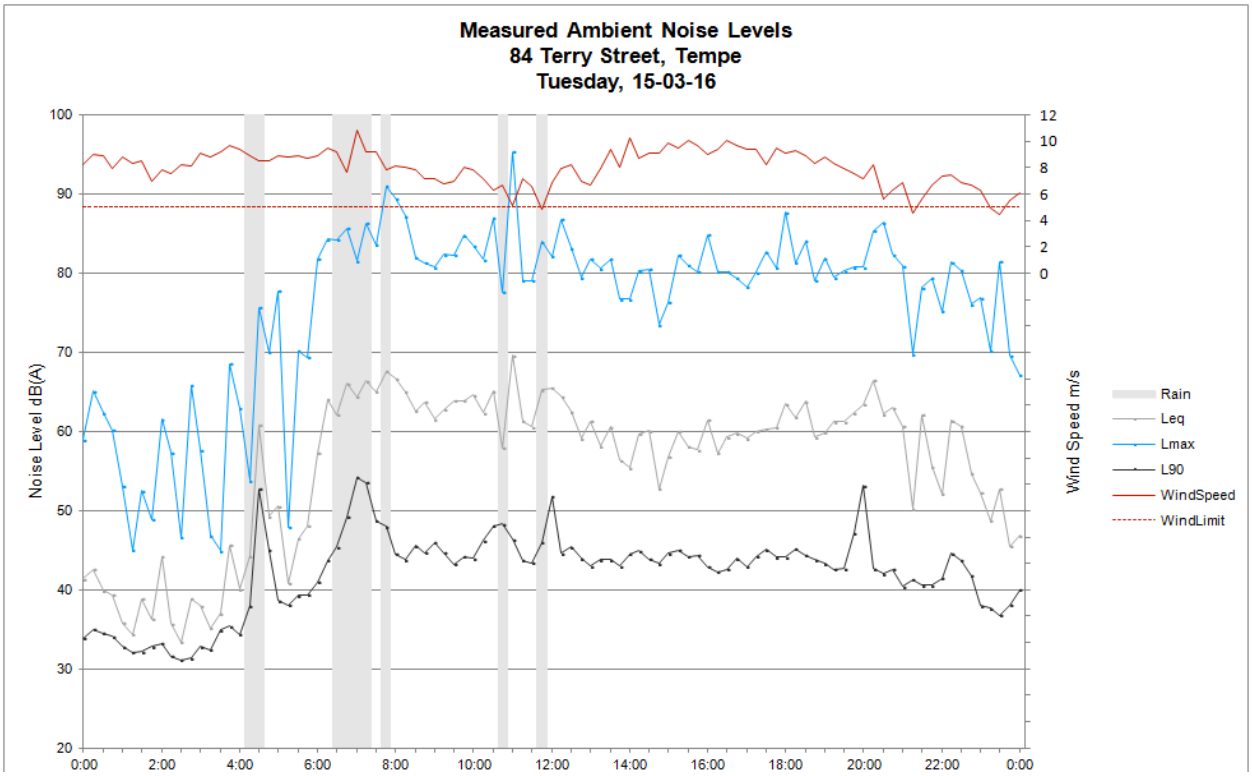

Measured Ambient Noise Levels
84 Terry Street, Tempe
Thursday, 10-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

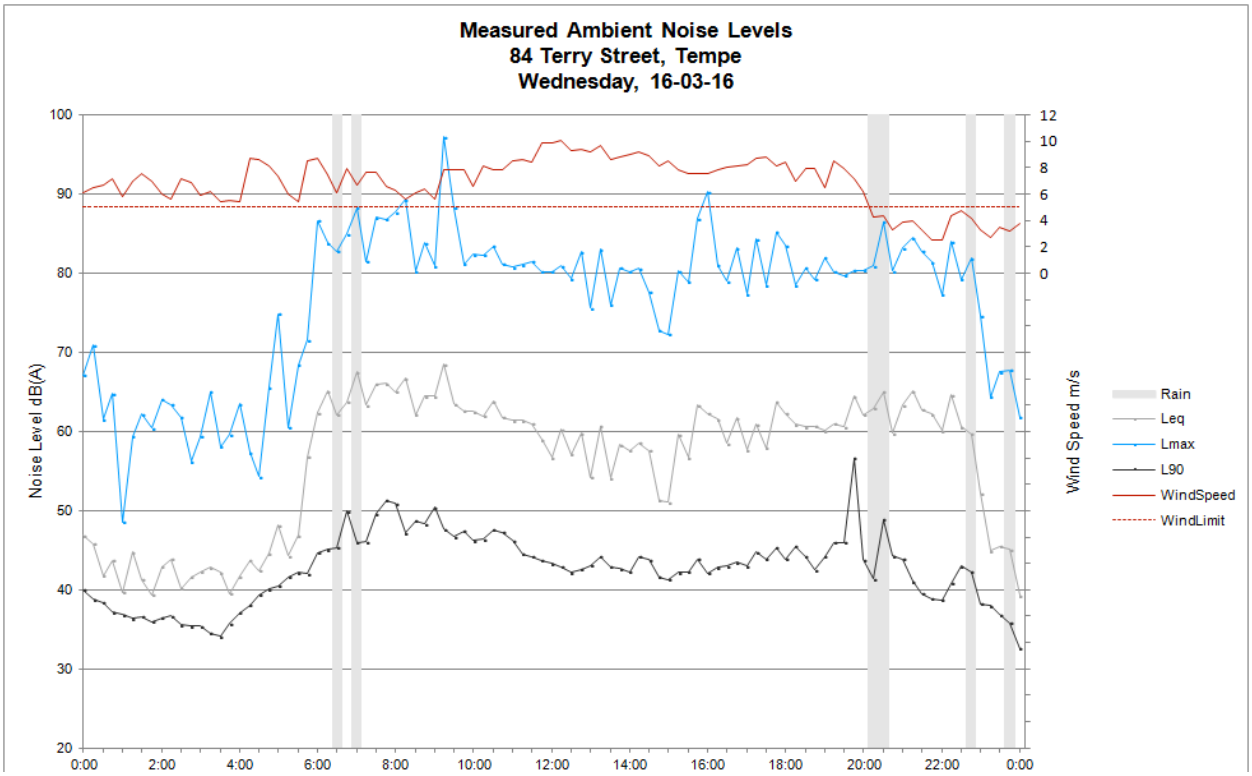

Measured Ambient Noise Levels
84 Terry Street, Tempe
Friday, 11-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

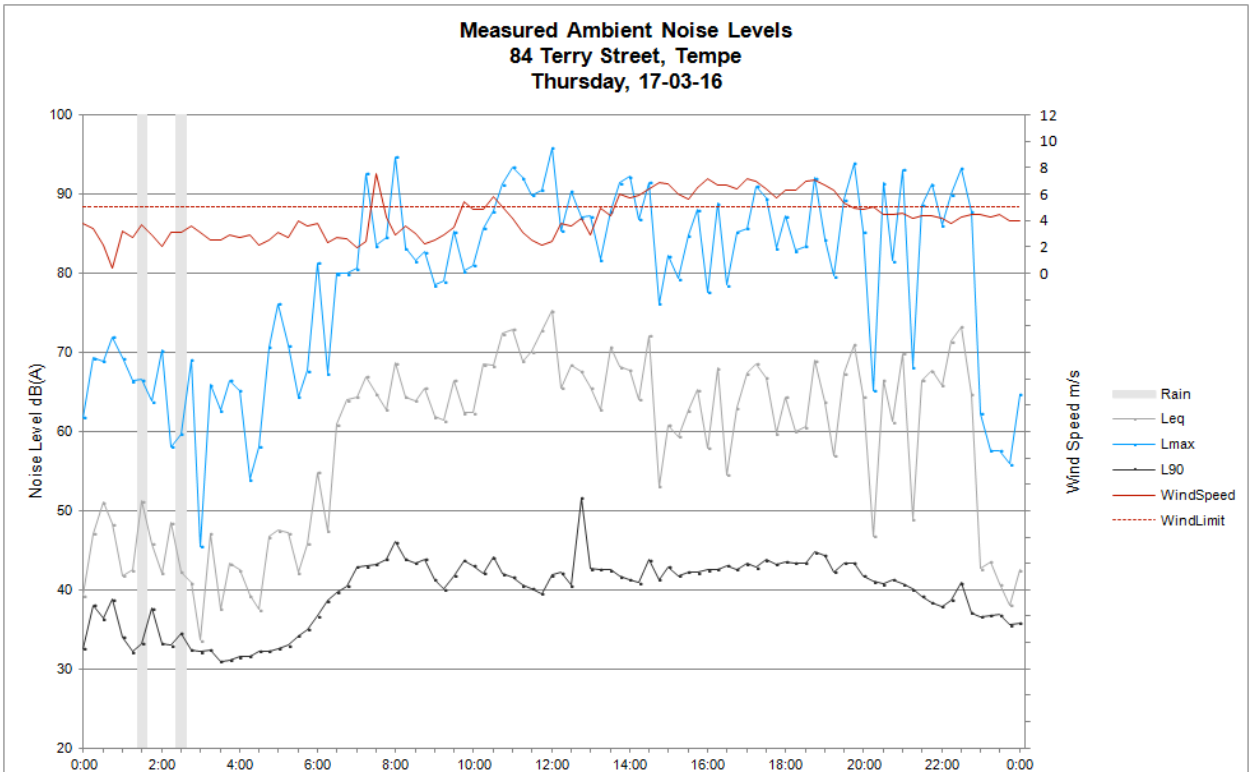

Measured Ambient Noise Levels
84 Terry Street, Tempe
Saturday, 12-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

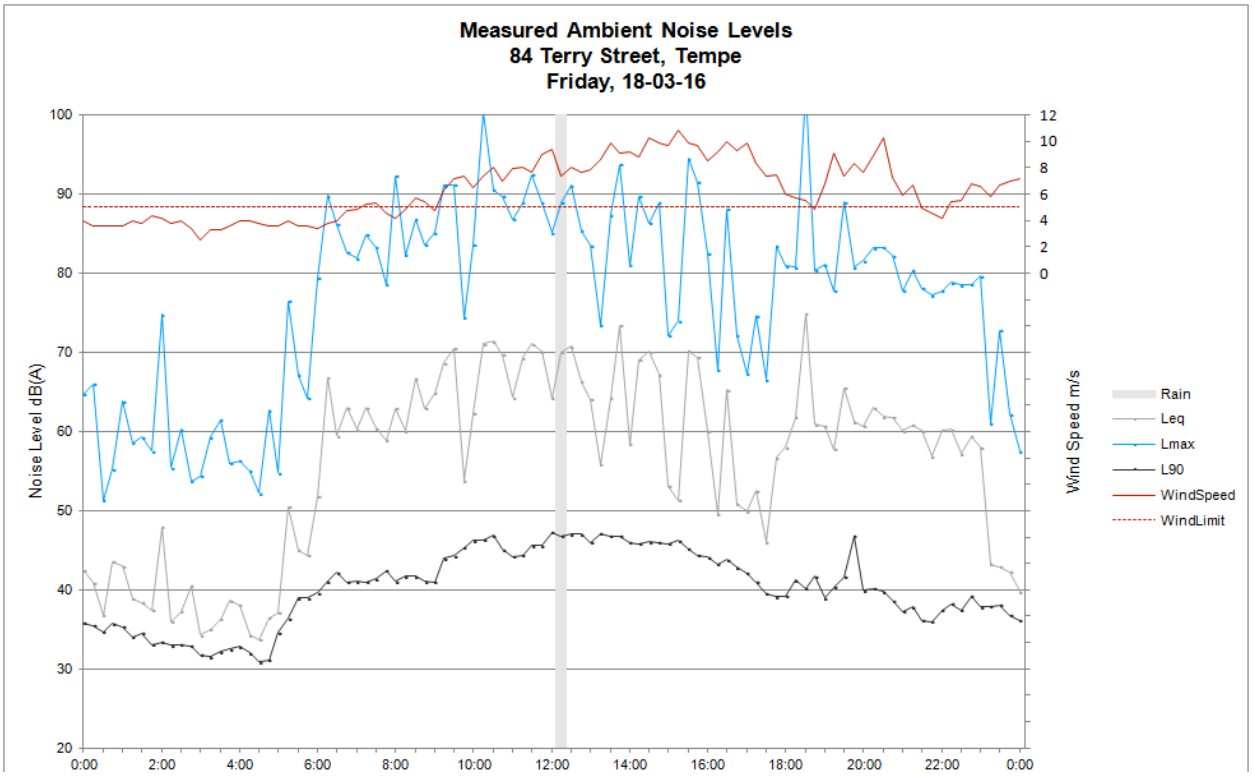

Measured Ambient Noise Levels
84 Terry Street, Tempe
Sunday, 13-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

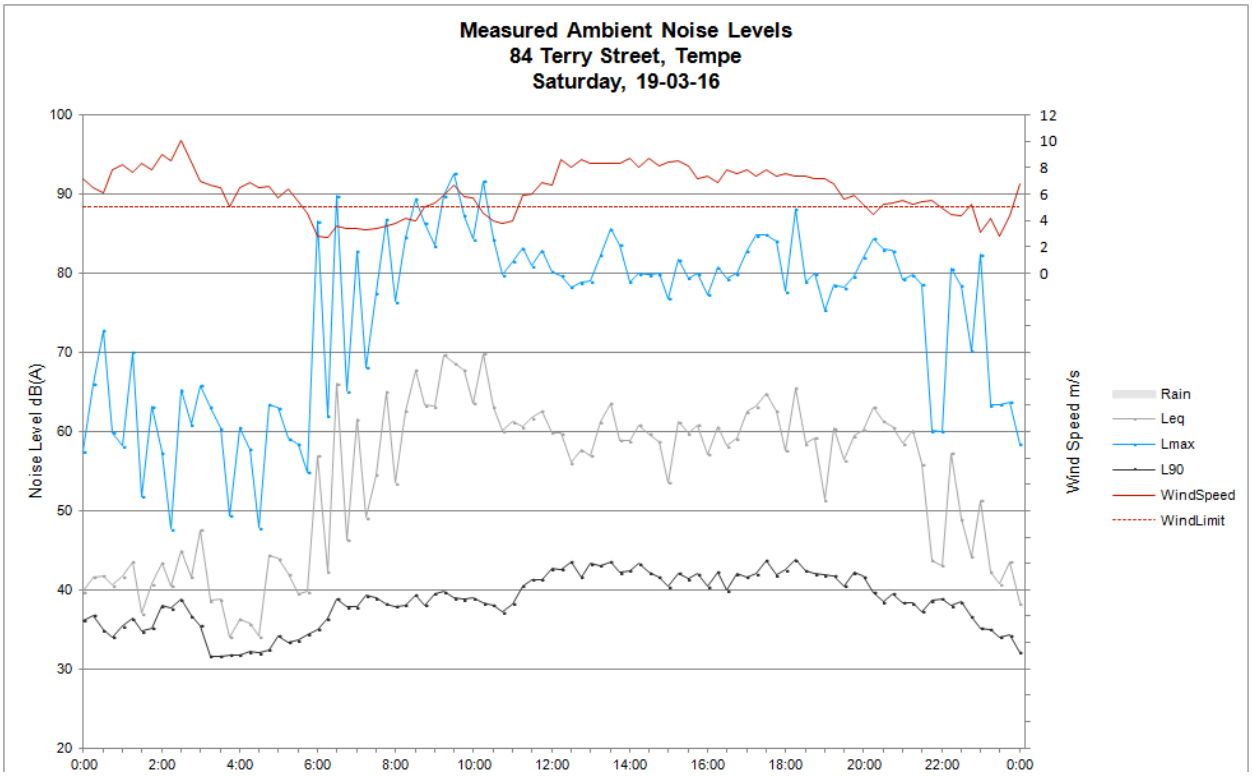

Measured Ambient Noise Levels
84 Terry Street, Tempe
Monday, 14-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

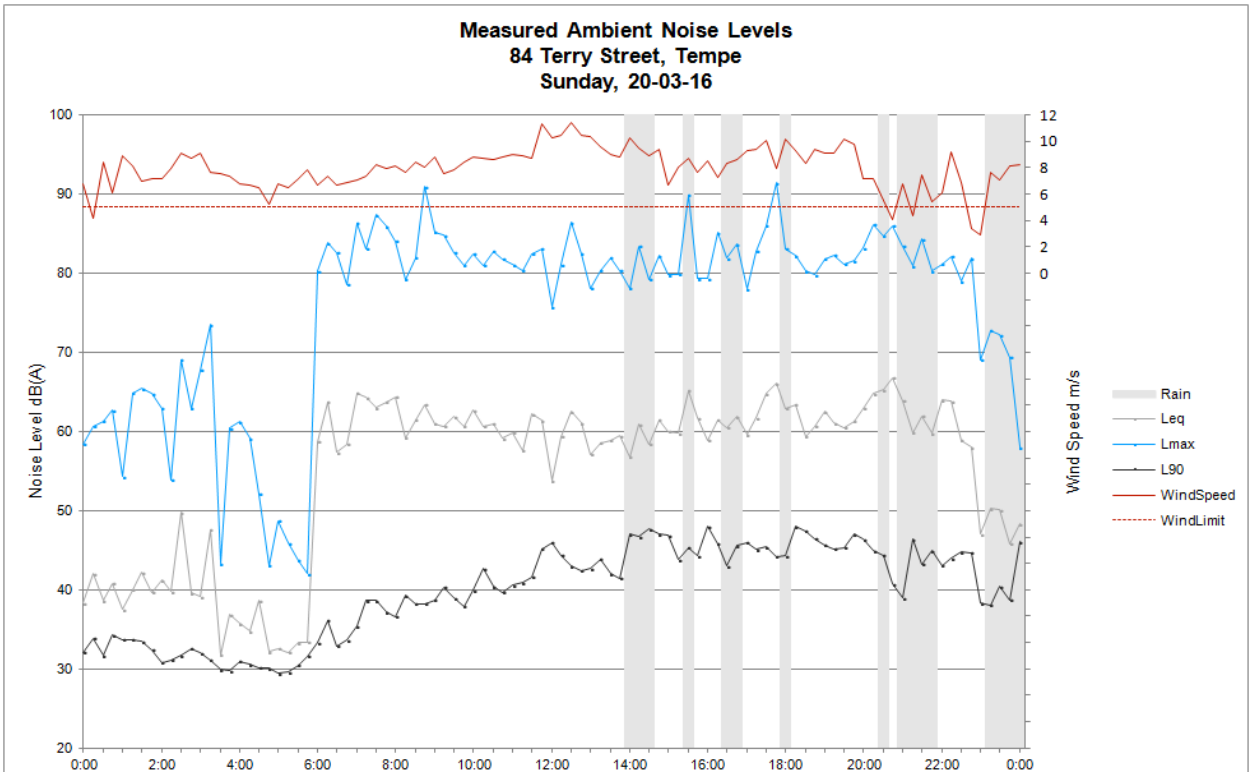

Measured Ambient Noise Levels
84 Terry Street, Tempe
Tuesday, 15-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

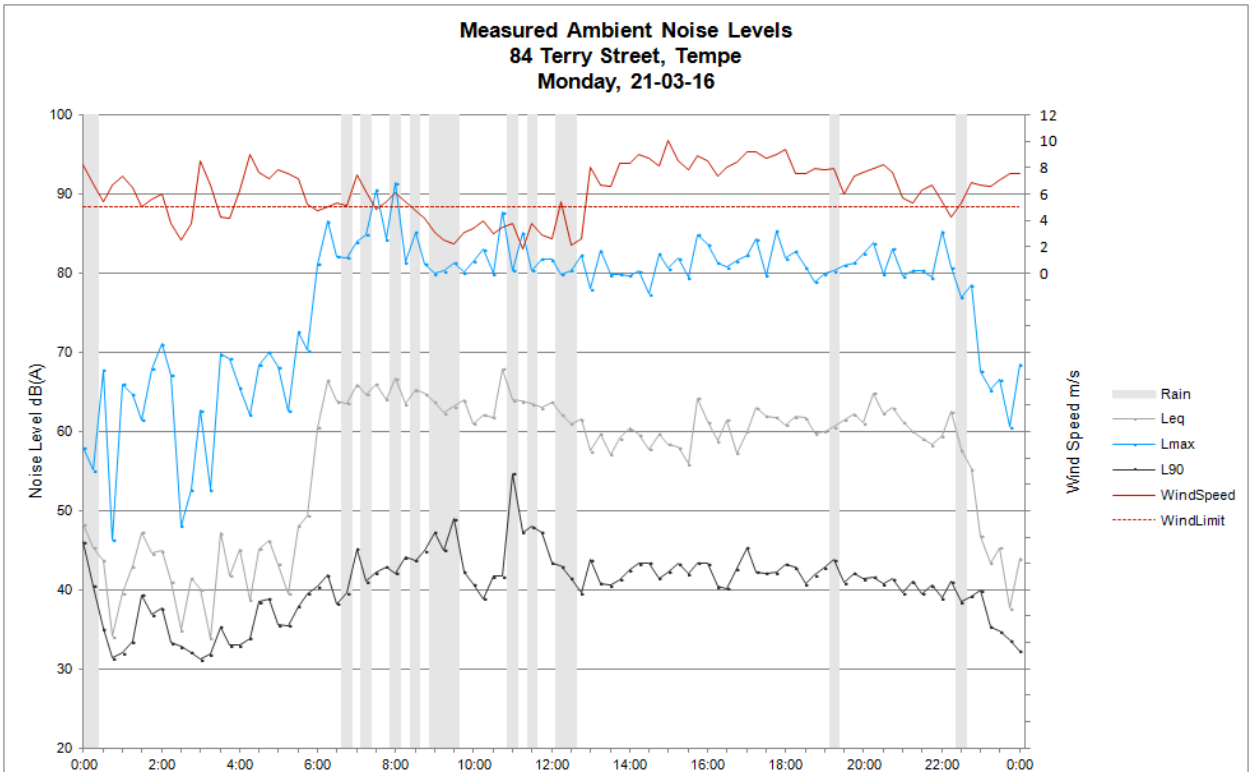

Measured Ambient Noise Levels
84 Terry Street, Tempe
Wednesday, 16-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

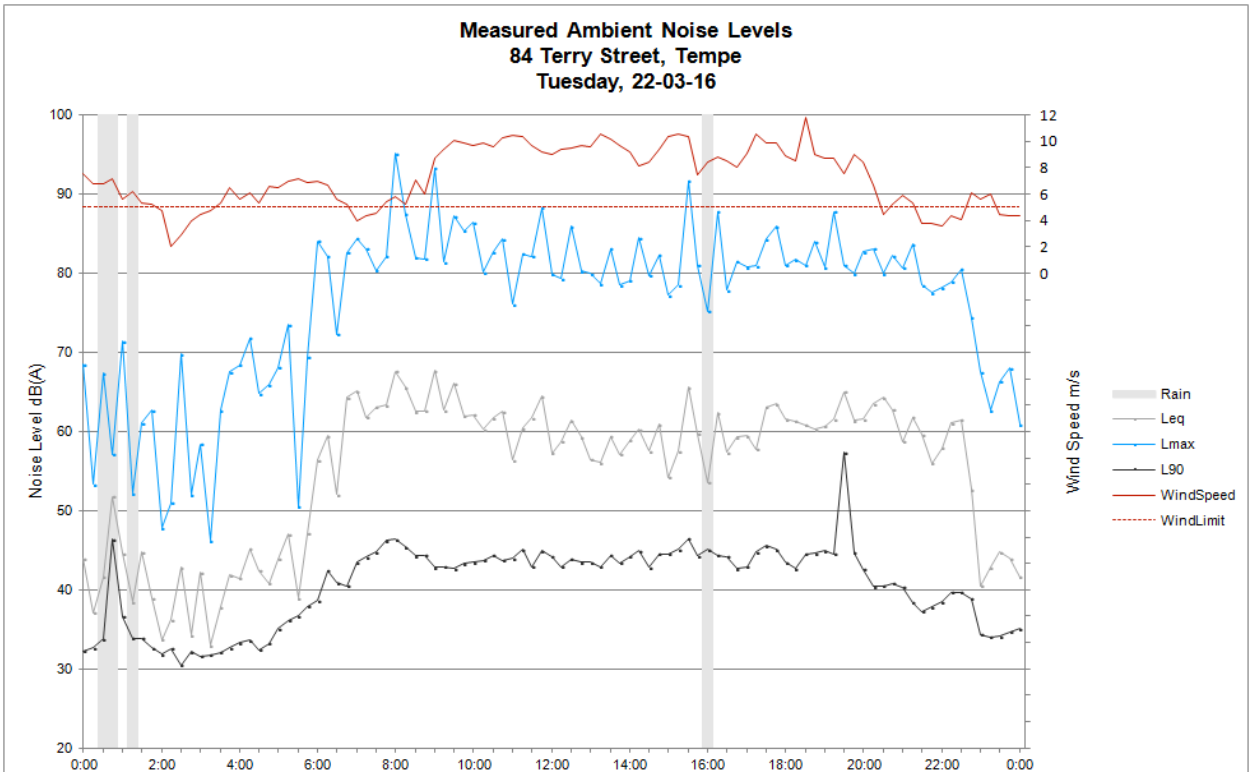

Measured Ambient Noise Levels
84 Terry Street, Tempe
Thursday, 17-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

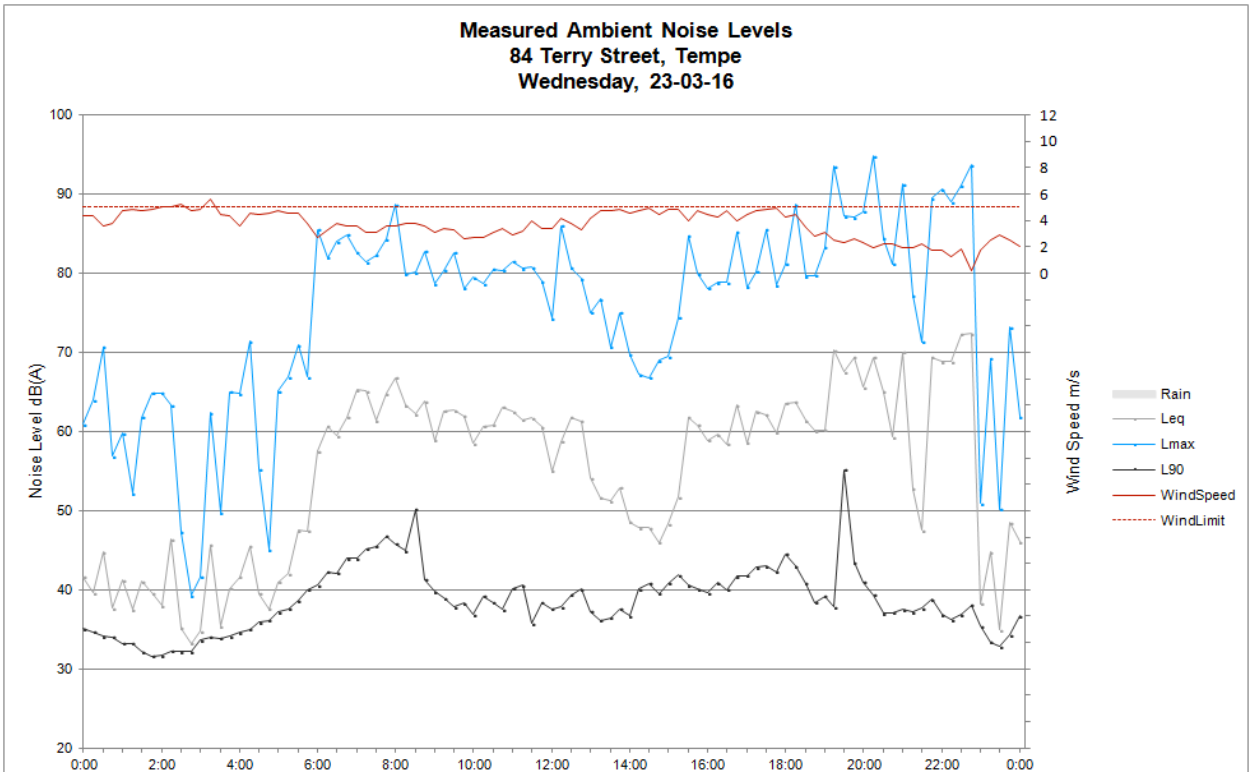

Measured Ambient Noise Levels
84 Terry Street, Tempe
Friday, 18-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
84 Terry Street, Tempe
Saturday, 19-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
84 Terry Street, Tempe
Sunday, 20-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
84 Terry Street, Tempe
Monday, 21-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
84 Terry Street, Tempe
Tuesday, 22-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
84 Terry Street, Tempe
Wednesday, 23-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

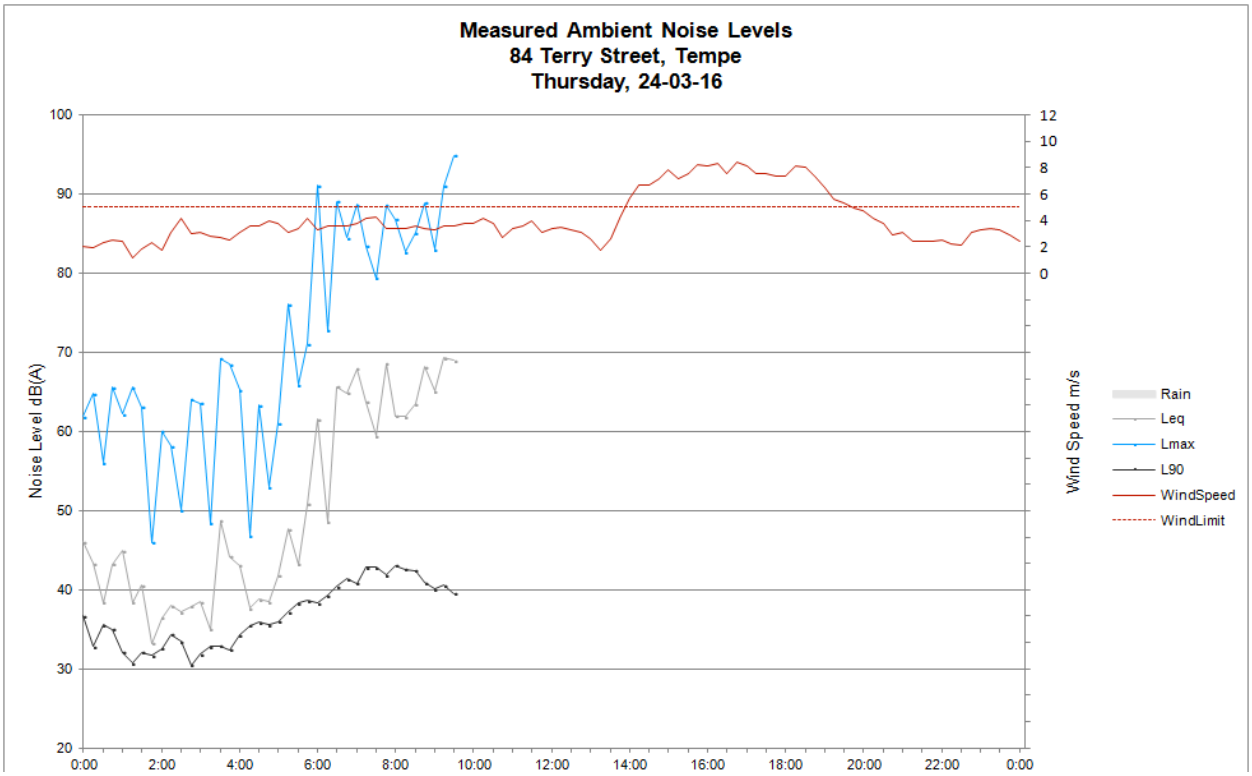
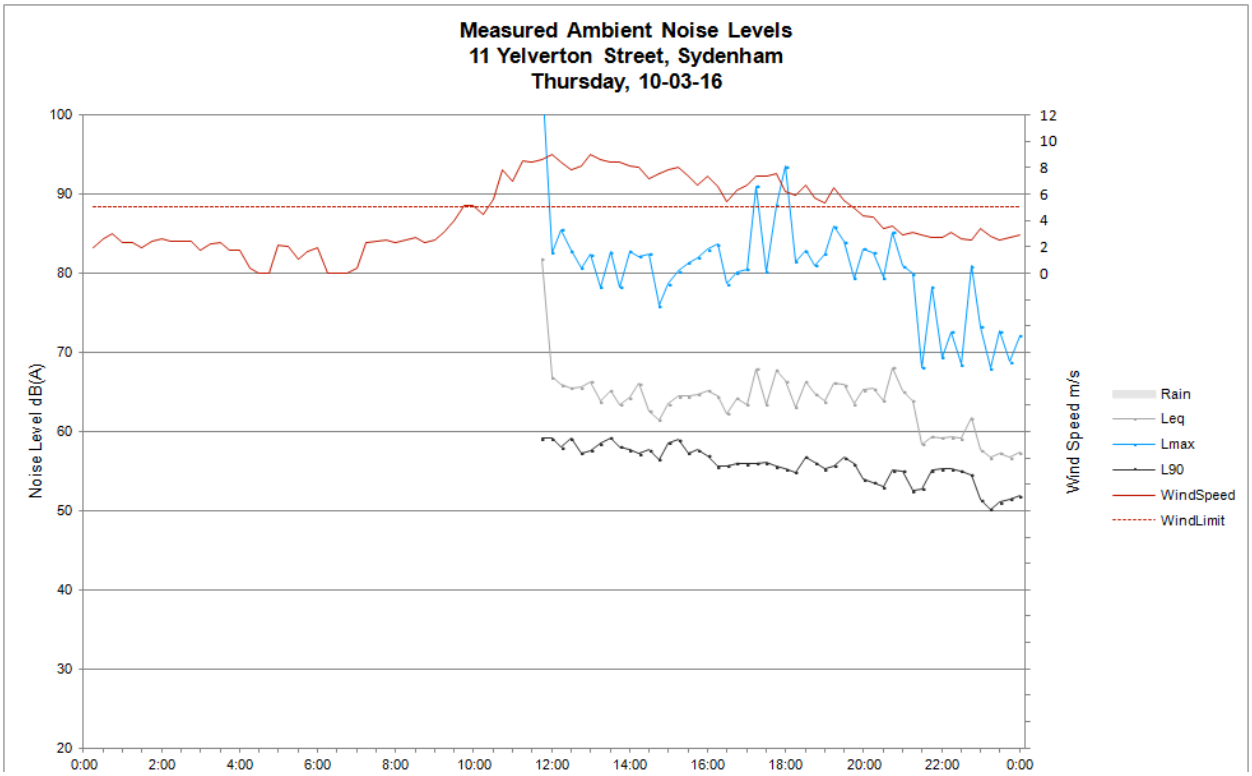
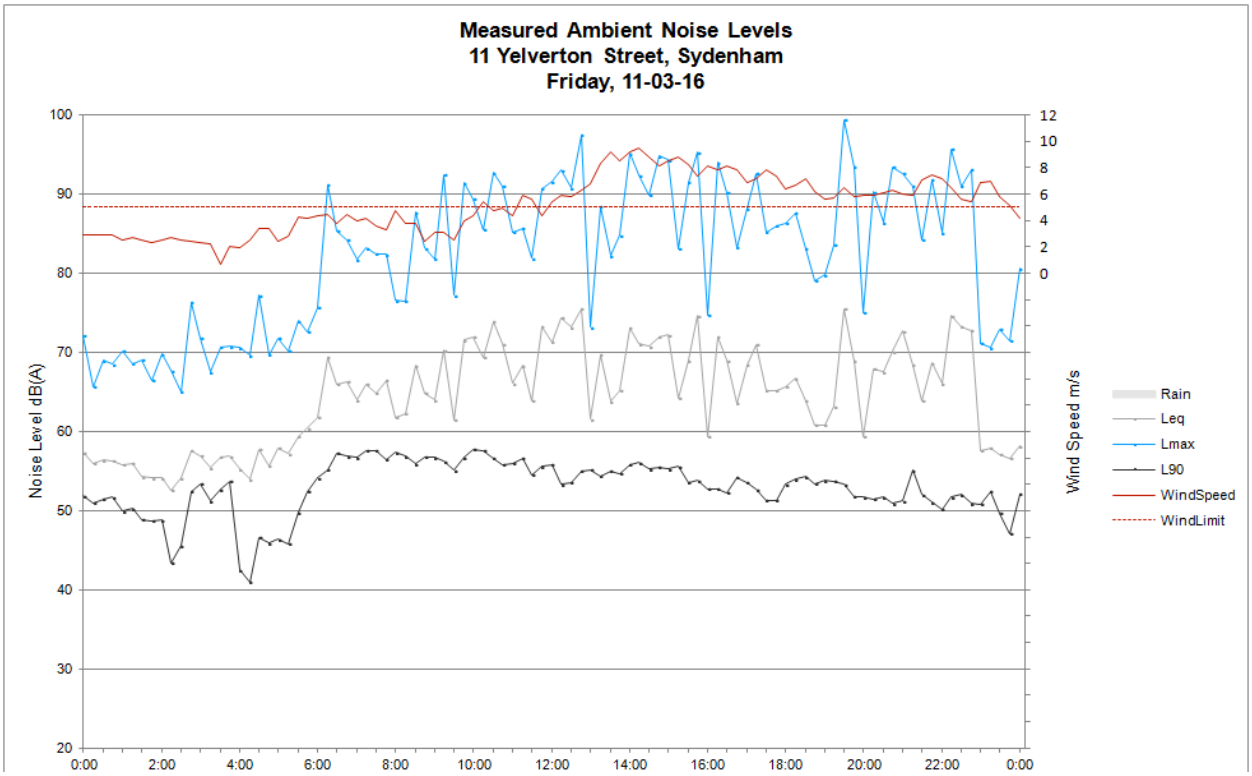
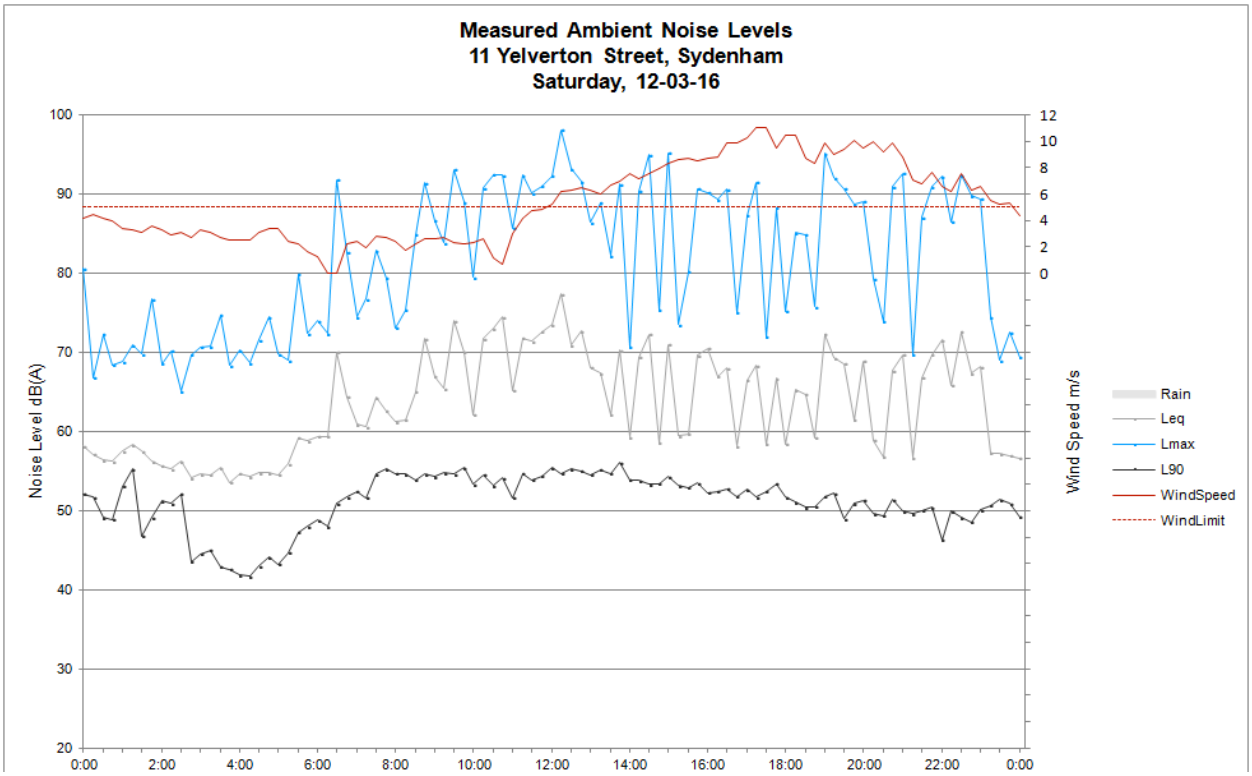

Measured Ambient Noise Levels
84 Terry Street, Tempe
Thursday, 24-03-16
Noise Level dB(A)
Wind Speed m/s
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

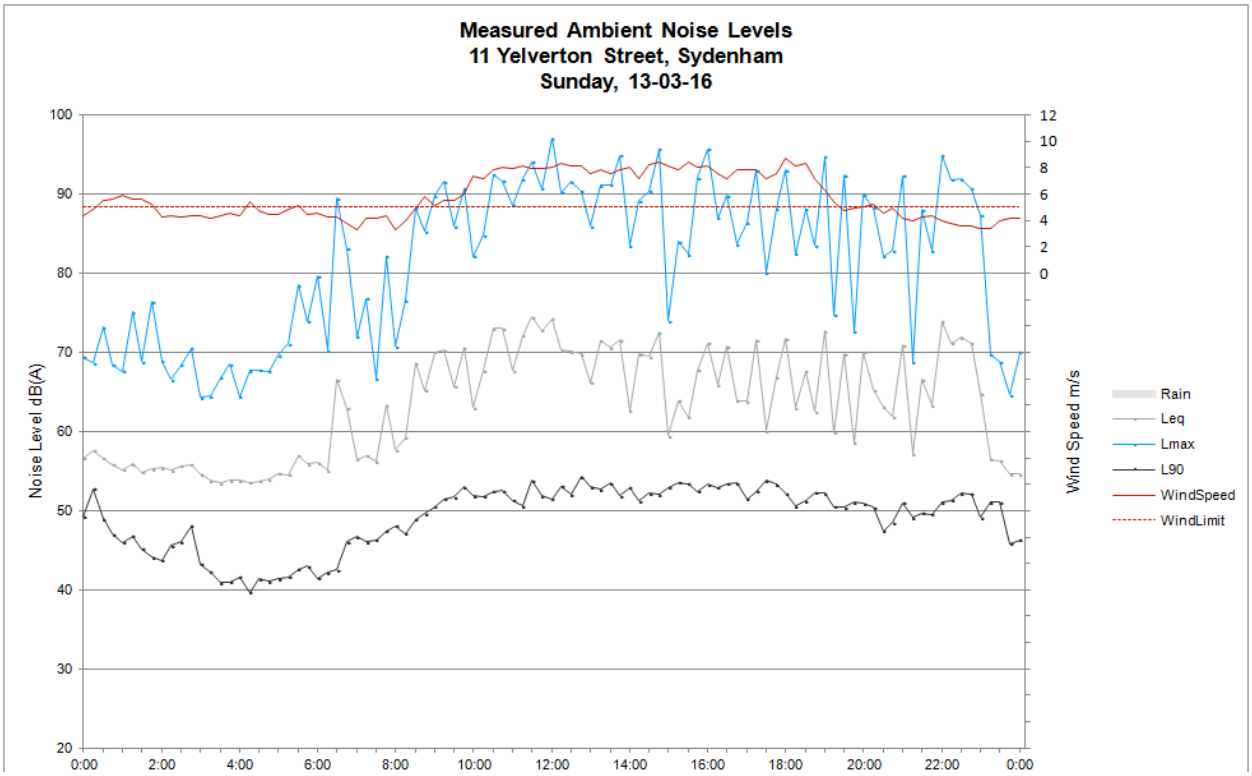
Table A.2 Ambient noise monitoring summary – 11 Yelverton Street, Sydenham

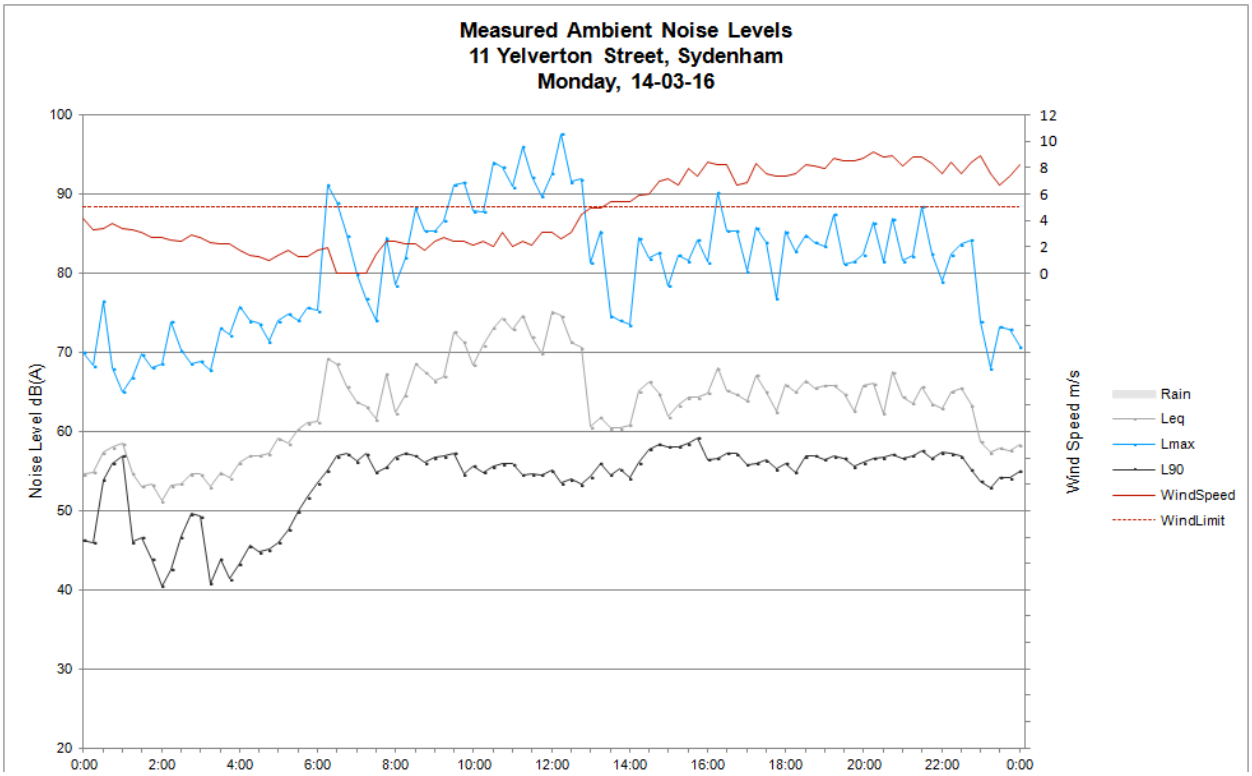
Date	ABL Day	ABL Evening	ABL Night	L_{eq} 11hr Day	L_{eq} 4hr Evening	L_{eq} 9hr Night
Thursday, 10-03-16	0	53	46	0	65	60
Friday, 11-03-16	53	51	43	70	69	64
Saturday, 12-03-16	0	49	41	0	68	62
Sunday, 13-03-16	48	49	43	69	68	64
Monday, 14-03-16	54	56	0	69	65	0
Tuesday, 15-03-16	57	54	47	67	66	61
Wednesday, 16-03-16	57	53	45	67	66	61
Thursday, 17-03-16	52	52	45	70	68	64
Friday, 18-03-16	54	52	45	69	65	60
Saturday, 19-03-16	54	51	46	66	64	59
Sunday, 20-03-16	0	0	0	0	0	0
Monday, 21-03-16	0	55	0	0	66	0
Tuesday, 22-03-16	0	54	45	0	66	60
Wednesday, 23-03-16	54	52	45	66	69	66
Thursday, 24-03-16	34	21	0	71	28	0
Friday, 25-03-16	0	0	0	0	0	0
Summary Values						
RBL	54	52	45	-	-	-
Average Leq	-	-	-	69	66	62

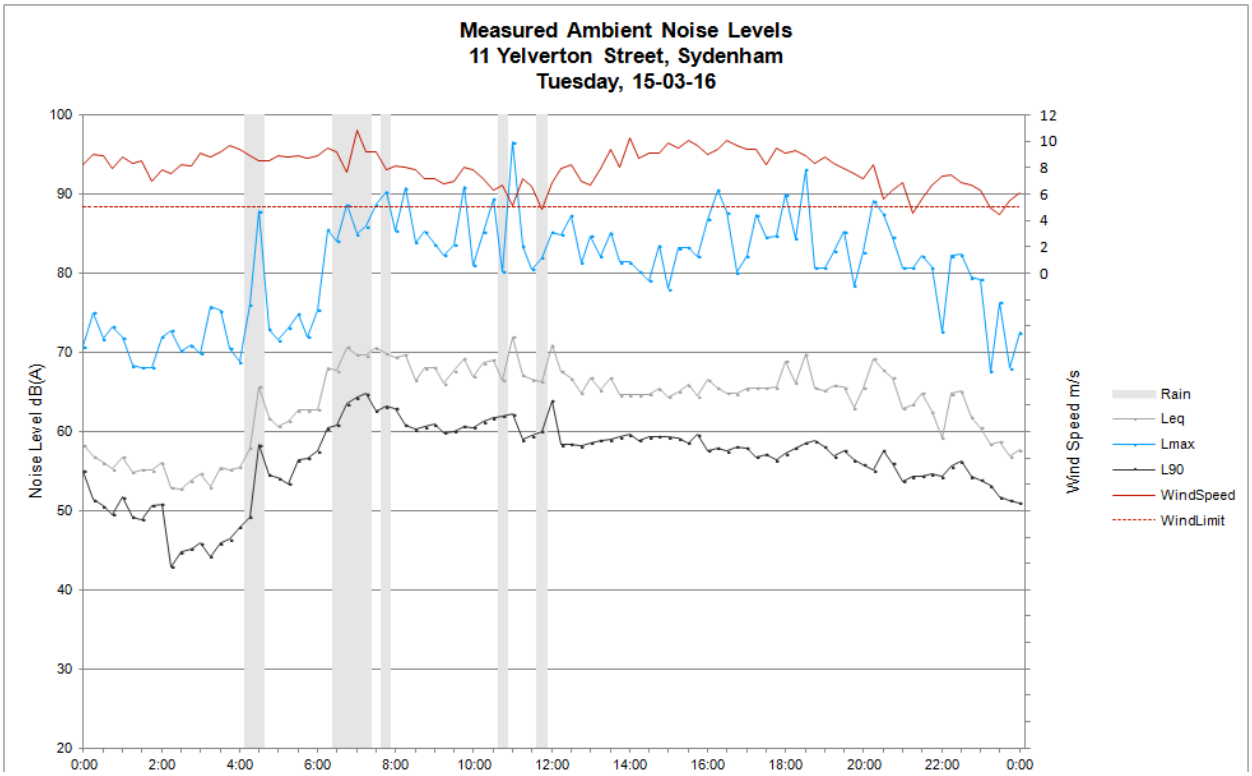

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Thursday, 10-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

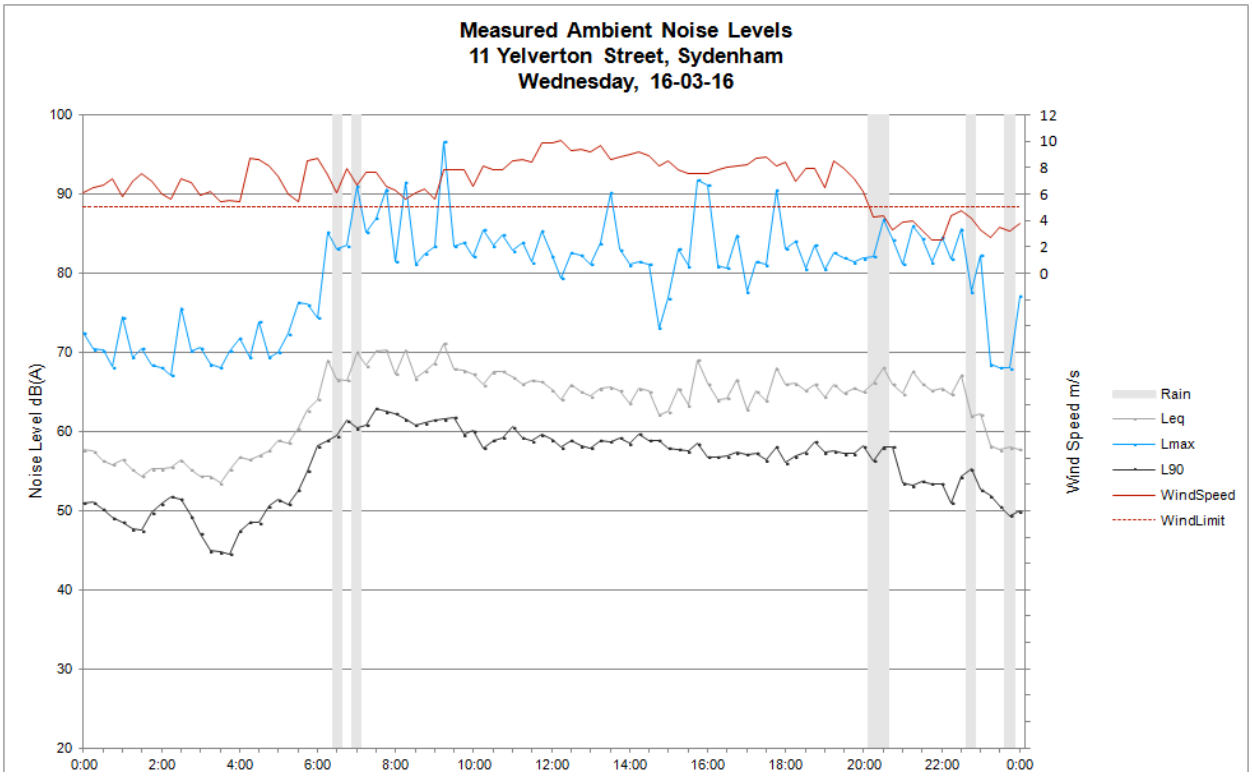

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Friday, 11-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

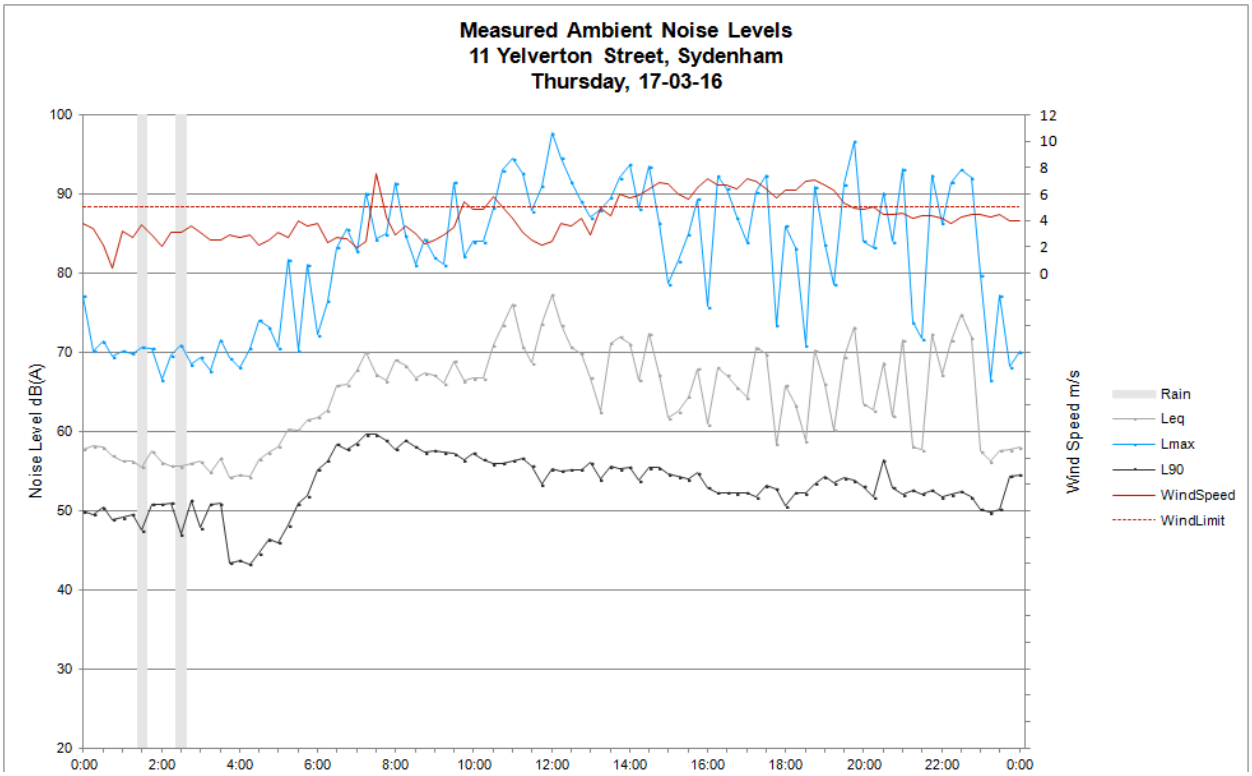

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Saturday, 12-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

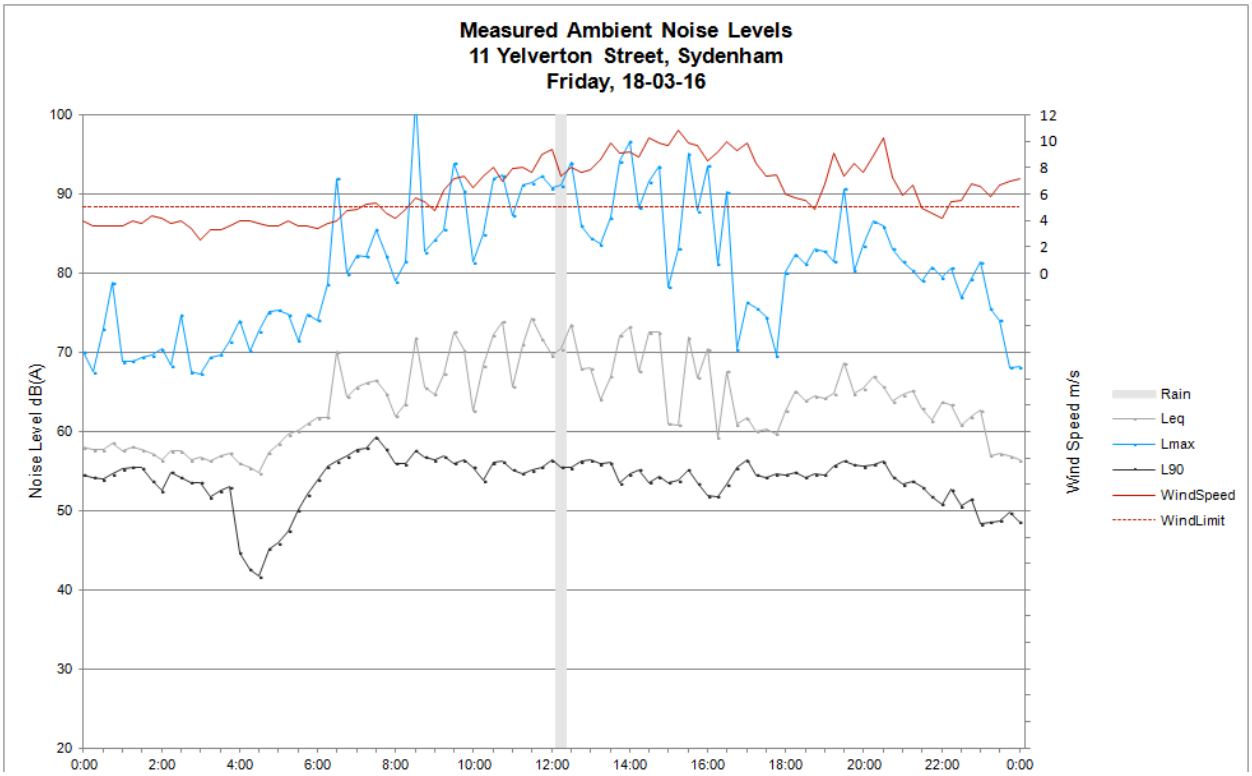

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Sunday, 13-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

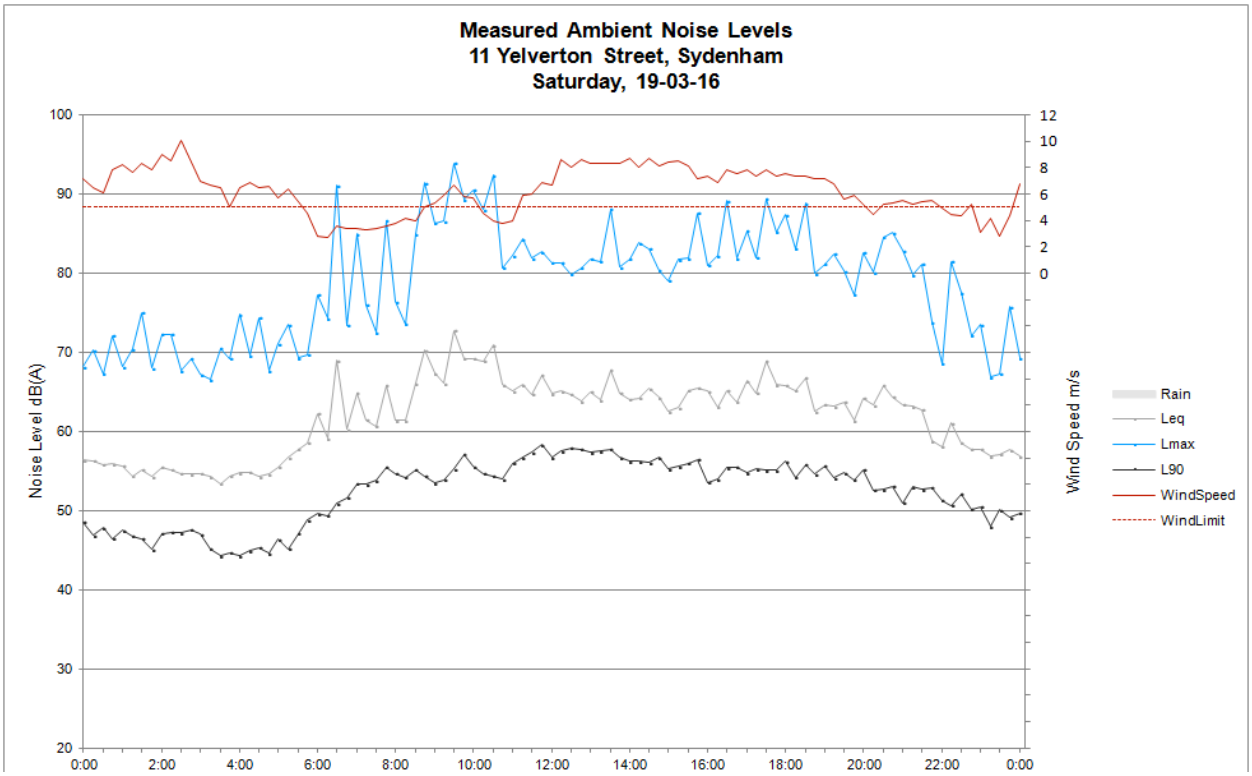

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Monday, 14-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

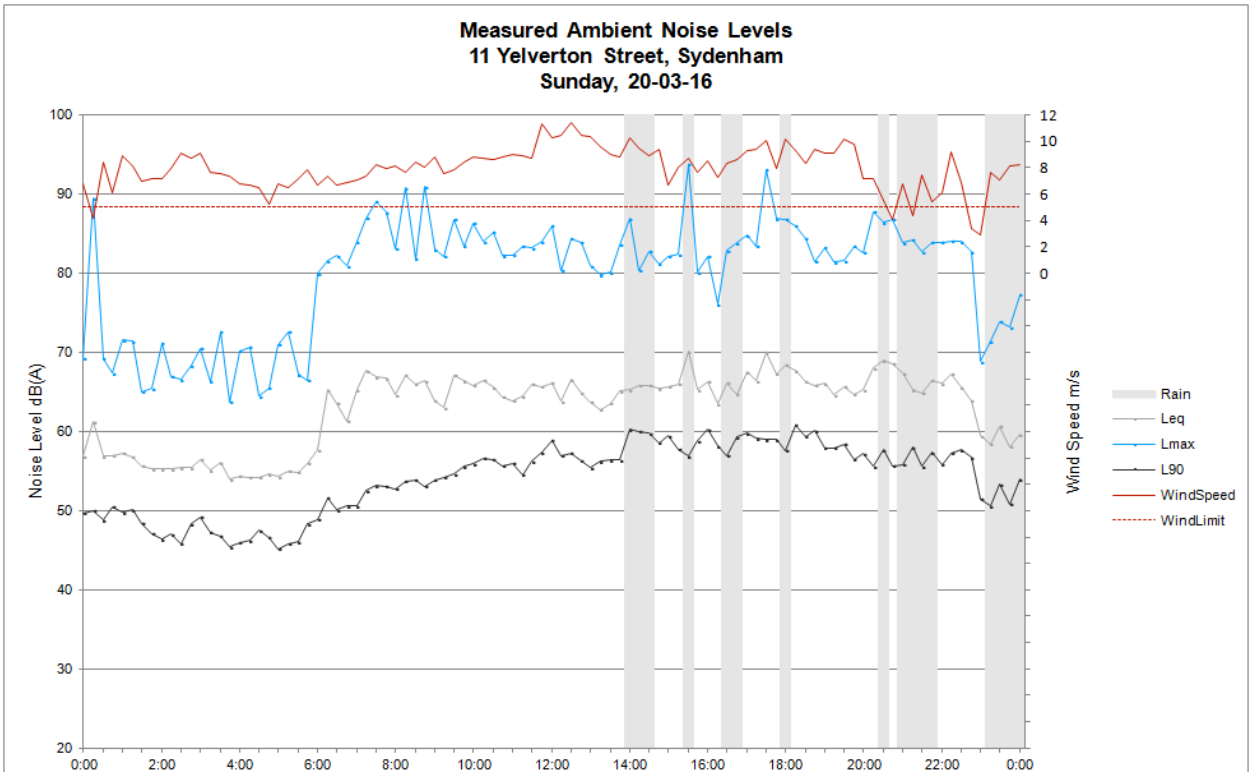

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Tuesday, 15-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

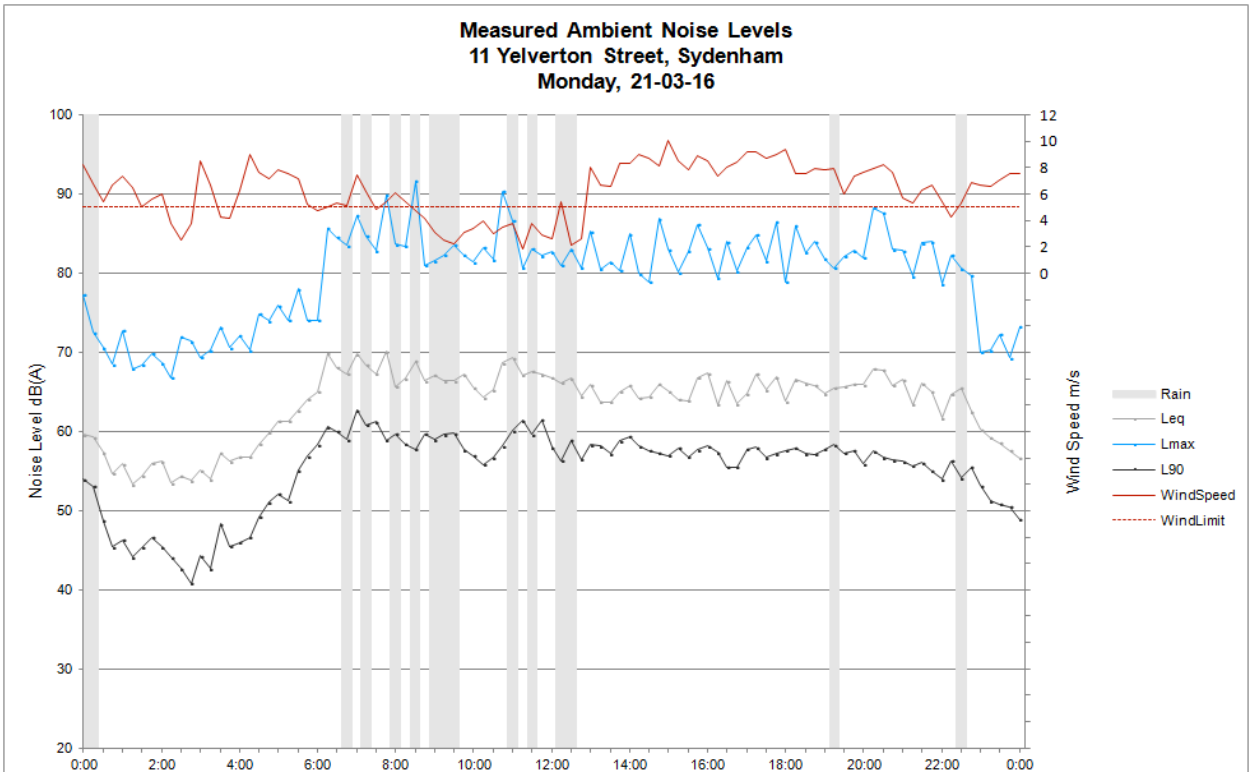

Measured Ambient Noise Levels
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Wednesday, 16-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

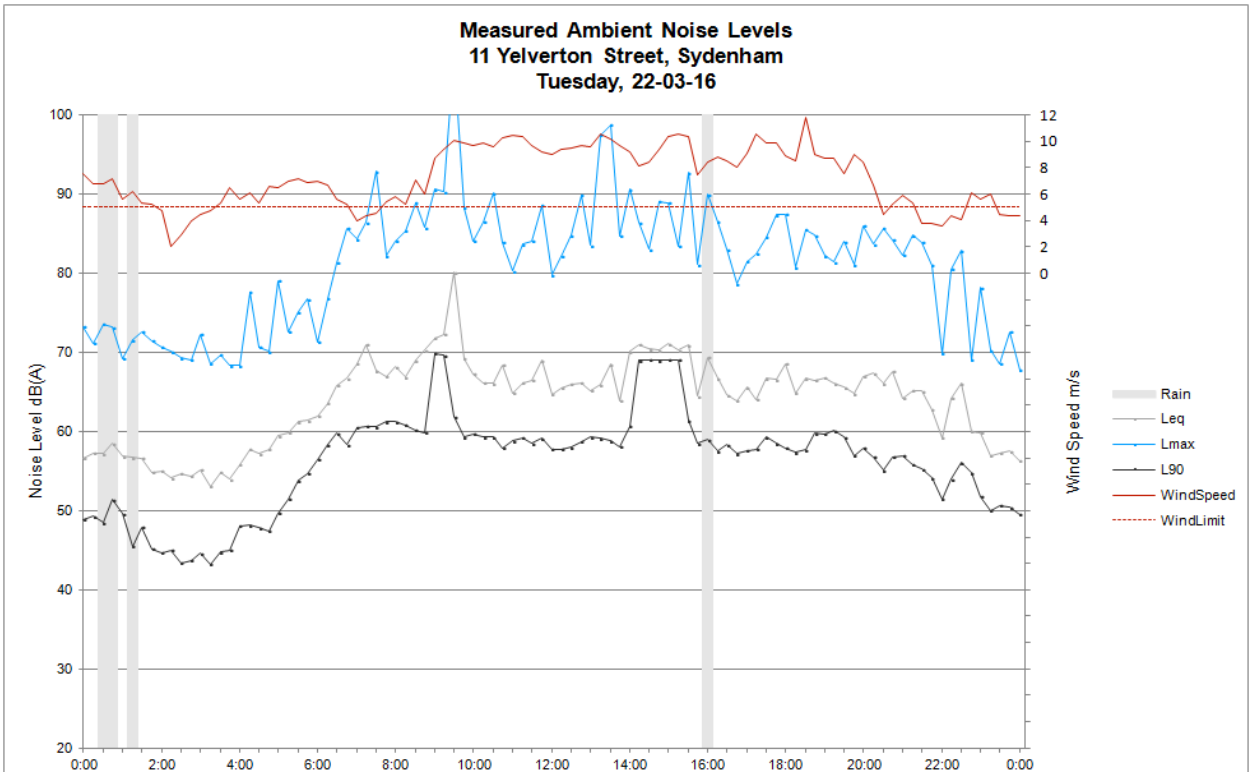

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Thursday, 17-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

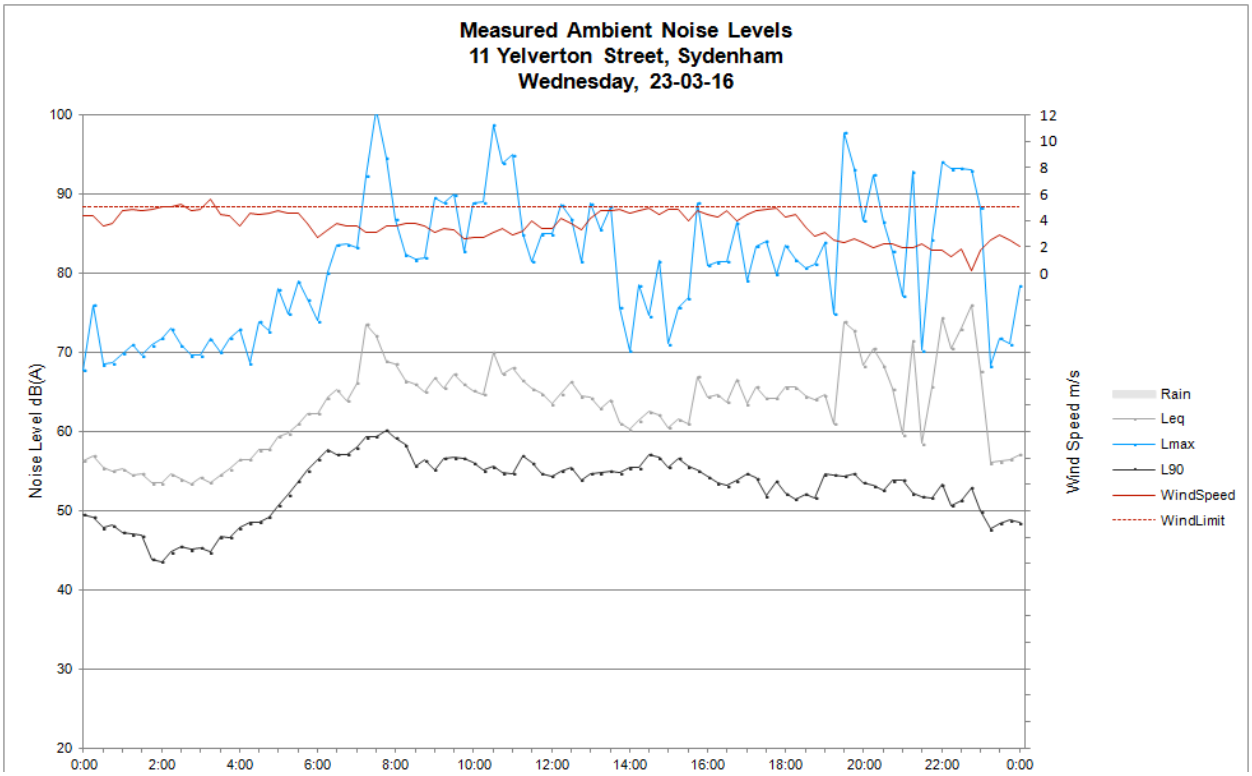

Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Friday, 18-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

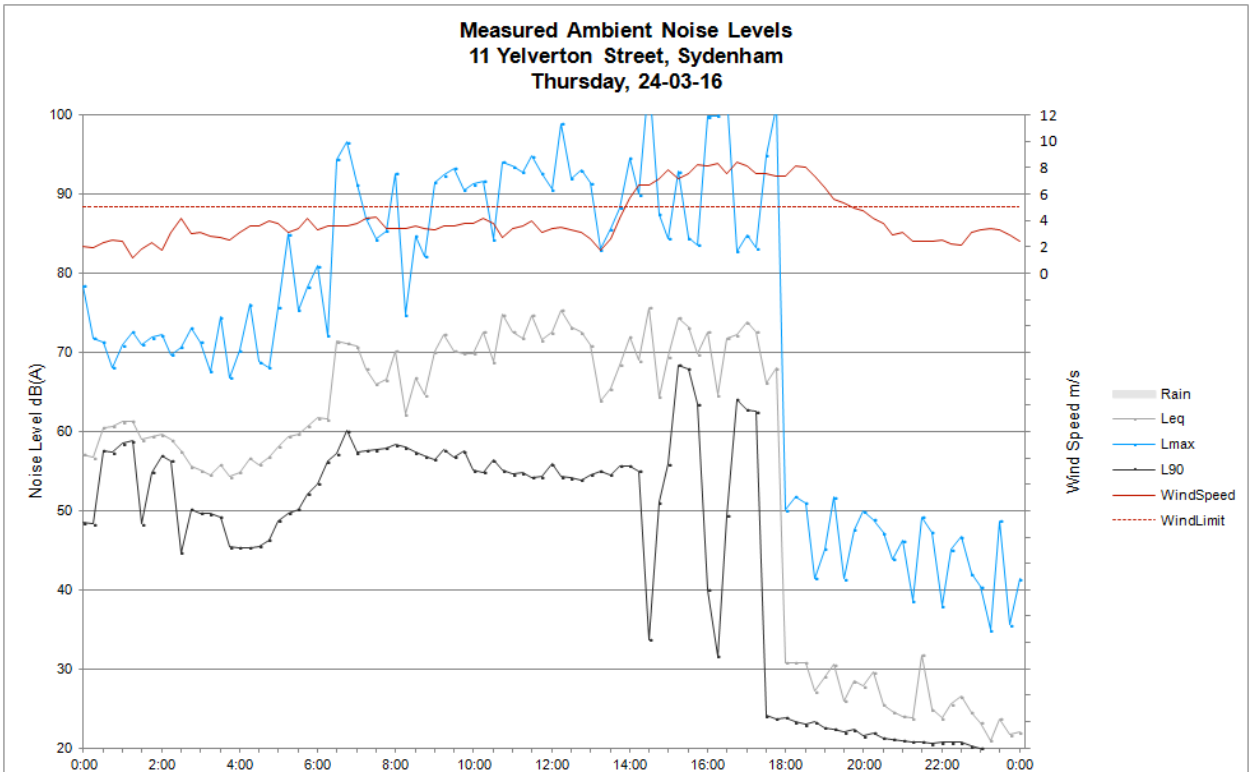

Measured Ambient Noise Levels
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Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

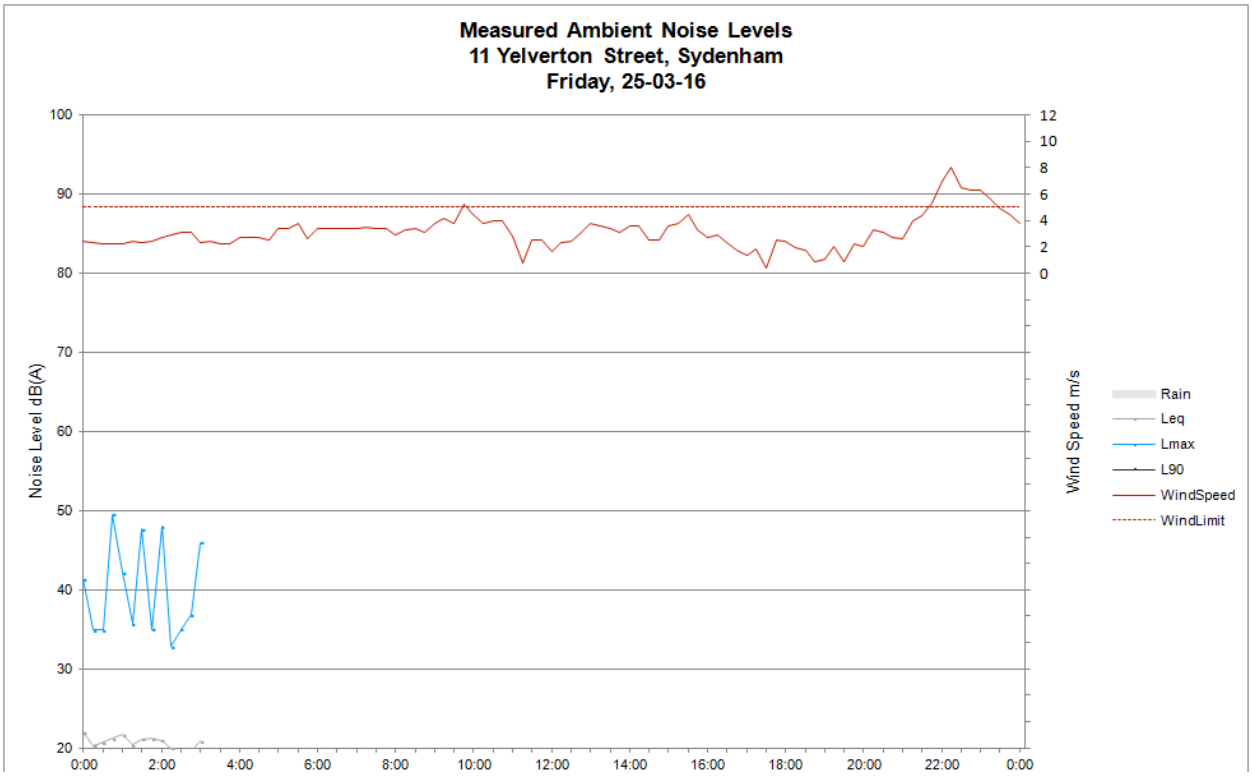

Measured Ambient Noise Levels
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Sunday, 20-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Monday, 21-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Tuesday, 22-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Wednesday, 23-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Thursday, 24-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit


Measured Ambient Noise Levels
11 Yelverton Street, Sydenham
Friday, 25-03-16
Noise Level dB(A)
Wind Speed m/s
Rain
Leq
Lmax
L90
WindSpeed
WindLimit

Appendix B

Calibration certificates

Brüel & Kjær

LICENSE AUTHORISATION CARD

Important: Please place this authorisation card in a safe place – you will need it for future upgrades.

Your Application is:

BZ-5503--001-

Your License Authorisation Code is:

OR55411-283125

Your System Order Number is:

6789945

Write your Instrument Serial number here: (Please, see the back of your Instrument)

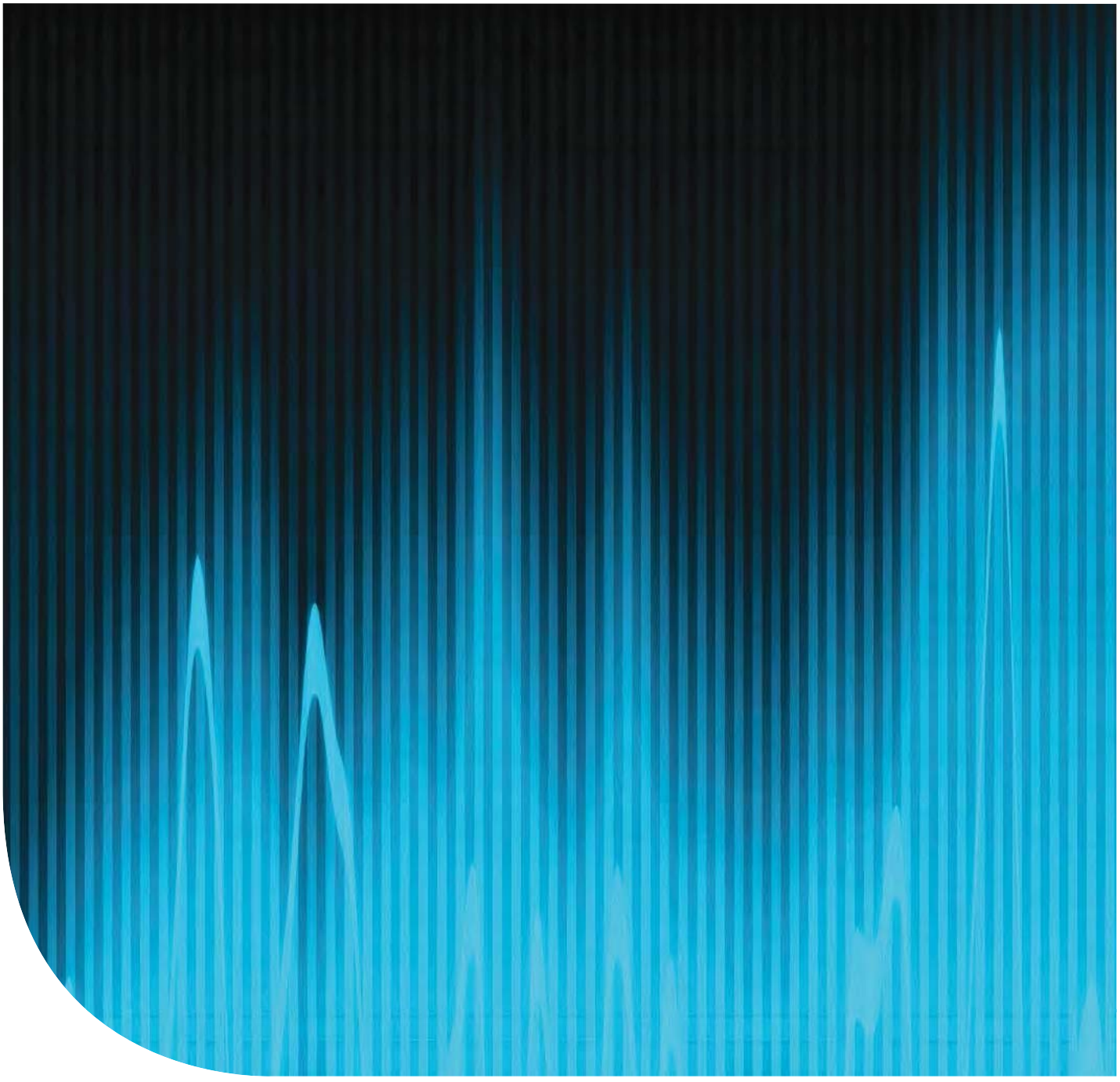
3008201.

BR 1625 – 13

SYDNEY
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St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

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Level 5, 21 Bolton Street
Newcastle, New South Wales, 2300
T 02 4927 0506 F 02 4926 1312

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866



Appendix F

Air quality assessment

Intended for
EMM Consulting Pty Ltd

Document type
Report

Date
July 2016

MODIFICATION OF DEVELOPMENT CONSENT – BORAL ST PETERS RAIL TERMINAL AIR QUALITY IMPACT ASSESSMENT

RAMBOLL ENVIRON

MODIFICATION OF DEVELOPMENT CONSENT – BORAL ST PETERS RAIL TERMINAL AIR QUALITY IMPACT ASSESSMENT

Version	Date	Made by	Checked by	Approved by	Signature
Final	21/06/2016	S. Fishwick	R. Kellaghan	S. Fishwick	

Ref AS121994

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\\Ausydfp1.environcorp.int\shared_files\Projects\EMGA Mitchell McLennan\1994_StPeters\Word Processing\AS121994_StPetersCBP_AQIA_210716.docx

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Wind Roses

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Incremental Isopleth Plots

EXECUTIVE SUMMARY

Boral Resources (NSW) Pty Ltd (Boral) own and operate a concrete batching plant (CBP) and construction materials handling facility (the handling facility) at 25 Burrows Road South, St Peters (the site). A modification to the site's development consent is proposed by Boral. The modification is proposed to simplify the existing development consent and seeks production limits for the CBP and throughput limits for the handling facility.

Ramboll Environ Australia Pty Ltd (Ramboll Environ) has been commissioned by EMM Consulting Pty Ltd (EMM) on behalf of Boral to conduct an air quality assessment for the modification.

Emissions of total suspended particulates (TSP), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) were estimated for current and future proposed operations associated with the site.

Existing air quality and meteorological conditions were analysed through a number of data resources, with particular weighting given to the Bureau of Meteorology Sydney Airport automatic weather station and NSW Office of Environment and Heritage Earlwood air quality monitoring station.

Atmospheric dispersion modelling predictions of calculated air pollution emissions were undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted indicated that the proposed modification was unlikely to result in exceedances of the applicable NSW Environment Protection Authority assessment criteria for TSP and PM_{10} or the National Environment Protection Measure standards for $PM_{2.5}$.

However, predicted dust deposition levels, an indicator of nuisance impact, were above the applicable assessment criteria for both current and future operations at the site. Dust deposition monitoring data collected at the site is also above the criteria, reinforcing the model predictions.

Analysis of model predictions for dust deposition indicates that the key influencing source of emissions at the site is the generation of dust by the movement of trucks across paved surfaces (e.g. roads and the handling facility). It is recommended that existing dust controls associated with the reduction of paved surface silt loading are reviewed and where possible improved.

1. INTRODUCTION

Boral Resources (NSW) Pty Ltd (Boral) own and operate a concrete batching plant (CBP) and construction materials handling facility (the handling facility) at 25 Burrows Road South, St Peters (the site).

On 6 September 1996, the then NSW Minister for Urban Affairs and Planning granted development consent to Boral under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of the CBP and the handling facility at the site. The development consent also permitted Boral to construct and operate an asphalt plant. This plant was constructed and operated, but was subsequently decommissioned and demolished in 2002.

A modification to the site's development consent is proposed. It is largely an administrative modification of the development consent under section 75W of the EP&A Act to simplify it (i.e. remove complexity) and remove irrelevant conditions. In addition, the application seeks to set production and throughput limits for the CBP and the handling facility and remove the condition restricting daily vehicle movements. The production limit sought for the CBP will result in a 10% increase in the combined production rates of the CBP and asphalt plant described in the environmental impact statement (EIS) that accompanied the development Application for the site in 1996, noting that the asphalt plant no longer operates. This application is referred to as the administrative modification (the modification).

Ramboll Environ Australia Pty Ltd (Ramboll Environ) has been commissioned by EMM Consulting Pty Ltd (EMM) on behalf of Boral to conduct an air quality assessment for the modification.

This air quality assessment provides:

- characterisation of the existing environment, specifically the existing air quality, prevailing meteorology and regulatory context;
- review of potential emission sources and mitigation measures;
- calculation of annual particulate matter emissions from both current and proposed future operations at the site; and
- atmospheric dispersion modelling of calculated emissions to predict potential particulate matter impacts at the surrounding sensitive receptor locations and determine the significance of the proposed administrative modification to ambient air quality.

The AQIA is guided by the NSW Environment Protection Authority (NSW EPA) document Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales ("the Approved Methods for Modelling", EPA 2005).

2. PROJECT SETTING AND DESCRIPTION

2.1 Project Setting

The site is located within the Inner West local government area (LGA) (formerly Marrickville LGA) adjacent to its eastern boundary with the Botany Bay LGA. The site is principally surrounded by industrial land uses which correspond with the site's and surrounding properties zoning as IN1 General Industrial under the *Marrickville Local Environmental Plan 2011* (Marrickville LEP).

The site is bordered by the Alexandra Canal to the south-east, Burrows Road South to the north-east, industrial land uses to the north-west and the Botany Goods Line to the south-west. The Sydney International Airport is located about 300 metres (m) to the south of the site. The nearest private residences are located about 600 m to the north-west of the site on the opposite side of the Princes Highway.

The regional setting and local context of the site can be seen in **Figure 2-1** and **Figure 2-2** respectively.

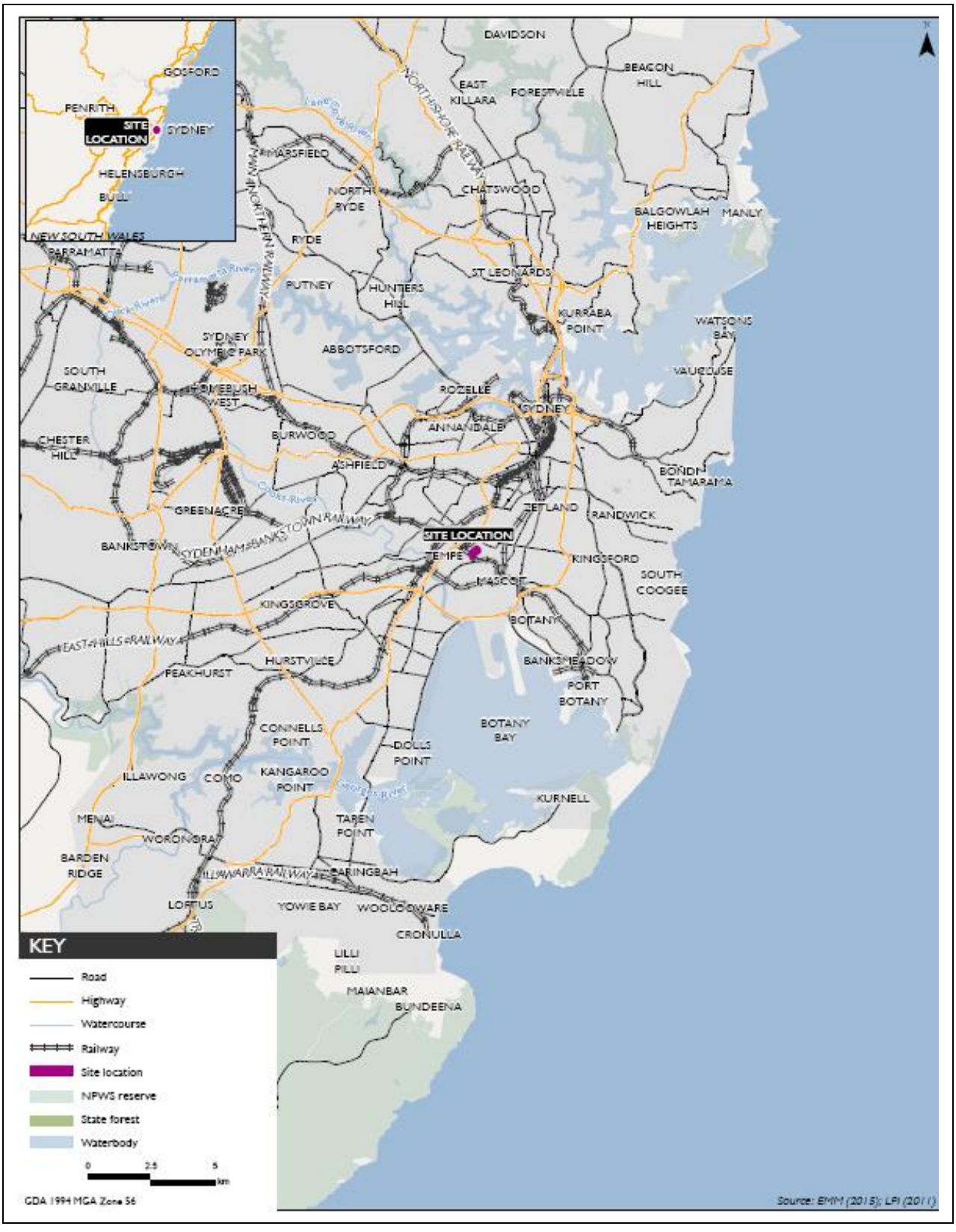


Figure 2-1: Site location - regional setting

Source: EMM (2016)



Figure 2-2: Site location – local context

Source: EMM (2016)

2.2 Surrounding Receptor Locations

The site is located in an existing industrial estate in southern Sydney. The surrounding area consists of commercial and industrial receptors. Residential receptors are located further afield, with the closest located approximately 600m to the north-east of the site. A number of commercial, industrial, and residential receptors, representative of the region, have been selected to assess air quality impacts from the site. The selected receptor locations are presented in **Table 2-1** and illustrated in **Figure 2-3**.

Table 2-1 Sensitive Receptor Locations Surrounding the Site

Receptor ID	Receptor type	Location (m, MGA56S)		Elevation (m, AHD)
		Easting	Northing	
1	Residential	330580	6245145	16
2	Residential	330940	6245470	14
3	Commercial/industrial	331405	6245045	3
4	Commercial	331440	6245000	5
5	Commercial	331535	6244910	4
6	Commercial	331425	6244820	2
7	Commercial	331325	6244750	4
8	Industrial	330915	6244990	6
9	Industrial	330775	6244995	8
10	Industrial	331250	6245060	4
11	Commercial/industrial	331375	6245095	6

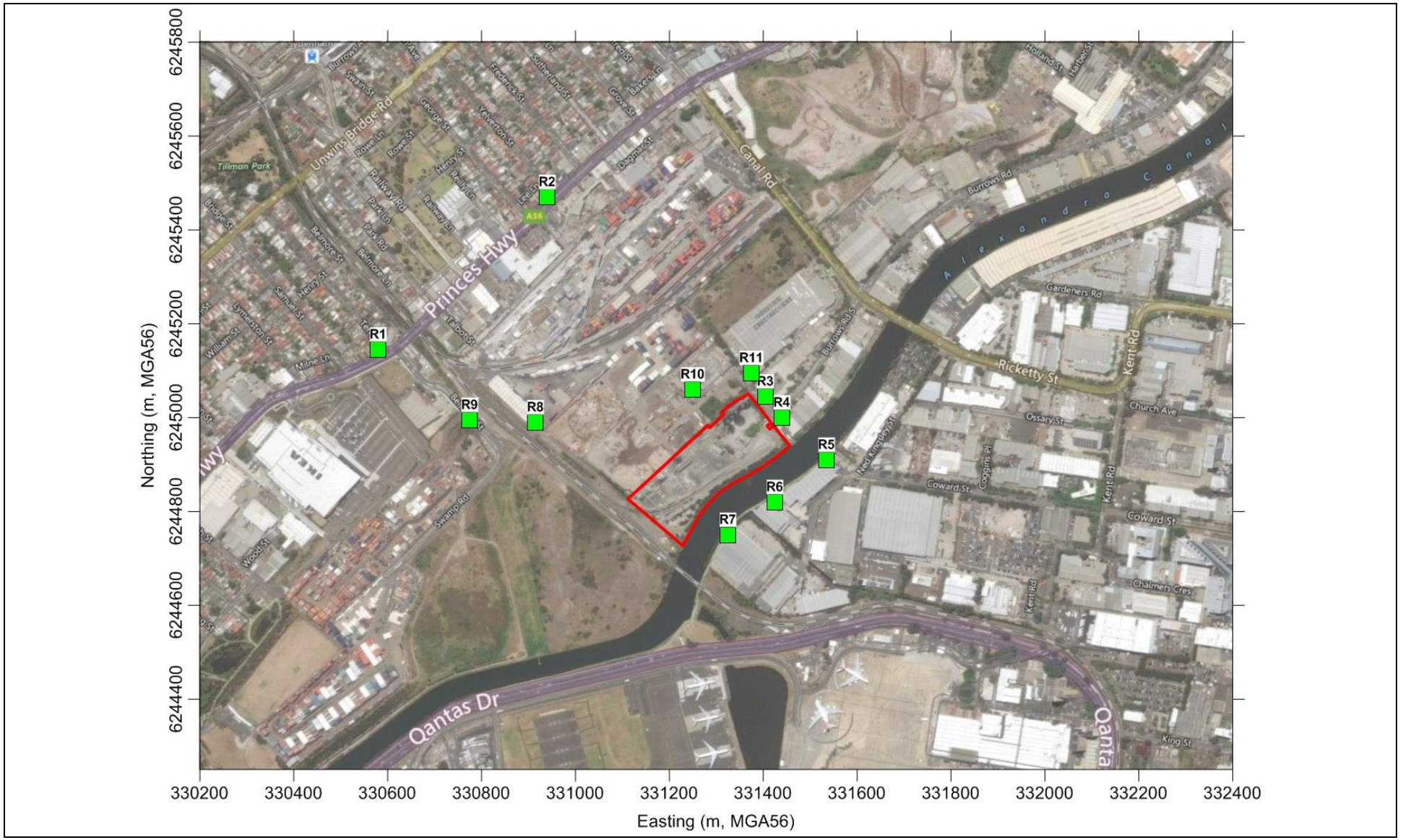


Figure 2-3: Surrounding Sensitive Receptor Locations

2.3 Description of current operations

The site has two existing land uses; a CBP and a construction materials handling facility. Both uses predominantly receive bulk construction materials (aggregate, sand and cement) from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. The majority of aggregate and sand material is received by rail. Some bulk construction materials as well as fly ash and special admixtures used in the CBP are delivered to the site by road.

All materials received are either used to make concrete at the CBP, or stored at the handling facility for subsequent distribution to other CBPs and asphalt plants within the Sydney metropolitan area. Concrete from the CBP is despatched by road in concrete agitators. All construction materials are despatched from the site by road in trucks.

The site has two driveways to Burrows Road South; the main driveway (Driveway 1) located in the middle of the site's boundary with Burrows Road South, and a second driveway (Driveway 2) located on the north-western boundary.

The original layout of the site has been modified a number of times since the original consent to improve overall operation and efficiency and to account for the demolition of the asphalt plant. The current layout of the site is illustrated in **Figure 2-4**.

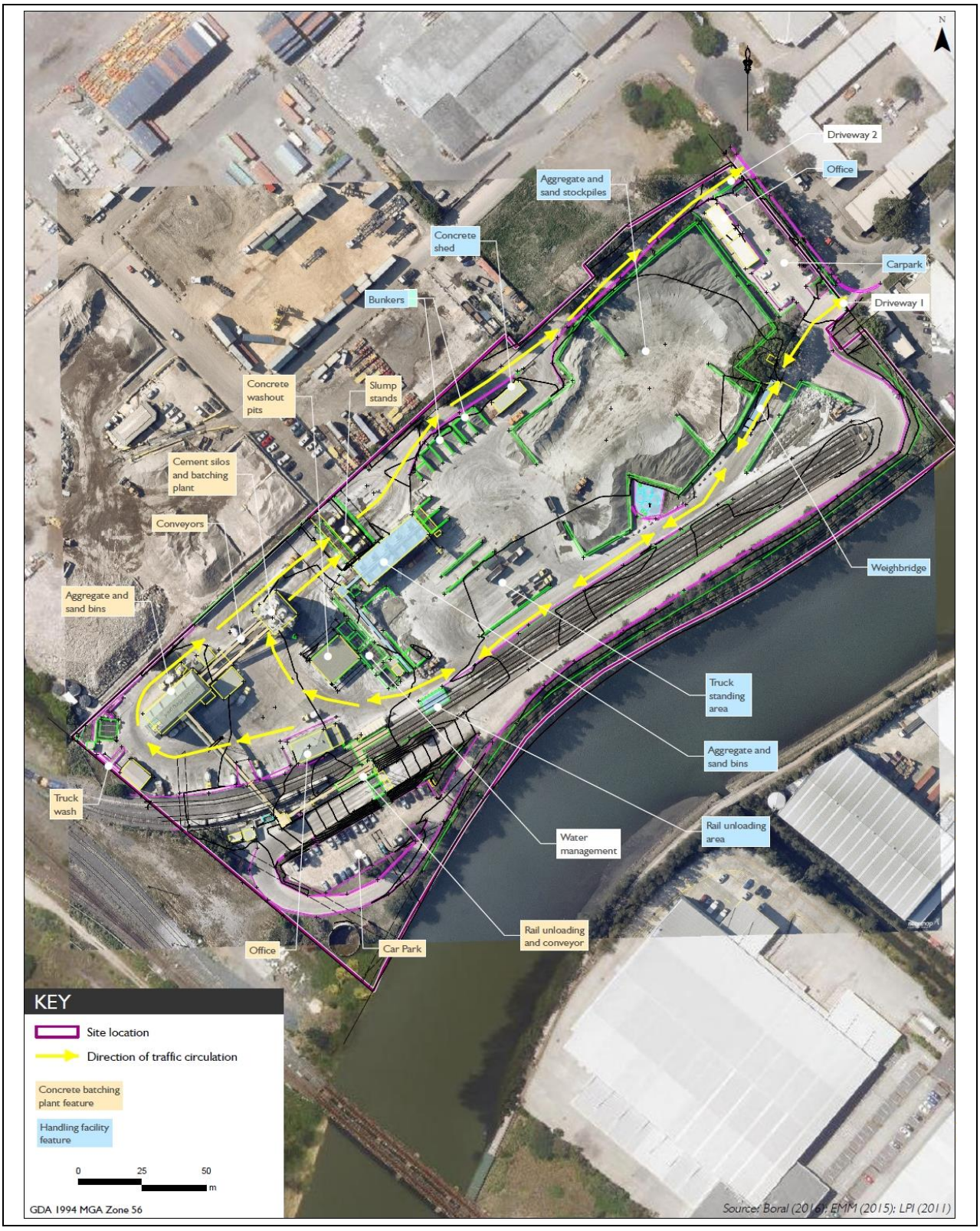


Figure 2-4: Site layout

Source: EMM (2016)

2.3.1 Concrete batching plant

The CBP is located in the south western section of the site. The location and general arrangement of the CBP is illustrated in **Figure 2-4**. Key components include:

- rail unloading area, for sand and aggregate material received by rail;
- elevated aggregate and sand bins;
- batching plant and elevated cement/fly ash silos;
- slump stands, where water added is to concrete agitators;
- concrete washout bays;
- truck wash bays;
- office, amenities and car park; and
- storage sheds.

The operation of the CBP involves the dry and wet batching of aggregates, sand, cement, fly ash and admixtures with water. The CBP produces approximately 254,200 cubic metres (m^3) of concrete per annum.

Aggregates and sand are delivered to the CBP mostly by rail, where they are bottom-dumped from rail wagons into pits below ground level at the rail unloading area. They are transferred from the pits at the unloading area by conveyor to elevated, fully enclosed storage bins, located in the south-western corner of the site. Aggregates and sand are also transferred to the CBP from the materials handling facility.

Fly ash is transported to the site by road in tankers or trucks and are transferred pneumatically (i.e. by pressurised hose) to elevated silos located above the batching plant. During the batching process, cement and fly ash are conveyed inside sealed airslides from the silos to a sealed weighing hopper, from where they are discharged into a transit mixer in the loading alley.

The CBP gravity dispenses the dry batched product into concrete agitators (also known as transit mixers) in the loading alley beneath the batching plant. The site has two loading alleys for dry batching into the concrete agitators. Admixtures are automatically dispensed in measured quantities into the concrete agitators.

Once the concrete agitators are filled with dry product, they proceed to one of two dual slump stands where water is added to concrete agitators prior to dispatch. The concrete agitators blend the dry batched product and water, and the end product (concrete) is then transported by road to customers.

Empty concrete agitators returning to the CBP are washed out in a series of washout bays. Once full, concrete in the washout bays is dried before being sent by truck for recycling. The CBP also recycles unused concrete from the concrete agitators. Unused concrete is dried in a drying yard located adjacent to the washout bays and then transported by truck for recycling.

2.3.2 Handling facility

The handling facility is located in the centre and north-eastern section of the site. The location and general arrangement of the handling facility is illustrated in **Figure 2-4**. Key components include:

- rail unloading area, for sand and aggregate material received by rail;
- elevated aggregate and sand storage bins;
- aggregate and sand stockpiles and bunkers;
- weighbridge;
- office, amenities and car park; and
- storage sheds.

The handling facility receives and temporarily stores aggregates and sand from Boral's Peppertree and Dunmore quarries before despatching it by truck to other CBPs and

asphalt plants within the Sydney metropolitan area. Some aggregates and sand are also transferred for use in the CBP onsite.

The EIS that accompanied the DA for the site in 1996 did not provide an estimate of the throughput of the handling facility. Current approximate volumes of bulk construction materials to and from the handling facility are presented in **Table 2-2**.

Table 2-2: Bulk construction material throughput (tpa)

Transport mode	**Aggregates**	**Sand**
Inbound		
Rail	320,000	327,000
Road	15,000	97,000
Outbound		
Road	252,000	357,000
Transferred within site to CBP	91,000	131,000

Aggregates and sand received by rail are transferred by conveyor from the train unloading area to elevated storage bins. From here, the material is either loaded into trucks for despatch offsite, or transferred to concrete storage bunkers and stockpiles within the central part of the site by a front end loader and/or dump truck. Aggregates and sand received by road are unloaded directly into the stockpile area and moved by front-end-loader to storage bunkers and stockpiles.

The existing storage bunkers and stockpiles provide a total stockpile capacity of around 23,000 t. The design of the storage bunkers comprise concrete retaining walls against which material is stacked. The retaining walls have a shade cloth fence mounted on top to capture dust emissions. Storage bunkers are fitted with a sprinkler system for additional dust suppression.

Materials stored in the stockpiles and bunkers are reclaimed by a front-end loader for loading into trucks and transport offsite. A portion of the stockpiled material is transferred to the CBP for use as required.

2.4 Proposed administrative modification

As described in **Section 2.3**, the CBP produces approximately 254,200 m^3 of concrete per annum, which is based on combined production estimates for concrete and asphalt production (the later which is no longer produced). A production increase of approximately 10% is sought, to enable the production of 280,000 m^3 of concrete per annum. The increase would not necessitate any modifications/alterations to the existing CBP.

The increase to 280,000 m^3 per annum would result in, on average, an additional 140 daily truck movements generated by the transport of concrete from the site. There would also be a small increase in the transport of constituent ingredients to the site (i.e. fly ash and admixtures).

3. AIR QUALITY ASSESSMENT CRITERIA

The site must demonstrate compliance with the impact assessment criteria outlined in the Approved Methods for Modelling (EPA, 2005). The impact assessment criteria are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being.

Relevant ambient air quality criteria applicable to the site are presented in the following sections.

3.1 Airborne particulate matter

When first regulated, airborne particulate matter (PM) was assessed based on concentrations of "total suspended particulate matter" (TSP). In practice, this typically referred to PM smaller than about 30-50 micrometers (μm) in diameter. As air sampling technology improved and the importance of particle size and chemical composition become more apparent, ambient air quality standards have been revised to focus on the smaller particle sizes, thought to be most dangerous to human health. Contemporary air quality assessment typically focuses on "fine" and "coarse" inhalable PM, based on health-based ambient air quality standards set for PM_{10} and $PM_{2.5}$[1].

Air quality criteria for PM in Australia are given for particle size metrics including TSP, PM_{10} and $PM_{2.5}$. Impact assessment criteria are prescribed by the NSW EPA for TSP and PM_{10}, however not for $PM_{2.5}$.

Under the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM), national reporting standards were initially prescribed for 24-hour average PM_{10} concentrations (NEPC, 1998). The AAQ NEPM was varied in 2003 to include 'advisory reporting standards' for $PM_{2.5}$ (NEPC, 2003) and again in 2015 to adopt these 'advisory reporting standards' as formal standards for $PM_{2.5}$ (NEPC, 2015). The latest variation also introduces an annual reporting standard for PM_{10} and establishes long term goals for $PM_{2.5}$, to be achieved by 2025 (NEPC, 2015).

It is noted that the purpose of the AAQ NEPM is to attain *'ambient air quality that allows for the adequate protection of human health and wellbeing',* and compliance with the AAQ NEPM is assessed through air quality monitoring data collected and reported by each state and territory. The AAQ NEPM standards are therefore not necessarily applicable to the assessment of impacts of emissions sources on individual sensitive receptors. For the purpose of this report, impacts are preferentially assessed against the NSW EPA's impact assessment criteria. In the case of $PM_{2.5}$, where impact assessment criteria do not exist, impacts are reported against the latest AAQ NEPM standards. The NSW EPA's impact assessment criteria and AAQ NEPM standards and goals for PM are presented in **Table 3-1**.

[1] Particulate matter with an aerodynamic diameter of less than 10 μm and 2.5 μm respectively.

Table 3-1: Impact assessment criteria for PM			
Pollutant	**Averaging Period**	**Concentration (µg/m³)**	**Purpose of goal**
TSP	Annual	90	NSW EPA impact assessment criteria
PM_{10}	24 hours	50	NSW EPA impact assessment criteria
		50	AAQ NEPM national reporting standard
	Annual	30	NSW EPA impact assessment criteria
		25	AAQ NEPM national reporting standard
$PM_{2.5}$	24 hours	25	AAQ NEPM national reporting standard
		20	AAQ NEPM long term goal for 2025
	Annual	8	AAQ NEPM national reporting standard
		7	AAQ NEPM long term goal for 2025

3.2 Dust deposition criteria

Nuisance dust deposition is regulated through the stipulation of maximum permissible dust deposition rates. The NSW EPA impact assessment goals for dust deposition are given in **Table 3-2** illustrating the allowable increment in dust deposition rates above ambient (background) dust deposition rates which would be acceptable so that dust nuisance could be avoided.

Table 3-2: Impact assessment criteria for dust deposition		
Averaging Period	**Maximum Increase in Deposited Dust Level**	**Maximum Total Deposited Dust Level**
Annual	2 g/m^2/month	4 g/m^2/month

Source: Approved Methods for Modelling, EPA 2005

4. CLIMATE AND DISPERSION METEOROLOGY

Meteorological mechanisms govern the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere. Emission generation rates are particularly dependent on wind energy and on the moisture budget, which is a function of rainfall and evaporation rates.

In the absence of onsite meteorological monitoring data, a combination of local area observational data and meteorological modelling techniques were used. Details regarding the meteorological modelling are presented in **Section 4.1**.

In order to analyse existing meteorological conditions, one hour average meteorological data and historical climate data were obtained from the BoM Automatic Weather Station (AWS) at Sydney Airport (Station Number 066037) a, located 2.5km south of the site.

4.1 Meteorological Modelling

Section 4.1 of DEC (2005) specifies that meteorological data representative of a site can be used in the absence of suitable on-site observations. Data should cover a period of at least one year with a percentage completeness of at least 90%. Site representative data can be obtained from either a nearby meteorological monitoring station or synthetically generated using the CSIRO prognostic meteorological model The Air Pollution Model (TAPM).

As stated, hourly average meteorological data from the nearby BoM Sydney Airport AWS was obtained in the absence of onsite monitoring at the site. Data was analysed for the period between 2010 and 2015, with annual wind roses for each year in this time period generated (**Appendix 1**). The wind roses demonstrate limited interannual variability and on this basis, the 2015 meteorological dataset was selected as the most complete and current calendar year of monitoring data for use in this assessment.

To supplement the BoM Sydney Airport meteorological observation dataset, the CSIRO meteorological model TAPM was used to generate parameters not routinely measured, specifically the vertical temperature profile.

TAPM was configured and run in accordance with the Section 4.5 of the Approved Methods for Modelling, with the following refinements:

- Modelling to 300 m grid cell resolution (beyond 1 km resolution specified).
- Inclusion of high resolution (90 m) regional topography (improvement over default 250 m resolution data).

The TAPM vertical temperature profile was adopted to account for upper air atmospheric conditions in the AERMOD modelling conducted.

4.2 Prevailing Wind Regime

A wind rose showing wind speed and direction data recorded at the BoM Sydney Airport AWS is presented in **Figure 4-1**. The annual recorded wind pattern is dominated by southerly, northeasterly and northwesterly airflow. The highest wind speeds recorded are most frequently experienced from the south and northeast. The average recorded wind speed for 2015 was 5.6 m/s, with a frequency of calm conditions (wind speeds less than 0.5 m/s) occurring in the order of 1% of the time.

Additional inter-annual, seasonal and diurnal wind roses for the BoM Sydney Airport AWS are provided in **Appendix 1**.

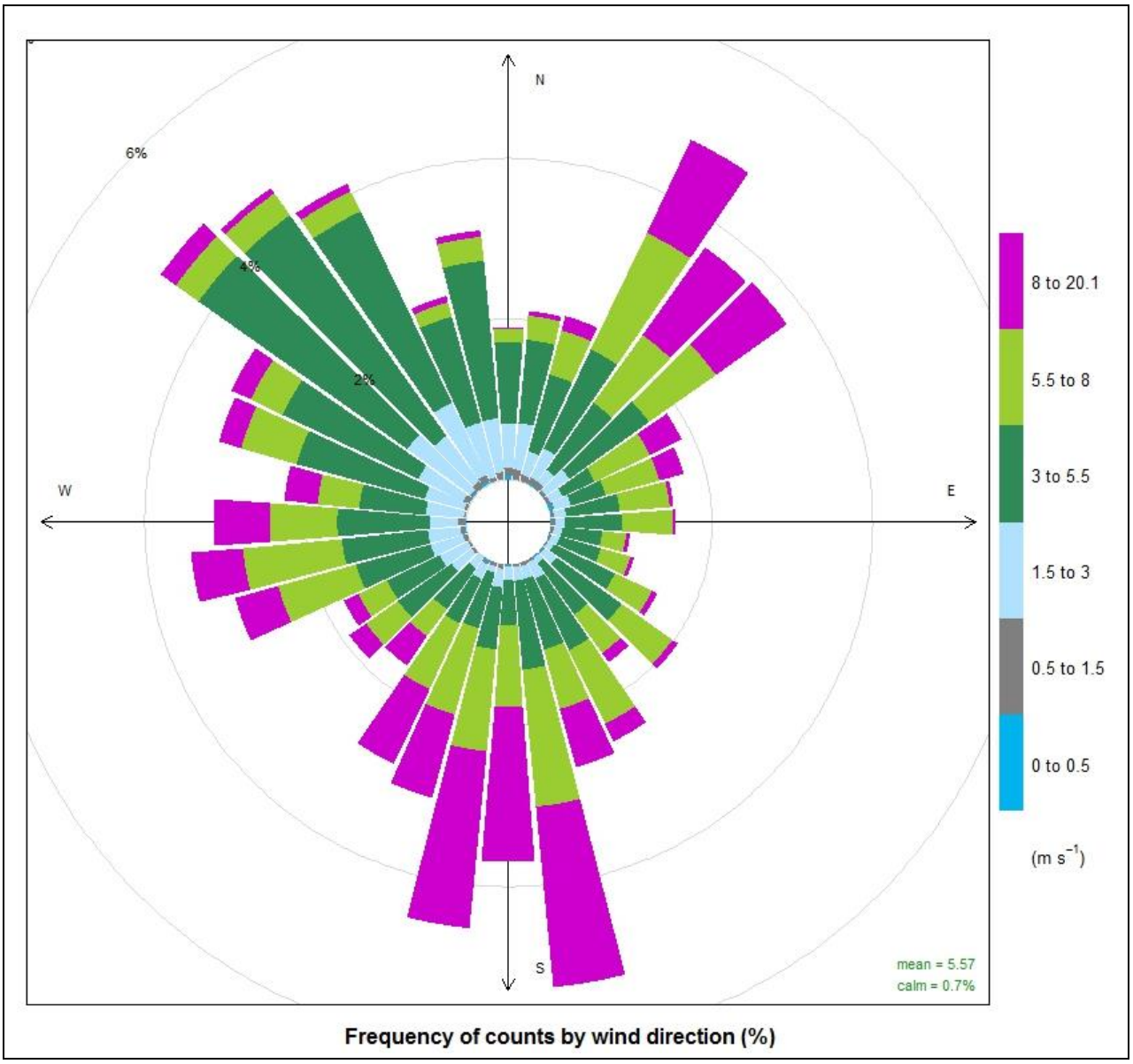


Figure 4-1: Annual Average Wind Rose – Sydney Airport AWS – 2015

Seasonal and diurnal (dividing the day into night and day) wind roses for the meteorological dataset are presented within **Appendix 1**.

Seasonal variation in wind speed and direction is evident in the recorded data from the BoM Sydney Airport AWS. Spring and summer are dominated by defined northeasterly and southerly components. Autumn experiences airflow from the southerly quadrant, however the northeasterly flow is replaced by northwesterly flow. The winter months are dominated by west to northwesterly airflow. Wind speeds are similar throughout the year, with comparable average wind speeds and incidence of calm conditions recorded across all seasons.

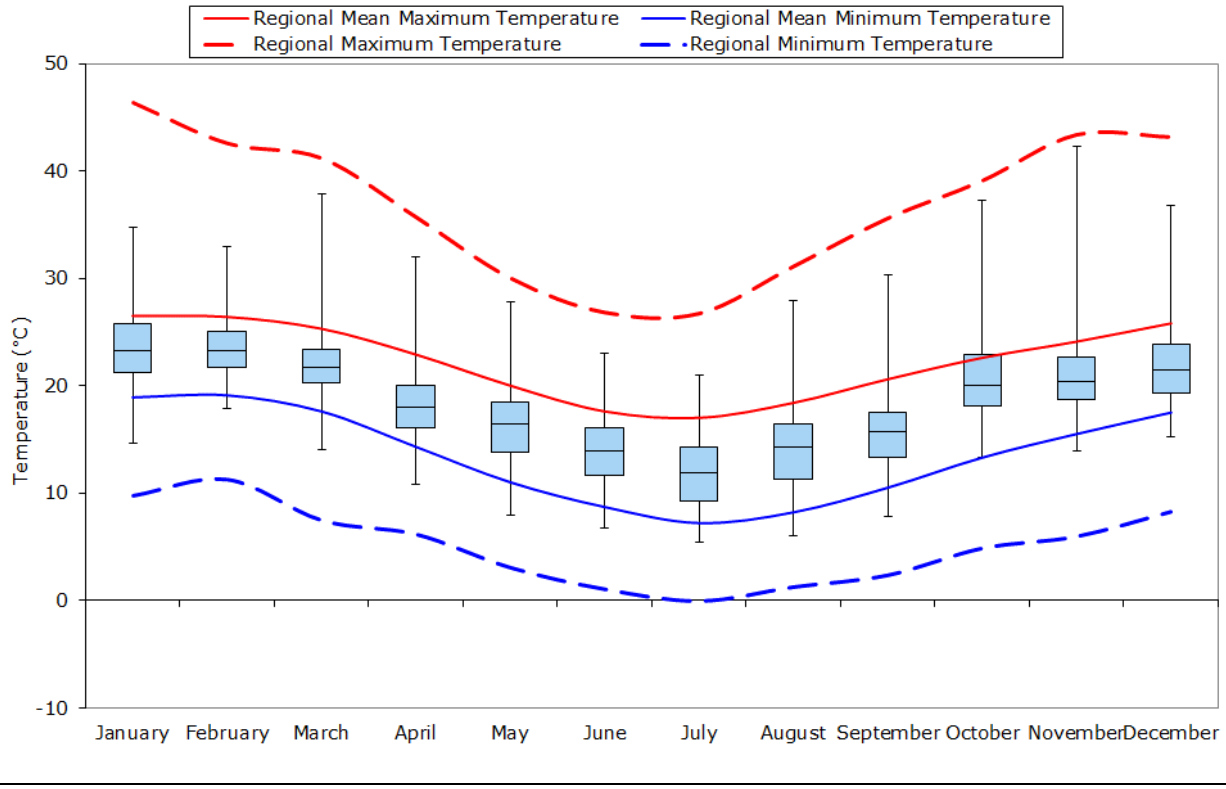
Diurnal variation is less defined at the BoM Sydney Airport AWS. Airflow form the southern, northeastern and northwestern quadrants occur during both daylight and night hours. Wind speeds are slightly higher during the day hours relative to the night.

4.3 Ambient Temperature

Monthly mean minimum temperatures are in the range of 7°C to 19°C, with mean maxima of 17°C to 27°C, based on the long-term average records from the BoM Sydney Airport AWS. Peaks occur during summer months with the highest

temperatures typically being recorded between November and February. The lowest temperatures are usually experienced between June and August.

The 2015 BoM Sydney Airport AWS temperature dataset has been compared with long-term trends recorded at the same location to determine the representativeness of the dataset. **Figure 4-2** presents the monthly variation in recorded temperature during 2015 compared with the recorded station mean, minimum and maximum temperatures. There is good agreement between temperatures recorded during 2015 and the recorded historical trends, indicating that the 2015 temperature dataset is representative of the location.



Note: 2015 data from Sydney Airport AWS are illustrated by the 'box and whisker' indicators. Boxes indicate 25th, median and 75th percentile temperature values while upper and lower whiskers indicate maximum and minimum values. Maximum and minimum temperatures from long-term measurements at Sydney Airport AWS are depicted as line graphs.

Figure 4-2: Temperature Comparison between Sydney Airport AWS 2015 dataset and Historical Averages (1939-2016) – Sydney Airport AWS BoM

4.4 Rainfall

Precipitation is important to air pollution studies since it impacts on dust generation potential and represents a removal mechanism for atmospheric pollutants.

Based on historical data recorded at Sydney Airport AWS, the area is characterised by moderate to high rainfall, with a mean annual rainfall of approximately 1,080 mm, and an annual rainfall range between 520mm and 2,025mm. Rainfall is most pronounced between summer and autumn, with lower rainfall during mid-winter to early spring. According to the long term records, an average of 129 rain days occur per year.

To provide a conservative (upper bound) estimate of the airborne particulate matter concentrations occurring due to the site, wet deposition (removal of particles from the air by rainfall) was excluded from the dispersion modelling simulations undertaken in this report.

4.5 Atmospheric Stability

Atmospheric stability refers to the degree of turbulence or mixing that occurs on the atmosphere and is a controlling factor in the rate of atmospheric dispersion of pollutants.

The Monin-Obukhov length (L) provides a measure of the stability of the surface layer (i.e. the layer above the ground in which vertical variation of heat and momentum flux is negligible; typically about 10 % of the mixing height). Negative L values correspond to unstable atmospheric conditions, while positive L values correspond to stable atmospheric conditions. Very large positive or negative L values correspond to neutral atmospheric conditions.

Figure 4-3 illustrates the seasonal variation of atmospheric stability derived from the Monin-Obukhov length calculated by AERMET for the site. The diurnal profile presented illustrates that atmospheric instability increases during daylight hours as convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for atmospheric dispersion of emissions would be greatest during day time hours and lowest during evening through to early morning hours.

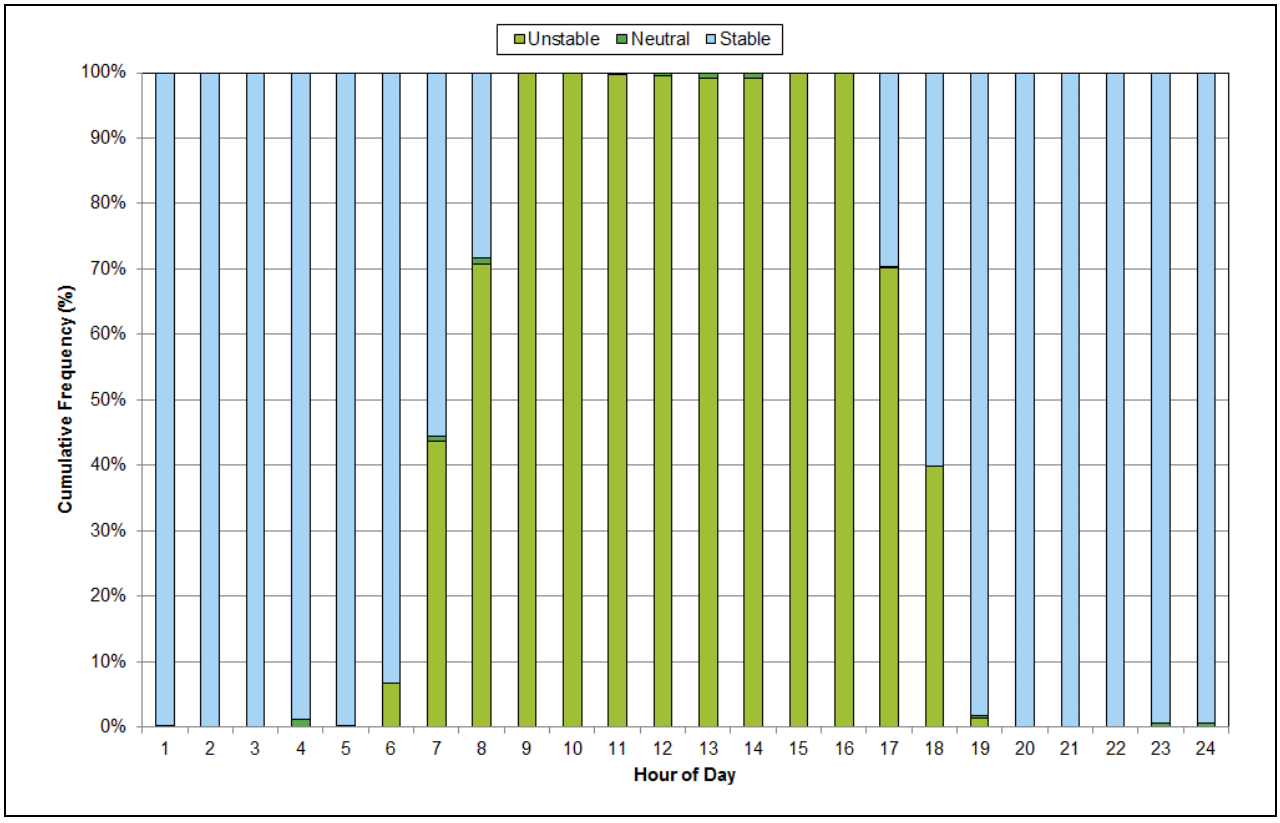
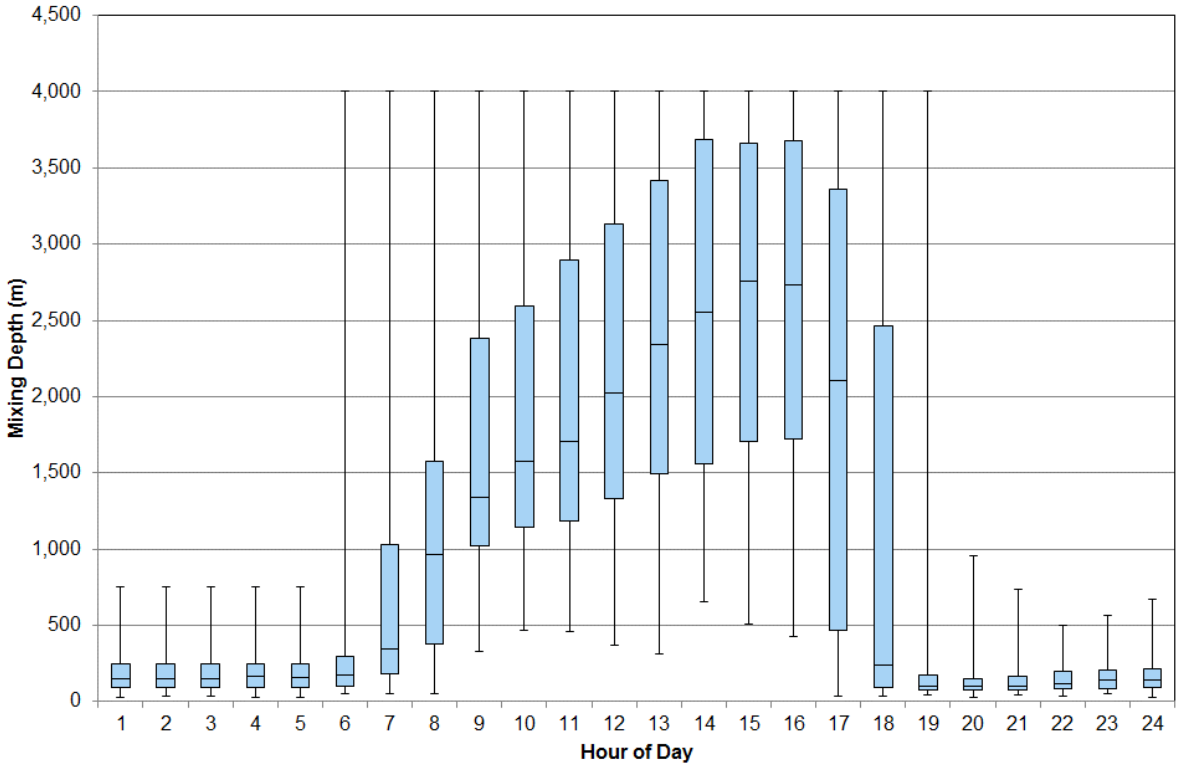


Figure 4-3: AERMET-Calculated Diurnal Variation in Atmospheric Stability– Site 2015

4.6 Mixing Depth

Hourly-varying atmospheric boundary layer depths were generated for the site by AERMET, the meteorological processor for the AERMOD dispersion model (see **Section 7.1** for further information), using a combination of surface observations from the BoM Sydney Airport AWS, sunrise and sunset times and adjusted TAPM-predicted upper air temperature profile.

The variation in average boundary layer depth by hour of the day for the site is illustrated in **Figure 4-4**. It can be seen that greater boundary layer depths are experienced during the day time hours, peaking in the mid to late afternoon. Higher day-time wind velocities and the onset of incoming solar radiation increases the amount of mechanical and convective turbulence in the atmosphere. As turbulence increases so too does the depth of the boundary layer, generally contributing to higher mixing depths and greater potential for atmospheric dispersion of pollutants.



Note: Boxes indicate 25th, Median and 75th percentile of AERMET-calculated mixing height data while upper and lower whiskers indicate maximum and minimum values.

Figure 4-4: AERMET-Calculated Diurnal Variation in Atmospheric Mixing Depth – Site

5. EXISTING AIR QUALITY ENVIRONMENT

The quantification of cumulative air pollution concentrations and the assessment of compliance with ambient air quality limits necessitate the characterisation of baseline air quality. Given that particulate matter emissions represent the primary pollutant of concern generated by the site, it is pertinent that existing sources and ambient air pollutant concentrations of these pollutants are considered.

5.1 Existing Local Sources of Atmospheric Emissions

The National Pollutant Inventory (NPI) database lists a large number of reporting emission sources within 10 km of the site. The majority of sources are located in the large industrial estates approximately 5 km to the southeast of the site and unlikely to cause significant direct cumulative impacts with emissions from the site.

Boral's recycling facility is located adjacent the north-western boundary of the site and involves the delivery, handling, crushing, stockpiling of construction materials and dispatch of final recycled product to market. Emissions from this facility have been explicitly included in the dispersion modelling for assessment of cumulative impacts (further details in **Section 5.1.1**).

Also adjacent the site on Burrows Road South is the Visy Recycling Facility, where curb side recyclables (glass, aluminium, paper, plastics and metal) are processed. Emissions from this site are not considered significant for cumulative assessment purposes. Other activities in the surrounding area include the clean-up works at the former Alexandria Landfill site, shipping container storage facilities, several small materials recycling facilities and Sydney Airport.

In addition to the above operations, it is considered that the following sources contribute to particulate matter emissions in the vicinity of the site:

- Dust entrainment and tyre and break wear due to vehicle movements along public roads;
- Petrol and diesel exhaust emissions from vehicle movements along public roads;
- Seasonal emissions from household wood burning fires; and
- Sea salt contained in sea breezes.

More remote sources which contribute episodically to PM in the region include dust storms and bushfires. Whereas dust storms predominately contribute primary particles from mechanical attrition, bushfires are a source of fine particles including both primary and secondary particles formed by atmospheric gas to particle conversion processes.

5.1.1 Neighbouring materials recycling facilities

Bingo Recycling operated a construction and demolition waste facility adjacent the Boral Recycling facility up until March 2016, when it was decommissioned. Emissions from the Bingo facility have been included in this assessment, as the periods of background data coincide with this site being operational. Emissions from the Boral materials recycling facility have the potential to cause direct cumulative impacts with emissions from the site. In the absence of site emissions inventories, an emissions inventory developed during a recent air quality impact assessment for an existing recycling facility in western Sydney undertaken by Ramboll Environ (*Widemere Recycling Facility - Air Quality Impact Assessment* - Environ 2015) has been referenced.

The annual particulate matter emissions for the Widemere facility have been scaled based on the land area ratio of the two facilities (1.8 ha for Boral and 1.5 ha for Bingo) against the Widemere facility (10 ha). Derived annual emissions for the two adjacent recycling facilities are presented in **Table 5-1**.

Table 5-1: Derived annual particulate matter emissions – neighbouring recycling facilities		
Pollutant	**Annual emissions (kg/year)**	
	Boral Recycling	**Bingo Recycling**
TSP	6,477	5,217
PM_{10}	1,544	1,244
$PM_{2.5}$	199	161

Ground level concentrations and deposition rates arising from the two recycling facilities were predicted through the dispersion model established to assess emissions from the site (see **Section 7**). Emissions were evenly distributed across both sites through the use of volume sources in the dispersion model. Model predictions of TSP, PM_{10}, $PM_{2.5}$ and dust deposition at each of the selected sensitive receptors are presented in **Table 5-2**.

Table 5-2 Incremental particulate matter concentration/deposition results – neighbouring recycling facilities

Receptor ID	Incremental Concentration/Deposition due to neighbouring recycling facilities					
	TSP Annual Average µg/m³	PM_{10} Maximum 24-hr µg/m³	PM_{10} Annual Average µg/m³	$PM_{2.5}$ Maximum 24-hr µg/m³	$PM_{2.5}$ Annual Average µg/m³	Deposition Annual Average g/m²/month
Criteria	**NA**	**NA**	**NA**	**NA**	**NA**	**2**
R1	0.1	0.1	<0.1	<0.1	<0.1	0.1
R2	0.1	0.1	<0.1	<0.1	<0.1	0.1
R3*	0.2	0.1	0.1	<0.1	<0.1	0.1
R4*	0.2	0.1	<0.1	<0.1	<0.1	0.1
R5*	0.1	0.1	<0.1	<0.1	<0.1	0.1
R6*	0.2	0.1	<0.1	<0.1	<0.1	0.1
R7*	0.3	0.1	0.1	<0.1	<0.1	0.2
R8*	1.4	0.6	0.3	0.1	<0.1	0.9
R9*	0.3	0.2	0.1	<0.1	<0.1	0.2
R10*	0.7	0.3	0.2	<0.1	<0.1	0.4
R11*	0.2	0.1	0.1	<0.1	<0.1	0.2

Note: * denotes industrial/commercial receptor

The predictions listed **Table 5-2** in are combined with the background monitoring data (see subsequent sections) and site-only increment model predictions (**Section 8**) to assess cumulative impacts at surrounding receptor locations.

5.2 Background PM_{10} and $PM_{2.5}$

Particulate matter concentrations (PM_{10} and $PM_{2.5}$) are recorded by the NSW OEH at the nearby Earlwood monitoring station, approximately 3.5km west of the site. Daily-varying concentrations of PM_{10} and $PM_{2.5}$ have been collated for the period between 2010 and 2015 in the absence of onsite monitoring data.

The daily varying (24-hour average) PM_{10} concentrations recorded at the NSW OEH Earlwood monitoring station recorded between 2010 and 2015 are illustrated in **Figure 5-1** for PM_{10} and **Figure 5-2** for $PM_{2.5}$.

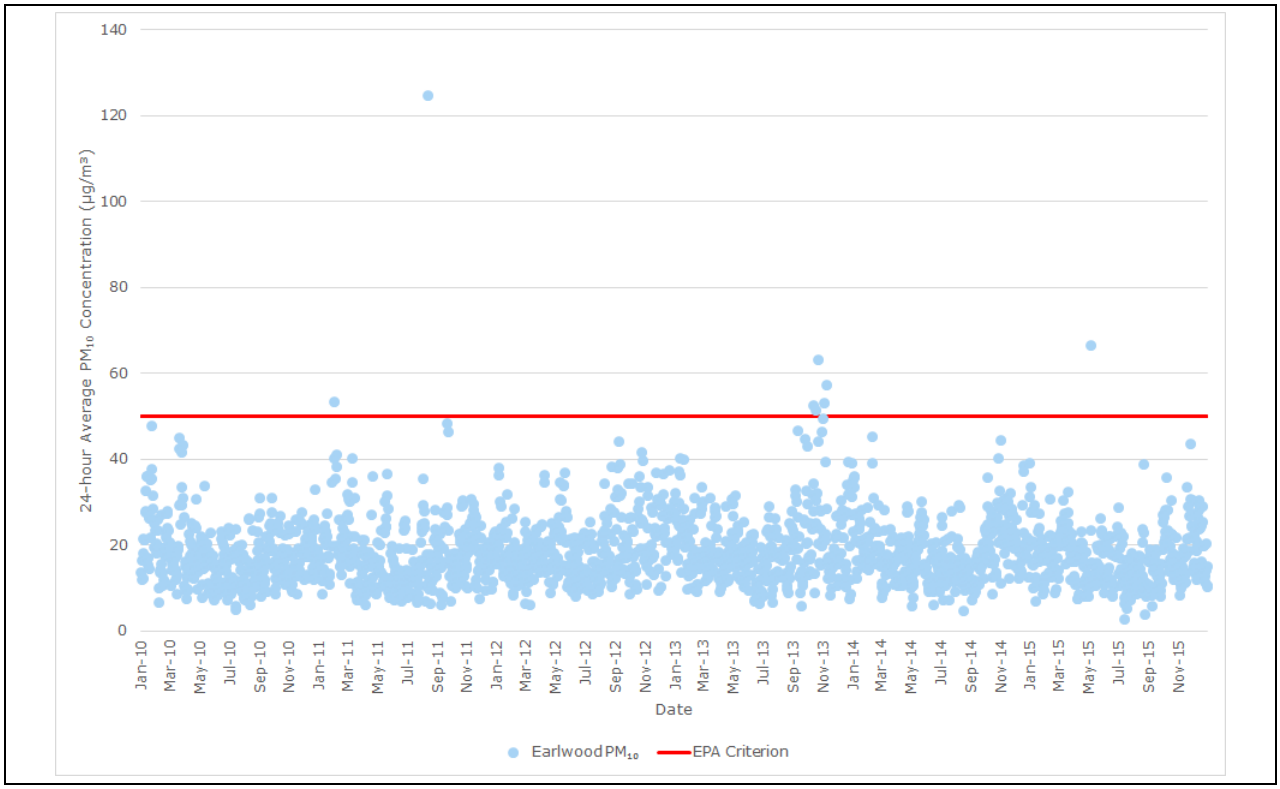


Figure 5-1: Time-series of 24-hour Average PM_{10} Concentrations recorded at OEH Earlwood – 2010 to 2015

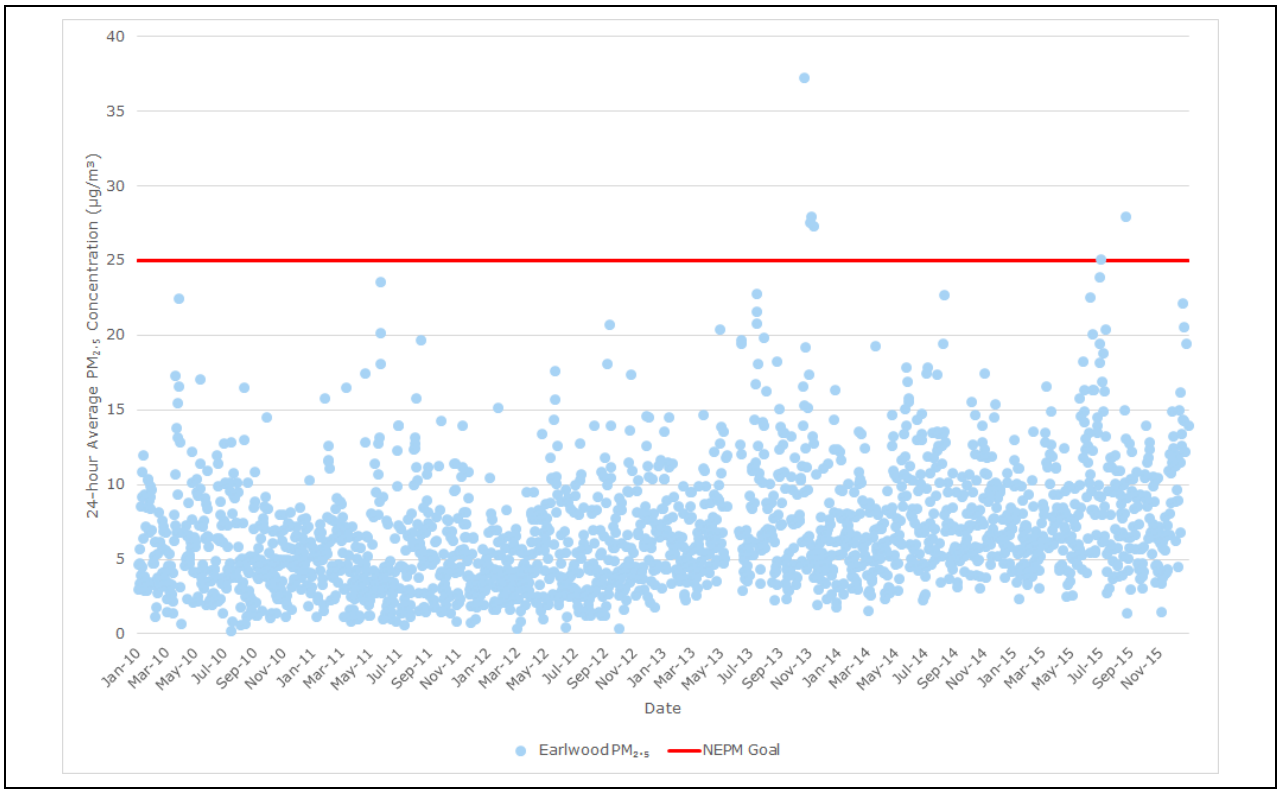


Figure 5-2: Time-series of 24-hour Average $PM_{2.5}$ Concentrations recorded at OEH Earlwood – 2010 to 2015

It can be seen from the **Figure 5-1** and **Figure 5-2** that both PM_{10} and $PM_{2.5}$ concentrations fluctuate on a daily basis throughout the presented period. Occasional exceedances of the NSW EPA criterion (PM_{10}) and NEPM goal ($PM_{2.5}$) occur, attributable to regional-scale events such as bushfires, hazard reduction burns and dust storms.

Percentile statistics of the 2010 to 2015 OEH Earlwood PM_{10} and $PM_{2.5}$ concentration datasets are presented in **Table 5-3**.

Table 5-3: PM_{10} and $PM_{2.5}$ monitoring data statistics – NSW OEH Earlwood station - 2010 to 2015

Statistic	**PM_{10}**	**$PM_{2.5}$**
Maximum	124.9	37.3
99.9th percentile	62.2	28.0
99.5th percentile	47.0	22.6
99th percentile	43.3	19.9
90th percentile	28.0	12.0
75th percentile	22.3	8.6
50th percentile	17.1	6.0
Period Average	18.5	6.8

To assess the cumulative 24-hour average PM_{10} and $PM_{2.5}$ impacts, the 99th percentile PM_{10} and $PM_{2.5}$ concentrations for the 2010 to 2015 period (**Table 5-3**) is adopted as a conservatively high estimate of ambient conditions on any given day outside of extreme regional (bushfire or dust storm) events.

The annual average PM_{10} and $PM_{2.5}$ concentrations for the 2010 to 2015 period were 18.5 µg/m^3 and 6.8 µg/m^3 respectively.

5.3 Background TSP

Historically, the NSW OEH recorded concurrent 24-hour average TSP and PM_{10} concentrations on a one-in-six day sampling regime in the Sydney Metropolitan Region, with this monitoring discontinuing in 2004. NSW OEH quarterly air quality monitoring reports for 2003 and 2004 were reviewed for concurrent PM_{10} and TSP concentrations. This data highlighted that on average, the ratio of PM_{10} to TSP concentrations was approximately 0.48.

In the absence of local TSP monitoring data, the PM_{10}/TSP relationship from the 2003-2004 NSW OEH monitoring reports has been applied to the NSW OEH Earlwood PM_{10} monitoring data collected between 2010 and 2015 (**Table 5-3**). The annual average TSP concentration adopted as background is therefore 38.5 µg/m³.

5.4 Background Dust Deposition

Dust deposition monitoring is undertaken at the site at three locations established at site boundary. Data recorded between January 2014 and January 2016 has been collated and reviewed, with annual average results presented in **Table 5-4**.

Annual average dust deposition levels at all three perimeter dust deposition gauges were above the NSW EPA criterion of 4g/m^2/month during both 2014 and 2015. These dust deposition levels are influenced by emissions generated by activities at the site and the neighbouring materials recycling facilities and therefore are not appropriate to

estimate background dust deposition levels. For this reason, this assessment will focus on the incremental contribution from site-only emissions, assessed against the NSW EPA incremental criterion of 2g/m^2/month, expressed as an annual average.

Table 5-4: Dust deposition monitoring

Year	Annual average dust deposition (g/m^2/month)		
	Site 1– near entrance to site on left	**Site 3– rear corner of property**	**Site 4 – along road near exit**
2014	9.3	8.9	13.0
2015	9.1	8.0	10.4

6. EMISSION ESTIMATION

Fugitive dust sources associated with the operation of the site were principally quantified through the application of NPI emission estimation techniques (specifically the Emission Estimation Technique Manual for Mining and United States Environmental Protection Agency (US-EPA) AP-42 emission factor equations). PM emissions were quantified for each particle size fraction, with the TSP size fraction also used to provide an indication of dust deposition rates. Fine particles (PM_{10} and $PM_{2.5}$) were estimated using ratios for the different particle size fractions available within the literature (principally the US-EPA AP-42).

6.1 Sources of Operational Emissions

Air emissions associated with the site would primarily comprise fugitive particulate matter releases. Potential sources of emission were identified as follows:

- Delivery of aggregate and sand material to site by train and truck;
- Transfer and handling of aggregate and sand at storage bins, handling facility and within the CBP;
- Transferring cement and cement supplement into silos from delivery trucks;
- CBP conveying and loading to agitator trucks;
- Wheel-generated dust from trucks movements across paved surfaces;
- Wind erosion from material storage bins and adjacent paved surfaces; and
- Diesel combustion by trucks, mobile plant and locomotive engines.

6.2 Emission Scenarios

Two emission scenarios were developed to quantify maximum potential impacts in the surrounding environment. The scenarios correspond to current operations and proposed future operations at the site.

Details on the assumptions made for the two operational scenarios are listed within **Appendix 2**.

6.3 Emission Reduction Factors

Based on information provided by Boral, a number of particulate matter emission controls are in place at the site. These include:

- Underground unloading of material from trains fitted with water sprays;
- Enclosed aggregate and sand storage silos;
- Pneumatic loading of cement silos with dust filters fitted;
- Dust extraction systems in the CBP;
- Covered conveyors and storage bins;
- Closure of agitator truck loading alleys through automatic doors;
- Water sprays at the materials handling facility;
- Use of water cart and street sweeper on paved surfaces.

To account for these emission control techniques, the following emission reduction factors were applied to account for proposed controls at the site:

- Train unloading - 50% reduction for water sprays and 30% reduction for windbreaks (NPI, 2012);
- Paved roads / surfaces wheel dust – 70% reduction for water flushing and sweeping (US-EPA AP-42, 2006). Additional 30% reduction factor applied for wind breaks to movements within the handling facility (NPI, 2012);
- Aggregate and sand conveyor transfer points - 50% reduction for water sprays (NPI, 2012);
- Loading to enclosed aggregate and sand storage silos and CPB components - 83% reduction for hooding with fabric filters (NPI, 2012);

- Automatic closing doors at agitator truck loading point – 99.5% reduction for truck loader emission control (Air Control Techniques, 2005)
- Unloading and truck loading at storage areas – 30% reduction for wind breaks (NPI, 2012);
- Wind erosion from material storage area stockpiles - 50% reduction for water sprays and 30% reduction for wind breaks (NPI, 2012);
- Cement/flyash silo loading – Controlled emission factors applied to account for pneumatic loading of silos.

6.4 Particulate Matter Emissions

A summary of site-related emissions by source type is presented in **Table 6-1** for current operations and **Table 6-2** for future operations and illustrated in **Figure 6-1** and **Figure 6-2**. Control measures proposed for implementation, as documented in **Section 6.3**, have been taken into account in the emission estimates.

Table 6-1 and **Figure 6-1** highlight that, for both existing and proposed future operations, the most significant sources of emissions are associated with truck movements on paved surfaces and aggregate handling and transfer across the site. The proposed changes to current operations at the site will result in an increase in associated TSP, PM_{10} and $PM_{2.5}$ emissions.

Further details regarding emission estimation factors and assumptions are provided in **Appendix 2**.

Table 6-1 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – current operations scenario

Site Area	Emissions Source	Calculated Emissions (kg/annum) by Source		
		TSP	PM_{10}	$PM_{2.5}$
CBP	Cement/Admix Delivery - Paved	595.7	114.3	27.7
	Aggregate Unloading from train	332.1	157.1	23.8
	Sand Unloading from train	78.5	37.1	5.6
	Aggregate Conveyor Transfer	474.5	224.4	34.0
	Sand Conveyor Transfer	112.2	53.0	8.0
	Aggregate Transfer to Storage	161.3	76.3	11.6
	Sand Transfer to Storage	38.1	18.0	2.7
	Cement/flyash unloading to silos	46.5	15.8	1.6
	Aggregate transfer storage to weigh hopper	161.3	76.3	11.6
	Sand transfer storage to weigh hopper	38.1	18.0	2.7
	Weigh hopper loading	161.8	80.9	12.2
	Mixer Loading (Truck Mixer)	519.9	144.2	23.3
	Agitator Truck Dispatch - Paved	7,014.6	1,346.5	287.1
Handling facility	Aggregate truck deliveries - unloading to stockpiles	48.4	22.9	3.5
	Aggregate truck deliveries - unloading to stockpiles	95.2	45.0	6.8
	Aggregate Unloading from train	515.9	244.0	37.0
	Sand Unloading from train	160.5	75.9	11.5
	Aggregate to internal truck	1,474.1	697.2	105.6
	Sand to internal truck	458.4	216.8	32.8
	Aggregate/Sand internal transport to MSA - Paved	814.9	156.4	37.6
	Aggregate unloading to MSA stockpiles	1,031.9	488.0	73.9

Table 6-1 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – current operations scenario

Site Area	Emissions Source	Calculated Emissions (kg/annum) by Source		
		TSP	**PM_{10}**	**$PM_{2.5}$**
	Sand unloading to MSA stockpiles	320.9	151.8	23.0
	Aggregate/Sand internal transport to CBP from MSA - Paved	279.6	53.7	12.9
	Aggregate handling at MSA stockpiles	293.4	138.8	21.0
	Sand handling at MSA stockpiles	128.6	60.8	9.2
	Aggregate dispatch truck loading	812.6	384.3	58.2
	Sand dispatch truck loading	350.3	165.7	25.1
	Aggregate/Sand Delivery and dispatch - Paved	8,217.0	1,577.3	378.9
Total site	Wind Erosion - Handling facility	2,888.3	1,444.1	216.6
	Diesel Combustion - onsite plant	375.3	375.3	344.0
	Diesel Combustion - trucks	182.2	182.2	167.0
	Diesel Combustion - locomotive idling	472.0	472.0	457.8
Total		**28,654.0**	**9,314.2**	**2,474.3**

Table 6-2 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – future operations scenario

Site Area	Emissions Source	Calculated Emissions (kg/annum) by Source		
		TSP	**PM_{10}**	**$PM_{2.5}$**
CBP	Cement/Admix Delivery - Paved	893.5	171.5	41.5
	Aggregate Unloading from train	499.8	236.4	35.8
	Sand Unloading from train	117.8	55.7	8.4
	Aggregate Conveyor Transfer	714.0	337.7	51.1
	Sand Conveyor Transfer	168.2	79.6	12.0
	Aggregate Transfer to Storage	242.8	114.8	17.4
	Sand Transfer to Storage	57.2	27.1	4.1
	Cement/flyash unloading to silos	55.5	18.9	1.9
	Aggregate transfer storage to weigh hopper	242.8	114.8	17.4
	Sand transfer storage to weigh hopper	57.2	27.1	4.1
	Weigh hopper loading	243.1	121.6	18.4
	Mixer Loading (Truck Mixer)	620.5	172.1	27.8
	Agitator Truck Dispatch - Paved	10,960.4	2,103.9	448.6
Handling facility	Aggregate truck deliveries - unloading to stockpiles	48.4	22.9	3.5
	Aggregate truck deliveries - unloading to stockpiles	95.2	45.0	6.8
	Aggregate Unloading from train	515.9	244.0	37.0
	Sand Unloading from train	160.5	75.9	11.5
	Aggregate to internal truck	1,474.1	697.2	105.6
	Sand to internal truck	458.4	216.8	32.8
	Aggregate/Sand internal transport to MSA - Paved	814.9	156.4	37.6
	Aggregate unloading to MSA stockpiles	1,031.9	488.0	73.9

Table 6-2 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – future operations scenario

Site Area	Emissions Source	Calculated Emissions (kg/annum) by Source		
		TSP	PM_{10}	$PM_{2.5}$
	Sand unloading to MSA stockpiles	320.9	151.8	23.0
	Aggregate/Sand internal transport to CBP from MSA - Paved	279.6	53.7	12.9
	Aggregate handling at MSA stockpiles	293.4	138.8	21.0
	Sand handling at MSA stockpiles	128.6	60.8	9.2
	Aggregate dispatch truck loading	812.6	384.3	58.2
	Sand dispatch truck loading	350.3	165.7	25.1
	Aggregate/Sand Delivery and dispatch - Paved	8,217.0	1,577.3	378.9
Total site	Wind Erosion - Handling facility	2,888.3	1,444.1	216.6
	Diesel Combustion - onsite plant	389.7	389.7	357.2
	Diesel Combustion - trucks	241.2	241.2	221.1
	Diesel Combustion - locomotive idling	472.0	472.0	457.8
Total		**33,865.4**	**10,606.6**	**2,778.2**

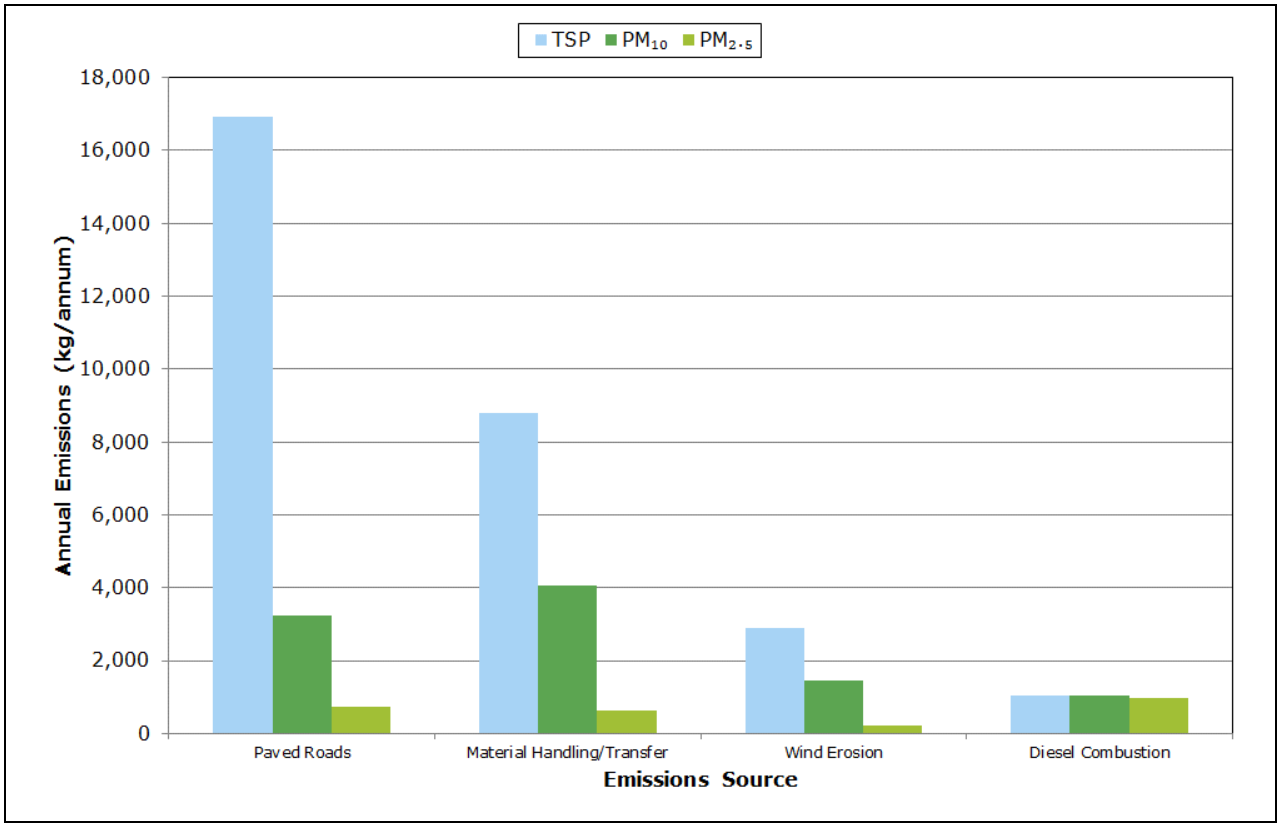


Figure 6-1: Comparison of Calculated Annual TSP, PM_{10} and $PM_{2.5}$ Emissions by Source Type – current operations

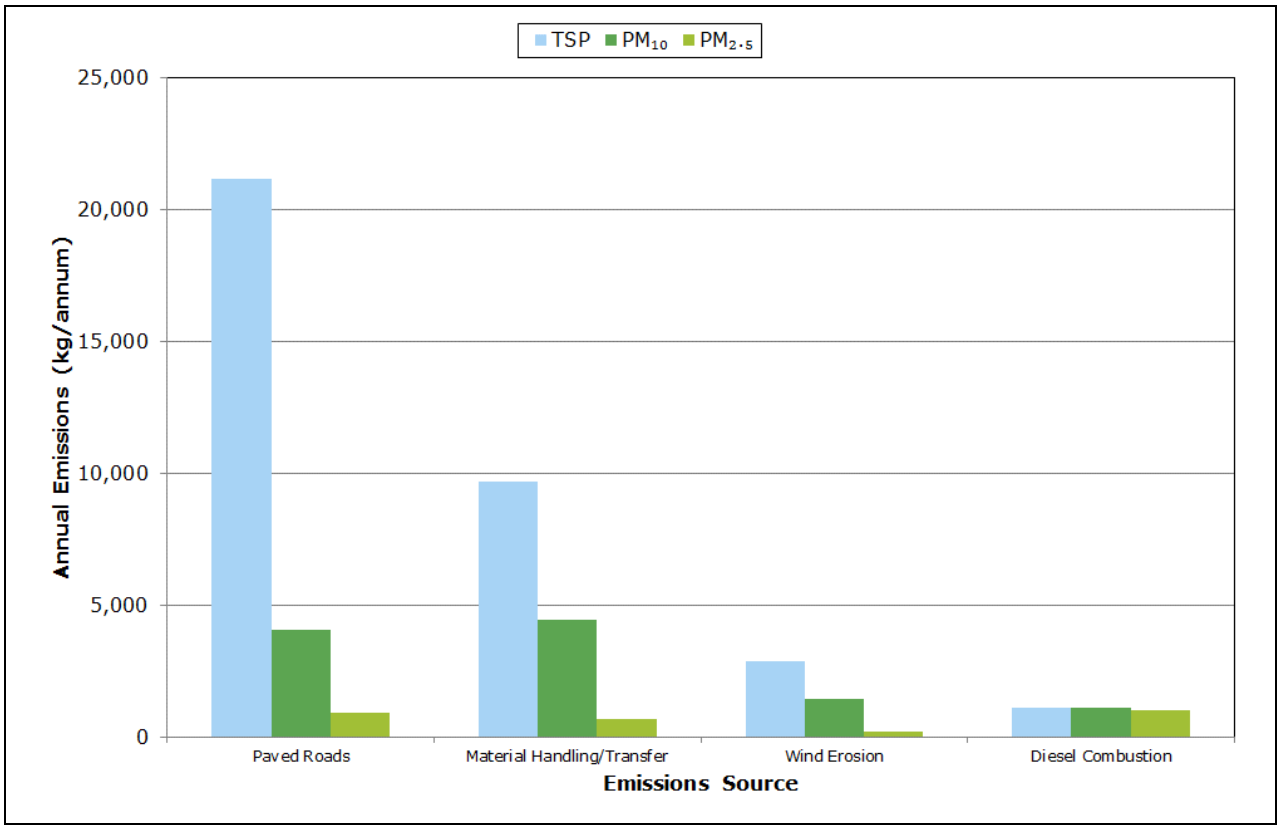


Figure 6-2: Comparison of Calculated Annual TSP, PM_{10} and $PM_{2.5}$ Emissions by Source Type – future operations

6.5 Metal Emissions

The US-EPA provide emission factors for various metals and metalloids associated with the handling and transfer of cement and cement additive at a CBP (US-EPA, 2006).

However, given that the transfer of cement and cement additive will be conducted by transfer points fitted with dust capture filter systems, emissions of metals associated with this component of the site will be negligible. Emissions of metals and metalloids have not been considered further within this assessment.

7. ASSESSMENT METHODOLOGY

7.1 Dispersion Model Selection and Application

The atmospheric dispersion modelling completed within this assessment used the AMS/US-EPA regulatory model (AERMOD) (US-EPA, 2004). AERMOD is designed to handle a variety of pollutant source types, including surface and buoyant elevated sources, in a wide variety of settings such as rural and urban as well as flat and complex terrain. AERMOD replaced the Industrial Source Complex (ISC) model for regulatory purposes in the US in December 2006 as it is considered to provide more realistic results with concentrations that are generally lower and more representative of actual concentrations compared to the ISC model. Compared to ISC, AERMOD represents an advanced new-generation model which requires additional meteorological and land-use inputs to provide more refined predictions.

Predicted concentrations were calculated for a regular Cartesian receptor grid covering a 2 km by 2 km computational domain centred over the site, with a grid resolution of 50 m applied. Additionally, concentrations were predicted at the sensitive receptor locations listed in **Table 2-1**.

Simulations were undertaken for the 12 month period of 2015 using the AERMET-generated file based largely on the BoM Sydney Airport AWS meteorological monitoring dataset as input (see **Section** 4 for description of input meteorology).

7.2 Modelling Scenarios

As identified in **Section 6.2**, two emission scenarios have been developed to estimate peak operational emissions of TSP, PM_{10} and $PM_{2.5}$ from both current (Scenario 1) and proposed future (Scenario 2) operations at the site. The air dispersion modelling has predicted ground-level concentrations and deposition rates for these two scenarios.

7.3 Source and Emissions Data

The methodology and results of the emissions inventory developed for this study are presented in **Section 6** and **Appendix 2**. The spatial allocation of emissions was based on the layout of the site presented in **Figure 2-4**. Material handling and wind erosion emissions were varied by wind speed, with higher emissions occurring during periods of higher wind speed.

7.4 Presentation of Model Results

Dispersion simulations were undertaken to predict the concentrations of TSP, PM_{10} and $PM_{2.5}$ and dust deposition. Incremental site-related concentrations and deposition rates occurring due to the current and proposed future operations across the site were modelled. Model results are expressed as the maximum predicted concentration for each averaging period at the selected assessment locations over the 2015 modelling period.

The results are presented in the following formats:

- Tabulated results of PM concentrations and dust deposition rates at the selected assessment locations are presented and discussed in **Section 8**.
- Isopleth plots, illustrating spatial variations in site-related incremental TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates are provided in **Appendix 3**.

Note, the isopleth plots of the maximum 24-hour average concentrations presented in **Appendix 3** do not represent the dispersion pattern on any individual day, but rather illustrate the maximum daily concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2015 modelling period.

8. DISPERSION MODELLING RESULTS

8.1 Overview

Incremental and cumulative TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates predicted to occur under current and proposed site operations are presented for each of the selected receptor locations.

Criteria applicable to the assessment of the predicted concentration are also presented. In the absence of impact assessment criteria for $PM_{2.5}$, reference is made to the NEPM standards for $PM_{2.5}$ to facilitate a screening assessment of predicted $PM_{2.5}$ concentrations.

Cumulative concentrations are based on the combination of the site-only increment, impact from the neighbouring recycling facility (**Section 5.1.1**) and the ambient baseline air quality concentrations (as per **Section 5**).

8.2 Incremental and cumulative impacts

Results from the dispersion modelling conducted for current and future operations at the site are presented in **Table 8-1** and **Table 8-2** respectively.

Exceedance of the NSW EPA incremental dust deposition criterion of 2 g/m2/month is predicted at receptors R3 and R4 during Scenario 1 (current operations) and receptors R3, R4, R10 and R11 for future operations.

Accounting for the neighbouring recycling facility and adopted ambient background concentrations, all other pollutants and averaging periods are below the applicable NSW EPA assessment criterion and NEPM standards at all neighbouring receptors for both current and future operations.

8.3 Source significance analysis

Further analysis of the source contribution to the predicted TSP concentrations and dust deposition levels at receptor R3 from future operations are presented in **Figure 8-1** to inform where mitigation measures should be targetted. It can be seen that key contributing source to TSP/dust deposition impacts from the site are emissions from truck movements along paved roads and surfaces. It is noted that this component in **Figure 8-1** also includes diesel combustion by trucks.

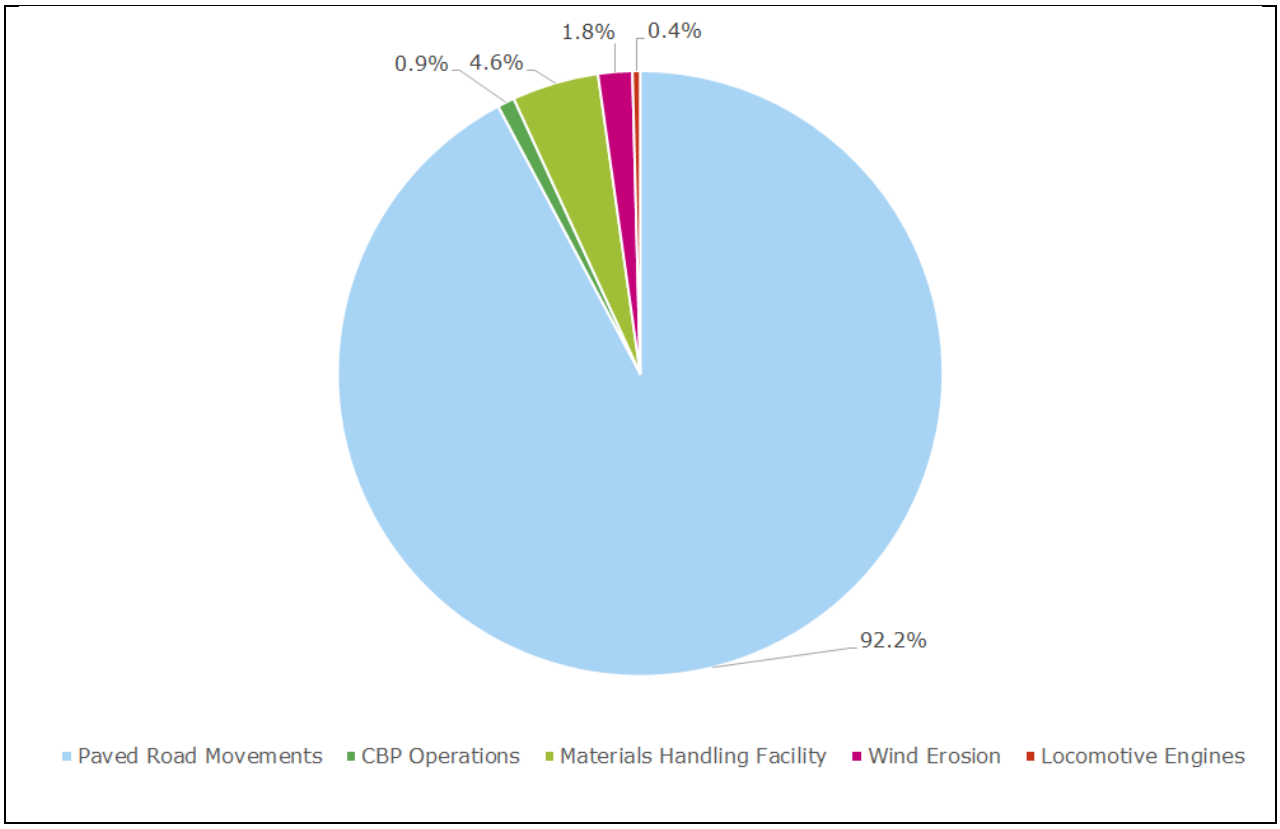


Figure 8-1: Contribution to predicted TSP/dust deposition impacts – receptor R3 – future operations

8.4 Change in impacts from current operations

As identified in **Section 6**, the proposed changes to current site operations would result in an increase in site emissions. The change in predicted ground level concentrations by pollutant and averaging period from current to proposed future operations is presented in **Figure 8-2**.

It can be seen that increase in ground level concentrations is predicted at all receptors and for all pollutants. The most notable increase is predicted for receptors R3, R4, R10 and R11. With the exception of dust deposition, the predicted increase in ground level concentrations is considered minor relative to existing air quality and applicable impact assessment criterion.

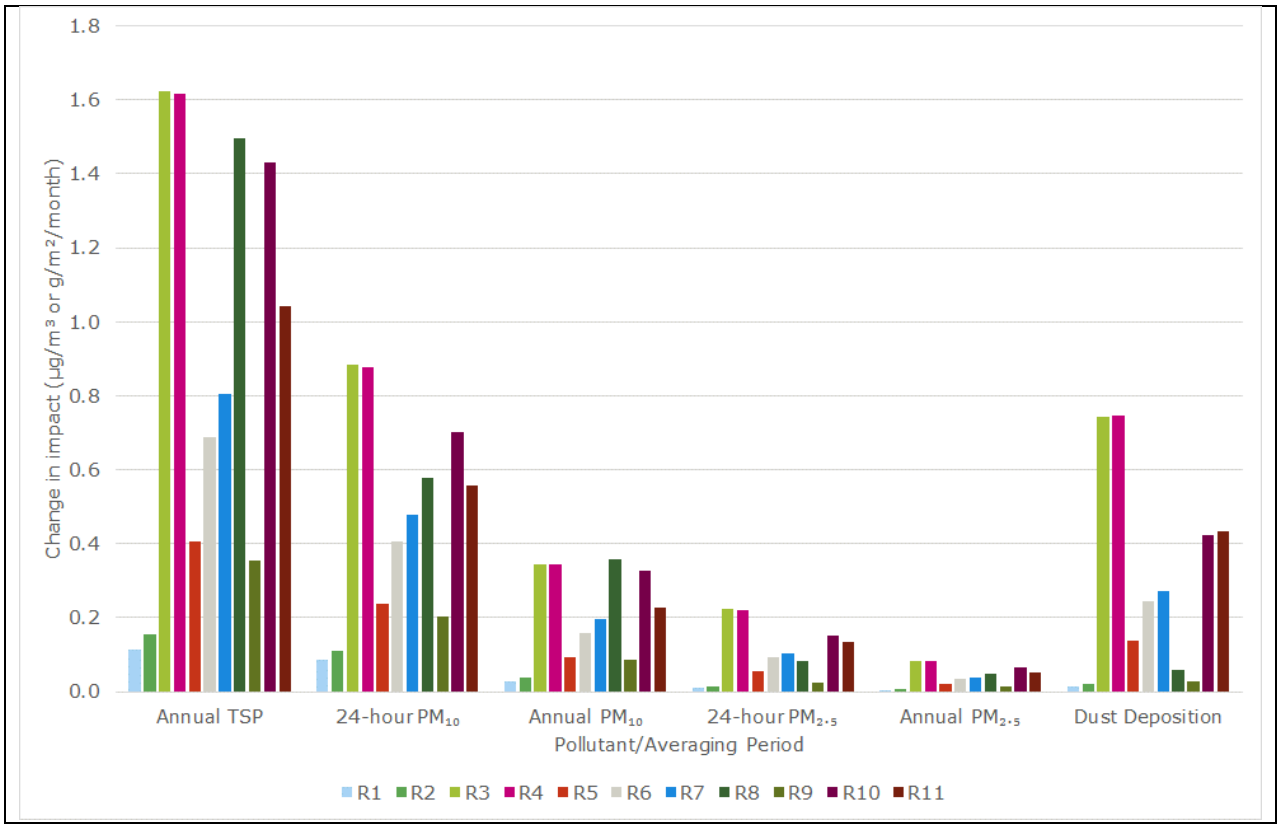


Figure 8-2: Change in predicted concentrations and deposition levels at sensitive receptors – current versus future operations

Table 8-1 Incremental and Cumulative Particulate Matter Concentration/Deposition Results – current operations

Receptor ID	Incremental Concentration/Deposition due to site						Cumulative Concentration due to site + Background Air Quality[a]				
	TSP	PM_{10}	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Deposition	TSP	PM_{10}	PM_{10}	$PM_{2.5}$	$PM_{2.5}$
	Annual Average	Maximum 24-hr	Annual Average	Maximum 24-hr	Annual Average	Annual Average	Annual Average	Maximum 24-hr	Annual Average	Maximum 24-hr	Annual Average
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	g/m²/month	µg/m³	µg/m³[b]	µg/m³	µg/m³[b]	µg/m³
Criteria	**NA**	**NA**	**NA**	**NA**	**NA**	**2**	**90**	**50**	**30**	**25**	**8**
R1	0.1	0.1	<0.1	<0.1	<0.1	0.1	38.8	43.5	18.6	20.0	6.8
R2	0.2	0.2	0.1	0.1	<0.1	0.1	38.8	43.6	18.6	20.0	6.8
R3*	5.4	3.3	1.4	1.1	0.4	**3.0**	44.2	46.7	19.9	21.0	7.2
R4*	6.8	4.0	1.6	1.2	0.5	**3.7**	45.6	47.4	20.2	21.1	7.3
R5*	1.4	1.0	0.4	0.4	0.1	0.7	40.1	44.4	18.9	20.3	6.9
R6*	2.6	1.9	0.7	0.7	0.2	1.3	41.3	45.3	19.3	20.6	7.0
R7*	2.6	2.1	0.8	0.8	0.3	1.3	41.4	45.5	19.4	20.8	7.1
R8*	0.5	0.4	0.2	0.2	0.1	0.3	40.4	44.2	19.0	20.2	6.9
R9*	0.3	0.2	0.1	0.1	<0.1	0.1	39.1	43.7	18.7	20.0	6.8
R10*	3.2	2.1	0.9	0.8	0.3	1.8	42.4	45.7	19.6	20.7	7.1
R11*	3.0	1.9	0.8	0.6	0.2	1.7	41.8	45.3	19.4	20.6	7.1

NA – Not applicable. Criteria are applicable to cumulative concentrations.

a) Background air quality includes both model predictions for neighbouring emission sources and adopted recorded particulate matter concentrations.

b) The maximum cumulative value is a sum of the maximum combined 24-hour average concentration from the site and the 99th percentile baseline concentration from the Earlwood 2010 to 2015 dataset.

Table 8-2 Incremental and Cumulative Particulate Matter Concentration/Deposition Results – proposed future operations

Receptor ID	Incremental Concentration/Deposition due to site						Cumulative Concentration due to site + Background Air Quality[a]				
	TSP	PM_{10}	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Deposition	TSP	PM_{10}	PM_{10}	$PM_{2.5}$	$PM_{2.5}$
	Annual Average	Maximum 24-hr	Annual Average	Maximum 24-hr	Annual Average	Annual Average	Annual Average	Maximum 24-hr	Annual Average	Maximum 24-hr	Annual Average
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	g/m²/month	µg/m³	µg/m³[b]	µg/m³	µg/m³[b]	µg/m³
Criteria	**NA**	**NA**	**NA**	**NA**	**NA**	**2**	**90**	**50**	**30**	**25**	**8**
R1	0.2	0.2	0.1	0.1	<0.1	0.1	38.8	43.5	18.6	20.0	6.8
R2	0.3	0.3	0.1	0.1	<0.1	0.1	38.9	43.6	18.6	20.0	6.8
R3*	7.0	4.2	1.7	1.3	0.5	**3.7**	45.5	47.5	20.2	21.2	7.3
R4*	8.4	4.9	1.9	1.4	0.5	**4.4**	47.0	48.2	20.4	21.3	7.3
R5*	1.8	1.3	0.5	0.4	0.1	0.9	40.4	44.6	19.0	20.3	6.9
R6*	3.3	2.3	0.9	0.8	0.3	1.6	41.8	45.6	19.4	20.7	7.1
R7*	3.4	2.5	1.0	0.9	0.4	1.6	42.0	45.8	19.5	20.8	7.2
R8*	2.0	1.0	0.5	0.3	0.1	0.3	40.6	44.3	19.0	20.2	6.9
R9*	0.6	0.4	0.2	0.1	<0.1	0.2	39.2	43.7	18.7	20.0	6.8
R10*	4.7	2.9	1.2	0.9	0.4	**2.3**	43.2	46.2	19.7	20.8	7.2
R11*	4.1	2.5	1.0	0.8	0.3	**2.1**	42.6	45.8	19.5	20.7	7.1

NA – Not applicable. Criteria are applicable to cumulative concentrations.

a) Background air quality includes both model predictions for neighbouring emission sources and adopted recorded particulate matter concentrations.

b) The maximum cumulative value is a sum of the maximum combined 24-hour average concentration from the site and the 99th percentile baseline concentration from the Earlwood 2010 to 2015 dataset.

9. MITIGATION AND MONITORING

9.1 Mitigation of particulate matter emissions

Section 6.3 details the various particulate matter mitigation measures currently implemented at the site. These controls were incorporated into the modelling wherever an appropriate emission reduction factor was available.

Predicted concentrations of PM_{10} and $PM_{2.5}$ arising from operations at the site are low at all surrounding receptors, suggesting that the control of these particle size fractions is effective at managing potential particulate matter-related health impacts.

However, the current dust deposition monitoring results and model predictions within this assessment suggest that the existing particulate matter mitigation measures at site may require refinement to avoid dust nuisance impacts to neighbouring receptors. As highlighted in **Section 8.3**, the key contributing source to predicted dust deposition exceedances at the neighbouring sensitive receptors is wheel-generated dust emissions from truck movements on paved surfaces about site.

Paved surfaces at site are currently controlled through regular sweeping and water flushing. A key influencing factor to emissions from truck movements on paved surfaces is the silt loading (measured in g/m^2) of the surface. It is therefore recommended that priority is given to the improvement of methods employed to manage and reduce the silt loading of paved surfaces about site.

9.2 Air quality monitoring

As stated in **Section 5.4**, Boral currently undertake dust deposition monitoring at three locations at the boundary to the site. Results obtained from these monitoring locations during 2014 and 2015 are consistently above the NSW EPA assessment criterion. It is recommended that the siting of these monitoring locations is reviewed. Consideration to the proximity of site and neighbouring facilities emission sources should be given.

If an appropriate location can be selected, it is recommended that an additional offsite monitoring location is established. An ideal location would be in the vicinity of the neighbouring sensitive receptors R3 and R4.

10. CONCLUSIONS

Ramboll Environ was commissioned by EMM to undertake an AQIA for the proposed modification to the site on behalf of Boral.

Emissions of TSP, PM_{10} and $PM_{2.5}$ were estimated for current and future proposed operations associated with the site. Atmospheric dispersion modelling predictions of calculated air pollution emissions were undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted indicated that the proposed modification was unlikely to result in exceedances of the applicable NSW EPA assessment criteria for TSP and PM_{10} or the NEPM standards for $PM_{2.5}$.

However, predicted dust deposition levels, an indicator of nuisance impact, were above the NSW EPA assessment criteria for both current and future operations at the site. Dust deposition monitoring data collected at the site is also above the criteria reinforcing the model predictions.

Analysis of model predictions for dust deposition indicates that the key influencing source of emissions at the site is the generation of dust by the movement of trucks across paved surfaces (e.g. roads and the handling facility). It is recommended that existing dust controls associated with the reduction of paved surface silt loading are reviewed and where possible improved.

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12. GLOSSARY OF ACRONYMS AND SYMBOLS

Approved Methods	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW
AHD	Australian Height Datum
BoM	Bureau of Meteorology
Boral	Boral Resources (NSW) Pty Ltd
CBP	Concrete batching plant
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPA	Environmental Protection Authority
EMM	EMM Consulting Pty Limited
µg	Microgram (g x 10-6)
µm	Micrometre or micron (metre x 10-6)
m^3	Cubic metre
NPI	National Pollutant Inventory
OEH	NSW Office of Environment and Heritage
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in aerodynamic diameter
Ramboll Environ	Ramboll Environ Australia Pty Ltd
TAPM	"The Air Pollution Model"
TSP	Total Suspended Particulates
The handling facility	Construction materials handling facility
The modification	The administrative modification
The site	Boral's site at 25 Burrows Road South
US-EPA	United States Environmental Protection Agency
VKT	Vehicle Kilometres Travelled

APPENDIX 1
WIND ROSES

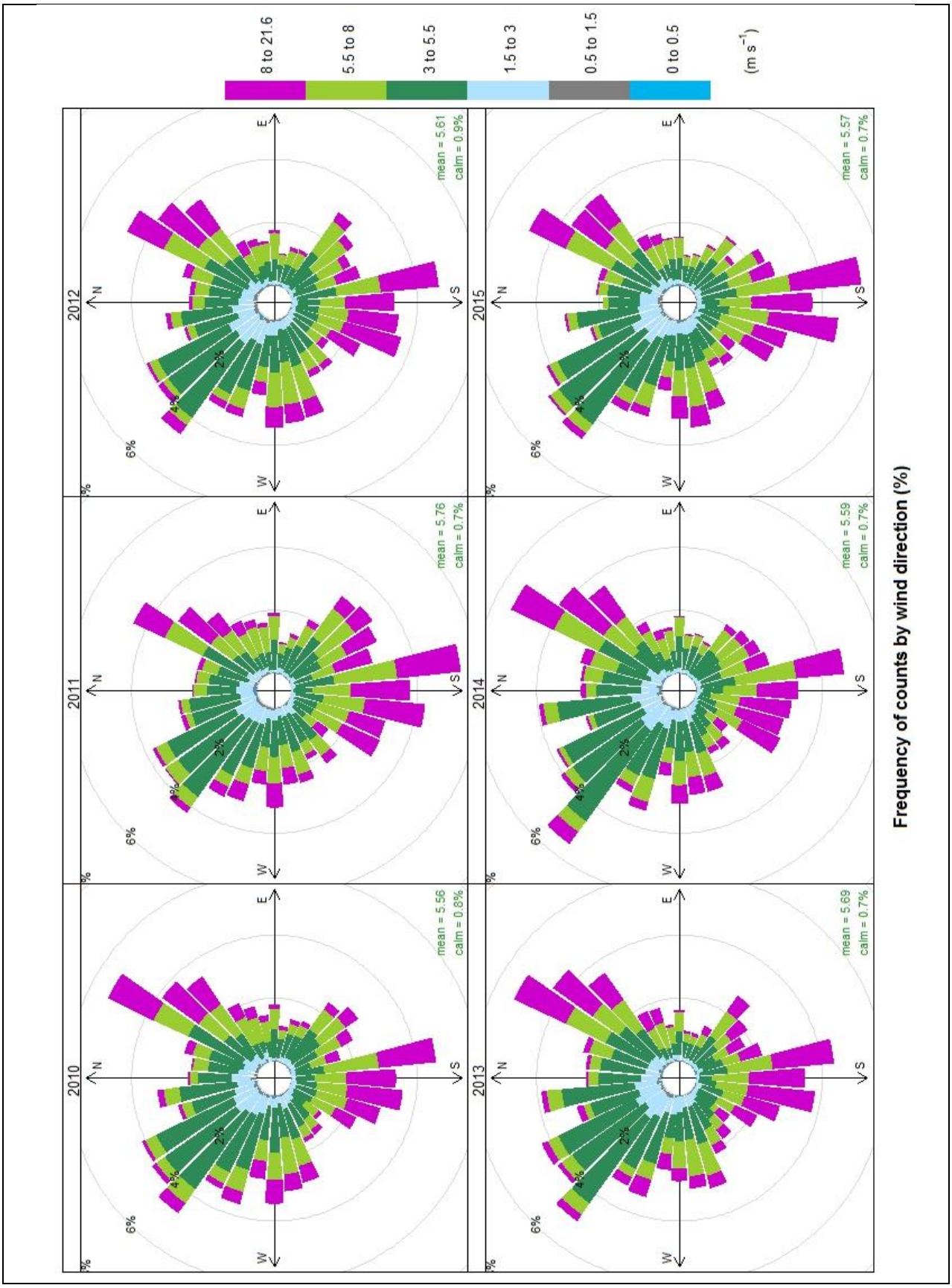


Figure A1.1 Annual Wind Roses – BoM Sydney Airport AWS – 2010 - 2015

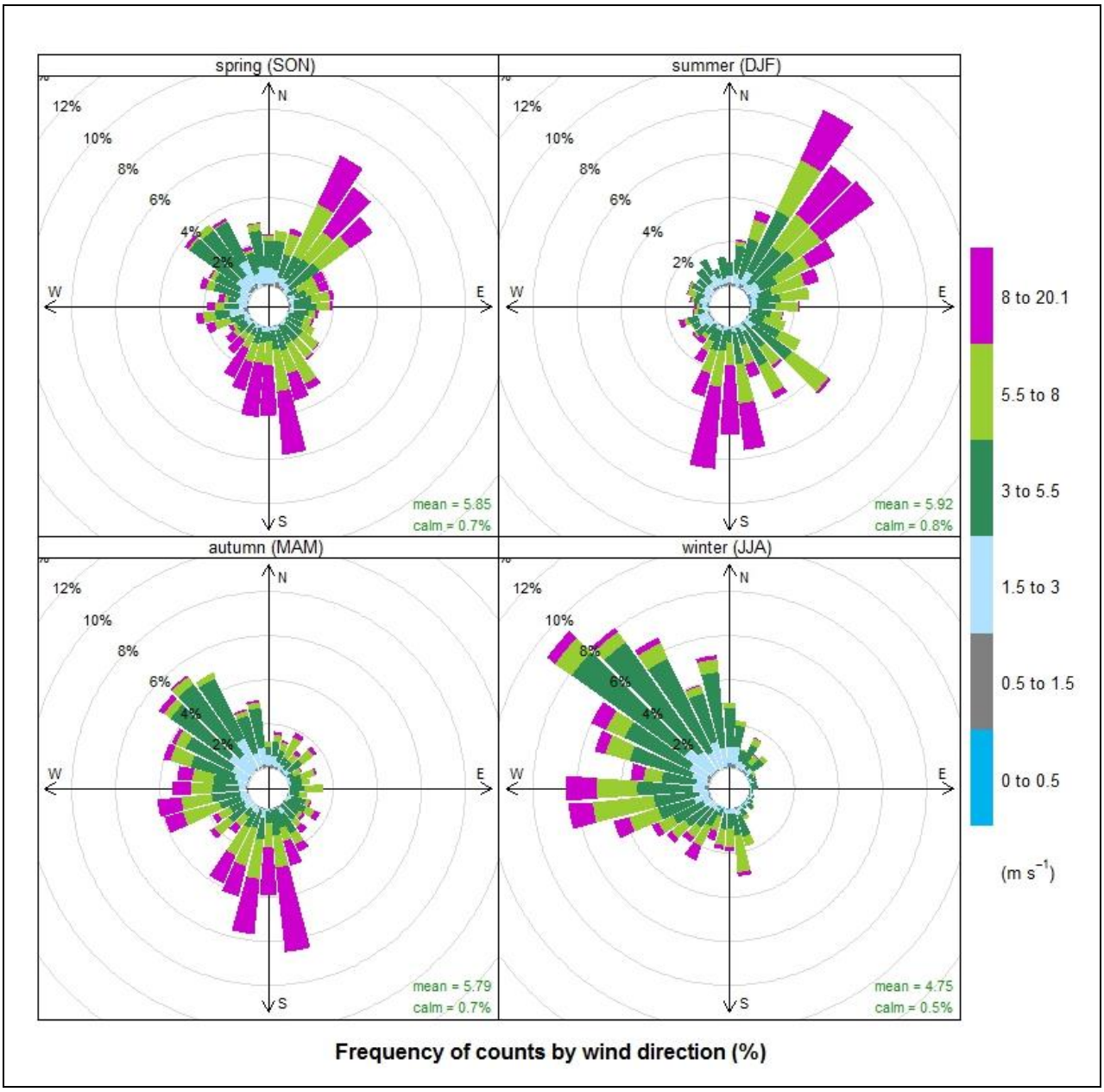


Figure A1.2 Seasonal Wind Roses – BoM Sydney Airport AWS – 2015

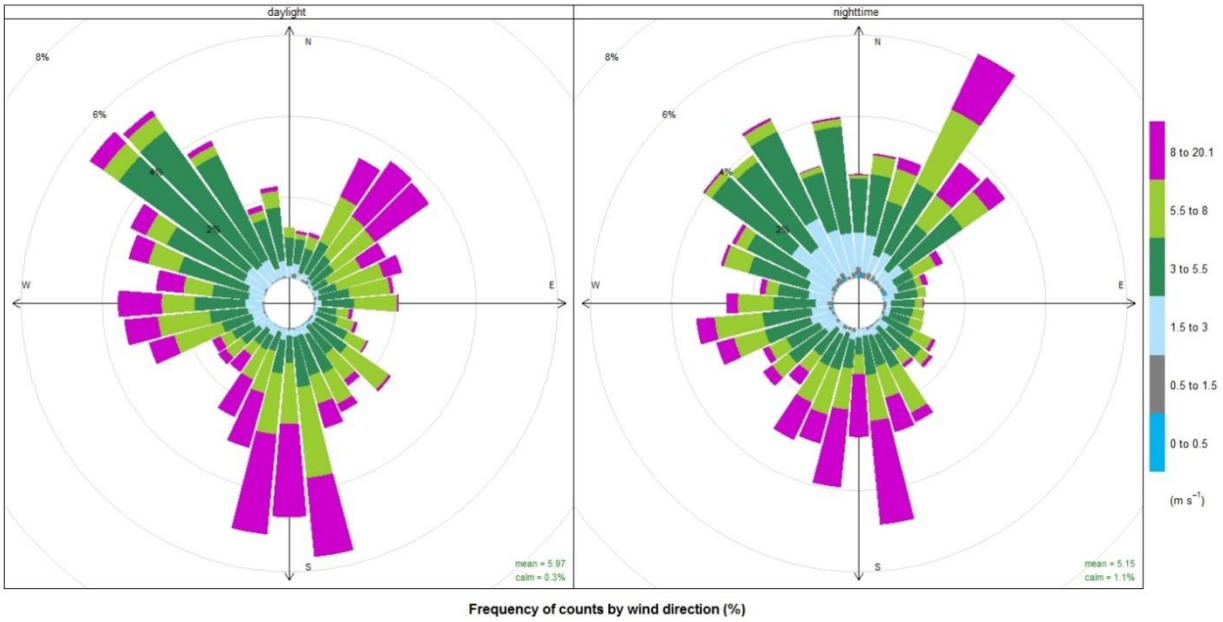


Figure A1.3 Diurnal Wind Roses – BoM Sydney Airport AWS – 2015

APPENDIX 2
EMISSIONS INVENTORY

Introduction

Air emission sources associated with the site were identified and quantified through the application of accepted published emission estimation factors, collated from a combination of United States Environmental Protection Agency (US-EPA) AP-42 Air Pollutant Emission Factors and NPI emission estimation manuals, including the following:

- NPI Emission Estimation Technique Manual for Mining (NPI, 2012);
- NPI Emission Estimation Technique Manual for Combustion Engines (NPI, 2008);
- AP-42 Chapter 13.2.5 – Industrial Wind Erosion (US-EPA 2006a);
- AP-42 Chapter 13.2.4 – Aggregate Handling and Storage Piles (US-EPA 2006b);
- AP-42 Chapter 11.12 – Concrete Batching (US-EPA 2006c); and
- AP-42 Chapter 13.2.1 – Paved Roads (US-EPA 2011a).

Sources of Particulate Matter Emissions

Air emissions associated with the site would primarily comprise fugitive particulate matter releases. Potential sources of emission were identified as follows:

- Delivery of aggregate and sand material to site by train and truck;
- Transfer and handling of aggregate and sand at storage bins, handling facility and within the CBP;
- Transferring cement and cement supplement into silos from delivery trucks;
- CBP conveying and loading to agitator trucks;
- Wheel-generated dust from trucks movements across paved surfaces;
- Wind erosion from material storage bins and adjacent paved surfaces; and
- Diesel combustion by trucks, mobile =plant and locomotive engines.

Operational Assumptions

To compile an emissions inventory for existing and proposed operations at the site, the following general assumptions were made:

- Operational activities occur 24 hours a day, 365 days per year;
- Total wind erodible area for the site of 0.9 ha
- Average truck weights (average of loaded and unloaded weights);
  - Aggregate/sand truck – 32.75 t;
  - Cement/supplement truck – 30.25 t; and
  - Agitator truck – 21.6 t.
- Peak daily truck movements were adopted continuously for conservative purposes;
  - Aggregate/sand truck delivery and dispatch – 110 for current and future scenarios;
  - Cement/supplement truck – 10 for current and 15 for future scenarios;
  - Agitator truck – 160 for current and 250 for future scenarios.
- Annual diesel consumption by onsite equipment of 104,250 L for current and 108,250 L for future.
- Assumed two locomotives per train. Two trains per day. Onsite idling time of eight hours per train.

Particulate Matter Emission Factors Applied

The emission factor equations applied within the assessment are documented in this subsection. **Table A2.1** lists the uncontrolled emission factors that were applied for the two emission scenarios, references the source of the listed factors and whether the factor is derived from a specific equation or a published default emission factor.

Table A2.1 Emission Estimation Factors Applied

Site area	Emission Source	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Emission Factor Unit	Source of Factor
CBP	Cement/Flyash/Admix Delivery - Paved	0.91	0.17	0.04210	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
CBP	Aggregate Unloading from train	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Sand Unloading from train	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Aggregate Conveyor Transfer	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Sand Conveyor Transfer	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Aggregate Transfer to Storage	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Sand Transfer to Storage	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Cement/flyash unloading to silos	0.0005	0.0002	0.00002	kg/tonne	US-EPA AP42 11.12 - Cement unloading to elevated storage silos (controlled)
CBP	Aggregate transfer storage to weigh hopper	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Sand transfer storage to weigh hopper	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
CBP	Weigh hopper loading	0.0026	0.0013	0.00020	kg/tonne	US-EPA AP42 11.12 - Weigh hopper loading
CBP	Mixer Loading (Truck Mixer)	1.1180	0.3100	0.0500	kg/tonne	US-EPA AP42 11.12 - Truck loading (truck mix) uncontrolled
CBP	Agitator Truck Dispatch - Paved	0.67	0.13	0.02731	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation

Site area	Emission Source	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Emission Factor Unit	Source of Factor
Materials Storage Area	Aggregate truck Unloading to stockpiles	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand truck Unloading to stockpiles	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate Unloading from train	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand Unloading from train	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate Conveyor Transfer	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand Conveyor Transfer	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate to internal truck	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand to internal truck	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate/Sand internal transport to storage bins - Paved	0.97	0.19	0.04494	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Materials Storage Area	Aggregate unloading to stockpiles	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand unloading to stockpiles	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate/Sand internal transport to CBP- Paved	0.97	0.19	0.04494	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Materials Storage Area	Aggregate handling at stockpiles	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand handling at stockpiles	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation

Site area	Emission Source	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Emission Factor Unit	Source of Factor
Materials Storage Area	Aggregate truck loading	0.0046	0.0022	0.00033	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Sand truck loading	0.0014	0.0007	0.00010	kg/tonne	US-EPA AP42 13.2.4 - Materials Handling Equation
Materials Storage Area	Aggregate/Sand Delivery and dispatch - Paved	0.97	0.19	0.04494	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Total site	Wind Erosion - Materials storage area	9169.1	4584.6	687.7	kg/ha/year	AP-42 13.2.5 - Industrial Wind Erosion

Details relating to the emission equations referenced in **Table A2.1** are presented in the following sections.

Paved Roads Equation

The emissions factors for paved roads, as documented within AP42 Chapter 13.2.2 -"Paved Roads" (US-EPA 2011), was applied as follows:

$E = k\ (sL)^{0.91}(W)^{1.02}$

Where:

E = Emissions Factor (g/VKT)

sL = road surface silt loading (g/m^2)

W = mean vehicle weight (tonnes)

k = constant of 1.5 for PM_{10}

Material parameters are listed in **Table A2.4**.

Materials Handling

Particulate matter emissions from material transfer operations were calculated through the application of the US-EPA predictive emission factor equation for continuous and batch drop loading and tipping operations (AP42, Section 13.2.4), given as follows:

$$E = k(0.0016) * \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right)$$

where,

E =Emissions (kg/tonne transferred)

U = mean wind speed (m/s)

M = material moisture content (%)

k = 0.74 for TSP, 0.35 for PM_{10} and 0.053 for $PM_{2.5}$

Wind Erosion Sources

Wind-blown dust from storage bins and the handling facility was estimated by applying the complex, predictive emission estimation procedure documented within AP-42 Chapter 13.2.5 "Industrial Wind Erosion" November 2006, as described below.

The predictive emission factor equation for industrial wind erosion is given as follows:

$$\mathrm{E} = \mathrm{k} \sum_{\mathrm{i}=1}^{\mathrm{N}} \mathrm{Pi}$$

Where,

k = particle size multiplier (k = 1 for TSP, 0.5 for PM_{10} and 0.075 for $PM_{2.5}$)

N = number of disturbances per year

Pi = erosion potential corresponding to the observed (or probable) fastest mile of wind for the i^{th} period between disturbances (g/m^2), calculated by:

$P = 58(u^* - ut^*) + 25(u^* - ut^*)$

$P = 0$ for $u^* \leq ut^*$

Where,

u* = friction velocity (m/s)

ut* = threshold friction velocity (m/s)

Diesel Calculations

Diesel combustion emissions by onsite mobile equipment have been estimated based on annual diesel consumption rates of 104,250 L for current and 108,250 L for future and the NPI (2008) emission factors for miscellaneous industrial vehicles. These factors are 0.0036 kg PM_{10} / litre and 0.0033 kg $PM_{2.5}$ / litre. Annual emissions from onsite diesel combustion are 375.3 kg PM_{10} and 344.0 kg $PM_{2.5}$ for current operations and 389.7 kg PM_{10} and 357.2 kg $PM_{2.5}$ for future operations.

Diesel combustion emissions of $PM_{2.5}$ from trucks are described in the tables below. It is assumed that 97% of PM_{10} emissions from diesel combustion is $PM_{2.5}$, emissions have been up-scaled accordingly.

Table A2.2 $PM_{2.5}$ Emissions – Trucks Moving Onsite

Equipment	PM Emission Factor (g/VKT) - 1996 ADR70/00	Annual VKT	Annual Emissions (kg/year)
Trucks moving on site - current	0.584	70,683	41.3
Trucks moving on site - future	0.584	91,488	53.4

Emission Factor Source: NSW EPA (2012) Technical Report No. 7, Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, 2008 Calendar Year,On-Road Mobile Emissions.

Table A2.3 $PM_{2.5}$ Emissions – Trucks Idling Onsite

Equipment	Trucks onsite at any hour	Emission Factor PM (g/hr) - USEPA	Hours per year	Annual Emissions (kg/year)
Trucks Idling on site - current	12	1.196	8,760	125.7
Trucks Idling on site - future	16	1.196	8,760	167.6

Emission Factor Source: NSW EPA (2012) Technical Report No. 7, Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, 2008 Calendar Year, On-Road Mobile Emissions.

Finally, in order to quantify emissions associated with idling locomotive engines at site, the following assumptions were made:

- Two trains per day;
- Each train with two locomotives of TT class;
- Time idling on site per train is eight hours;
- Locomotive gross power rating of 4,490 bhp;
- Locomotive engines are assumed to be in notch 1 when idling. Based on Table 5-2 of US-EPA (1998), idling power output is 202 bhp;
- Locomotive emissions were estimated based on US-EPA Tier 0+ emission factors (US-EPA, 2009);
- US-EPA emission factor is for PM_{10}. TSP is assumed to be 100% PM_{10}, while PM_{10} is assumed to be 97% $PM_{2.5}$ (US-EPA, 2009).

Calculated annual emissions from idling locomotives for both scenarios are as follows:

- 472 kg TSP/PM_{10}; and
- 457.8 kg $PM_{2.5}$.

Project Related Input Data

Material property inputs used in the emission equations presented in **Table A2.1** are detailed in **Table A2.4**. It is noted that minimal details relating to the material properties were available at the time of reporting. To compensate, values were adopted from the literature.

Table A2.4 Material Property Inputs for Emission Estimation Factors Applied

Material Properties	Units	Value	Source of Information
Moisture Content of aggregate	%	1.77	Default value for aggregate – US-EPA AP42 (2006c)
Moisture Content of sand	%	4.14	Default value for Sand – US-EPA AP42 (2006c)
Silt Loading of Paved Roads	g/m^2	12	Default loading for concrete batching plants- US-EPA AP42 (2011a)

Key operational details by process used in the emission calculations are listed in **Table A2.5**.

Table A2.5 Emission Estimation Activity Rates Applied for Emission Calculations

Site Area	Emissions source	Unit	Current	Future
CBP	Cement/Flyash/Admix Delivery - Paved	Annual vehicles kilometre travelled	2,190	3,825
CBP	Aggregate Unloading from train	Tonnes of material	206,000	310,000
CBP	Sand Unloading from train	Tonnes of material	160,000	240,000
CBP	Aggregate Conveyor Transfer	Tonnes of material	206,000	310,000
CBP	Sand Conveyor Transfer	Tonnes of material	160,000	240,000
CBP	Aggregate Transfer to Storage	Tonnes of material	206,000	310,000
CBP	Sand Transfer to Storage	Tonnes of material	160,000	240,000
CBP	Cement/flyash unloading to silos	Tonnes of material	93,000	111,000
CBP	Aggregate transfer storage to weigh hopper	Tonnes of material	206,000	310,000

Site Area	Emissions source	Unit	Current	Future
CBP	Sand transfer storage to weigh hopper	Tonnes of material	160,000	240,000
CBP	Weigh hopper loading	Tonnes of material	366,000	550,000
CBP	Mixer Loading (Truck Mixer)	Tonnes of material	93,000	111,000
CBP	Agitator Truck Dispatch - Paved	Annual vehicles kilometre travelled	35,040	54,750
Materials Storage Area	Aggregate truck Unloading to stockpiles	Tonnes of material	15,000	15,000
Materials Storage Area	Sand truck Unloading to stockpiles	Tonnes of material	97,000	97,000
Materials Storage Area	Aggregate Unloading from train	Tonnes of material	320,000	320,000
Materials Storage Area	Sand Unloading from train	Tonnes of material	327,000	327,000
Materials Storage Area	Aggregate Conveyor Transfer	Tonnes of material	320,000	320,000
Materials Storage Area	Sand Conveyor Transfer	Tonnes of material	327,000	327,000
Materials Storage Area	Aggregate to internal truck	Tonnes of material	320,000	320,000
Materials Storage Area	Sand to internal truck	Tonnes of material	327,000	327,000
Materials Storage Area	Aggregate/Sand internal transport to storage bins - Paved	Tonnes of material	647,000	647,000
Materials Storage Area	Aggregate/Sand internal transport to storage bins - Paved	Annual vehicles kilometre travelled	3,982	3,982
Materials Storage Area	Aggregate unloading to stockpiles	Tonnes of material	320,000	320,000
Materials Storage Area	Sand unloading to stockpiles	Tonnes of material	327,000	327,000
Materials Storage Area	Aggregate/Sand internal transport to CBP- Paved	Tonnes of material	222,000	222,000

Site Area	Emissions source	Unit	Current	Future
Materials Storage Area	Aggregate/Sand internal transport to CBP- Paved	Annual vehicles kilometre travelled	1,366	1,366
Materials Storage Area	Aggregate handling at stockpiles	Tonnes of material	91,000	91,000
Materials Storage Area	Sand handling at stockpiles	Tonnes of material	131,000	131,000
Materials Storage Area	Aggregate truck loading	Tonnes of material	252,000	252,000
Materials Storage Area	Sand truck loading	Tonnes of material	357,000	357,000
Materials Storage Area	Aggregate/Sand Delivery and dispatch - Paved	Annual vehicles kilometre travelled	28,105	28,105
Total site	Wind Erosion - Materials storage area	Area (ha)	0.9	0.9

APPENDIX 3
INCREMENTAL ISOPLETH PLOTS

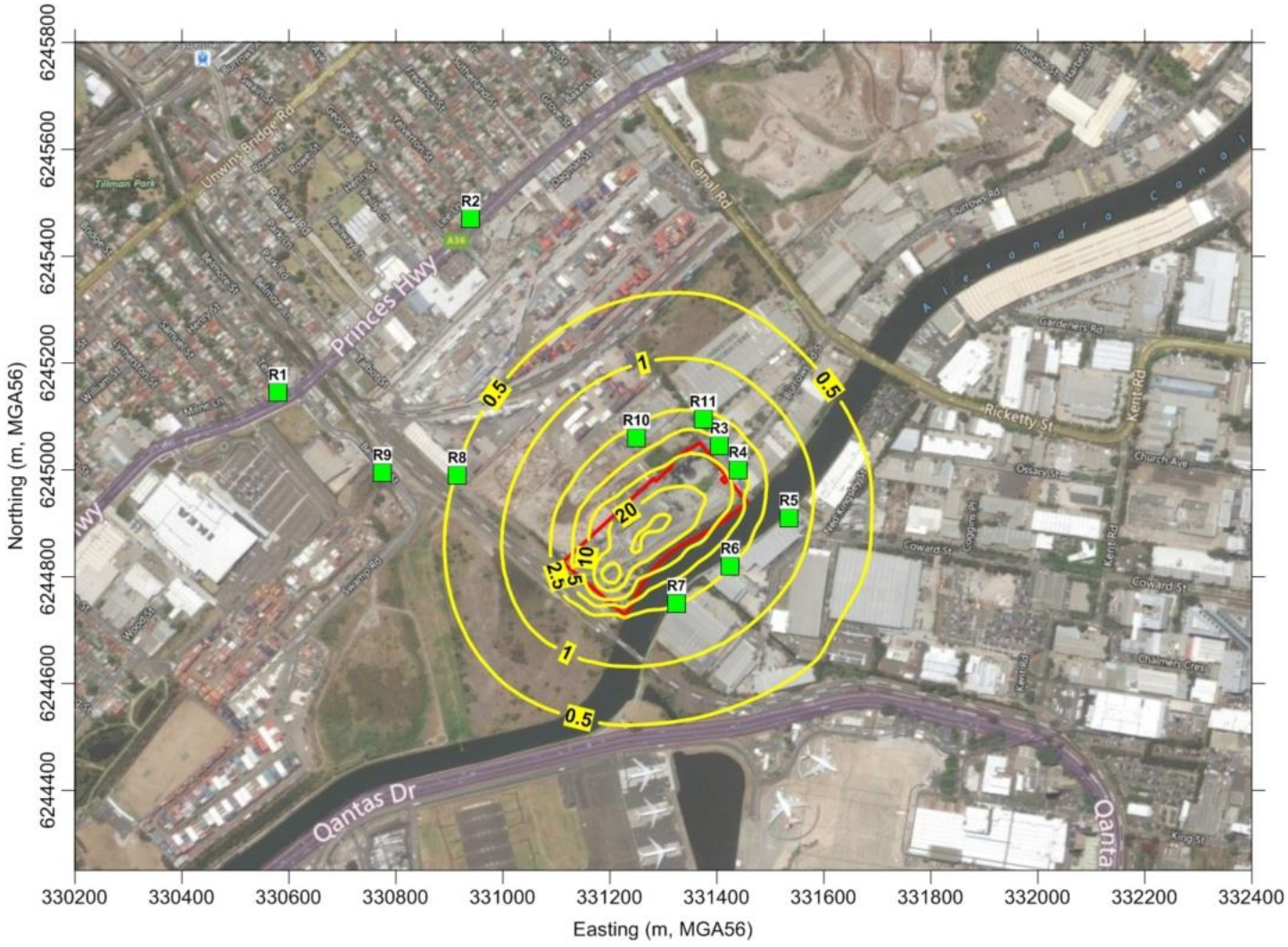


Figure A3.1 Predicted Incremental Annual Average TSP Concentrations (µg/m³) - Current

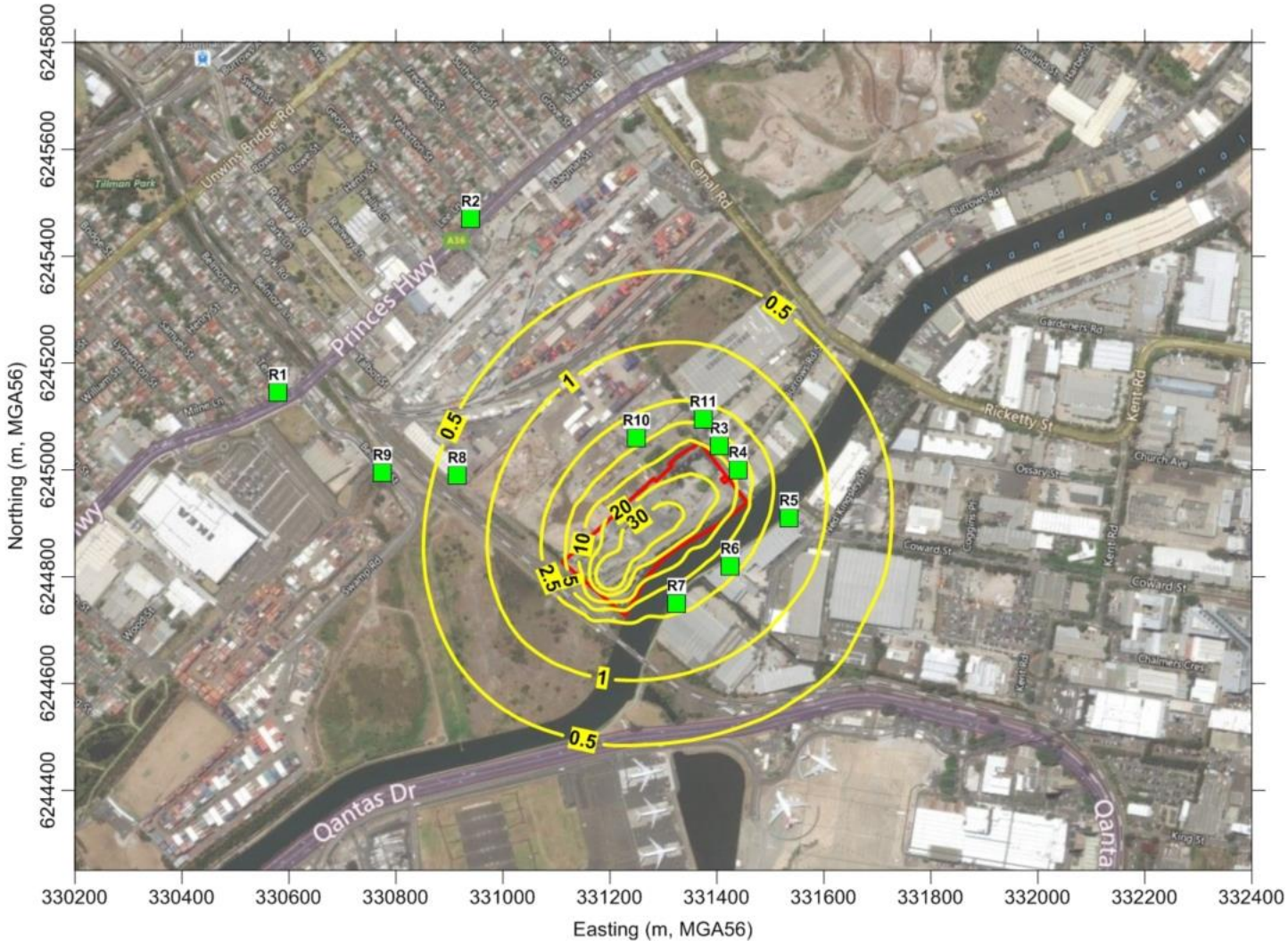


Figure A3.2 Predicted Incremental Annual Average TSP Concentrations (µg/m³) - Future

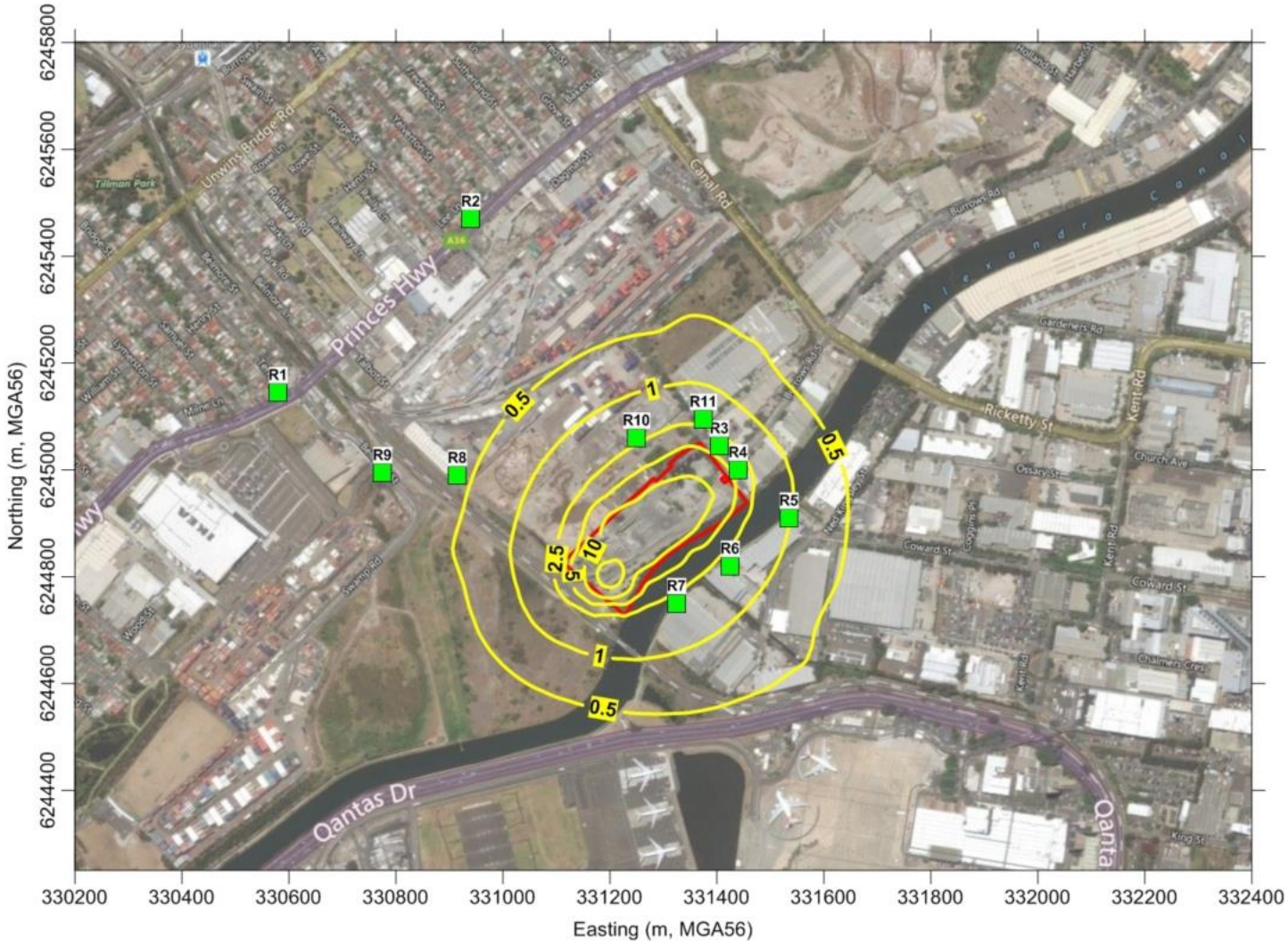


Figure A3.3 Predicted Incremental Maximum 24-hour Average PM_{10} Concentrations (µg/m³) – Current

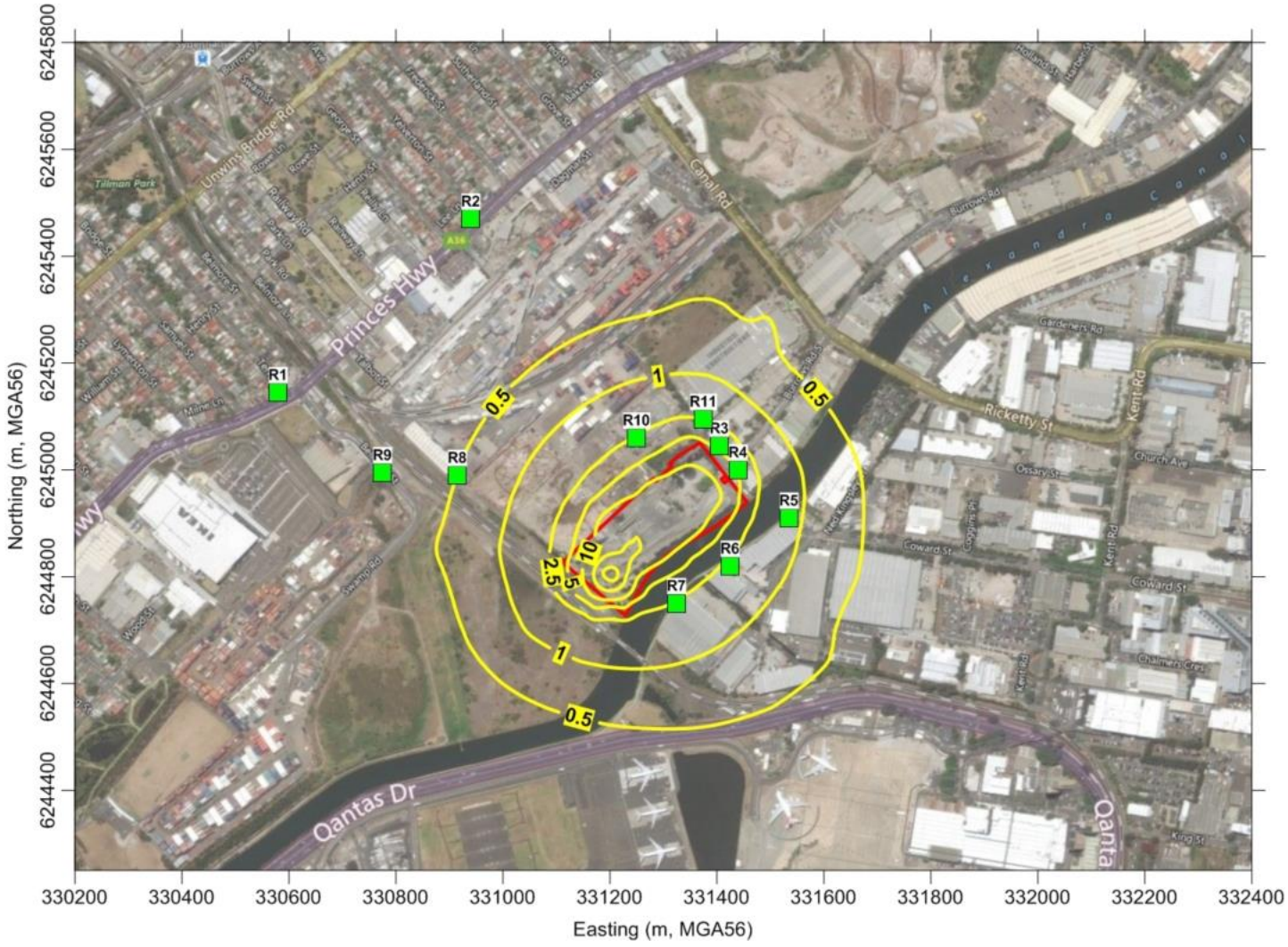


Figure A3.4 Predicted Incremental Maximum 24-hour Average PM_{10} Concentrations (µg/m³) - Future

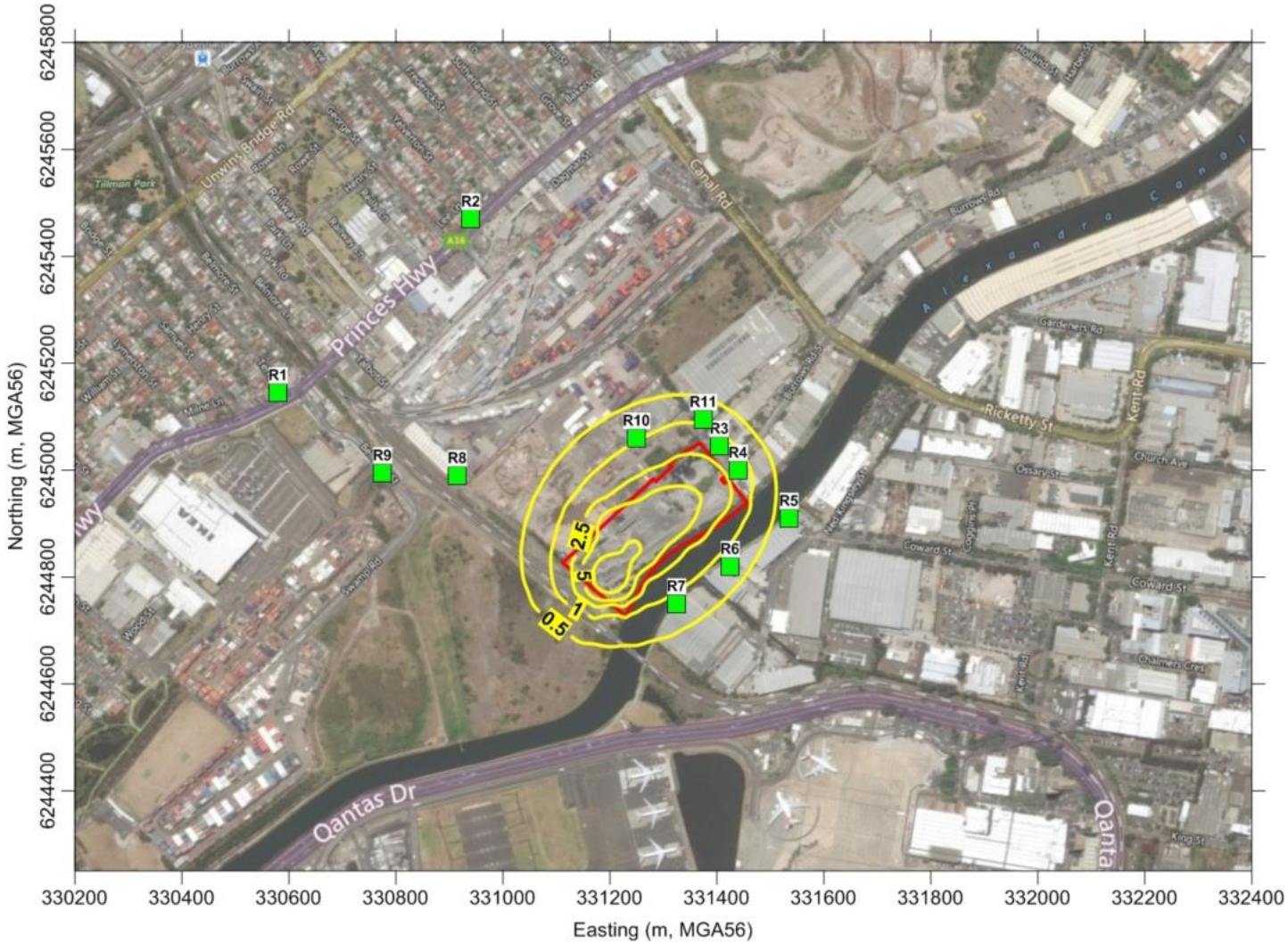


Figure A3.5 Predicted Incremental Annual Average PM_{10} Concentrations (µg/m³) - Current

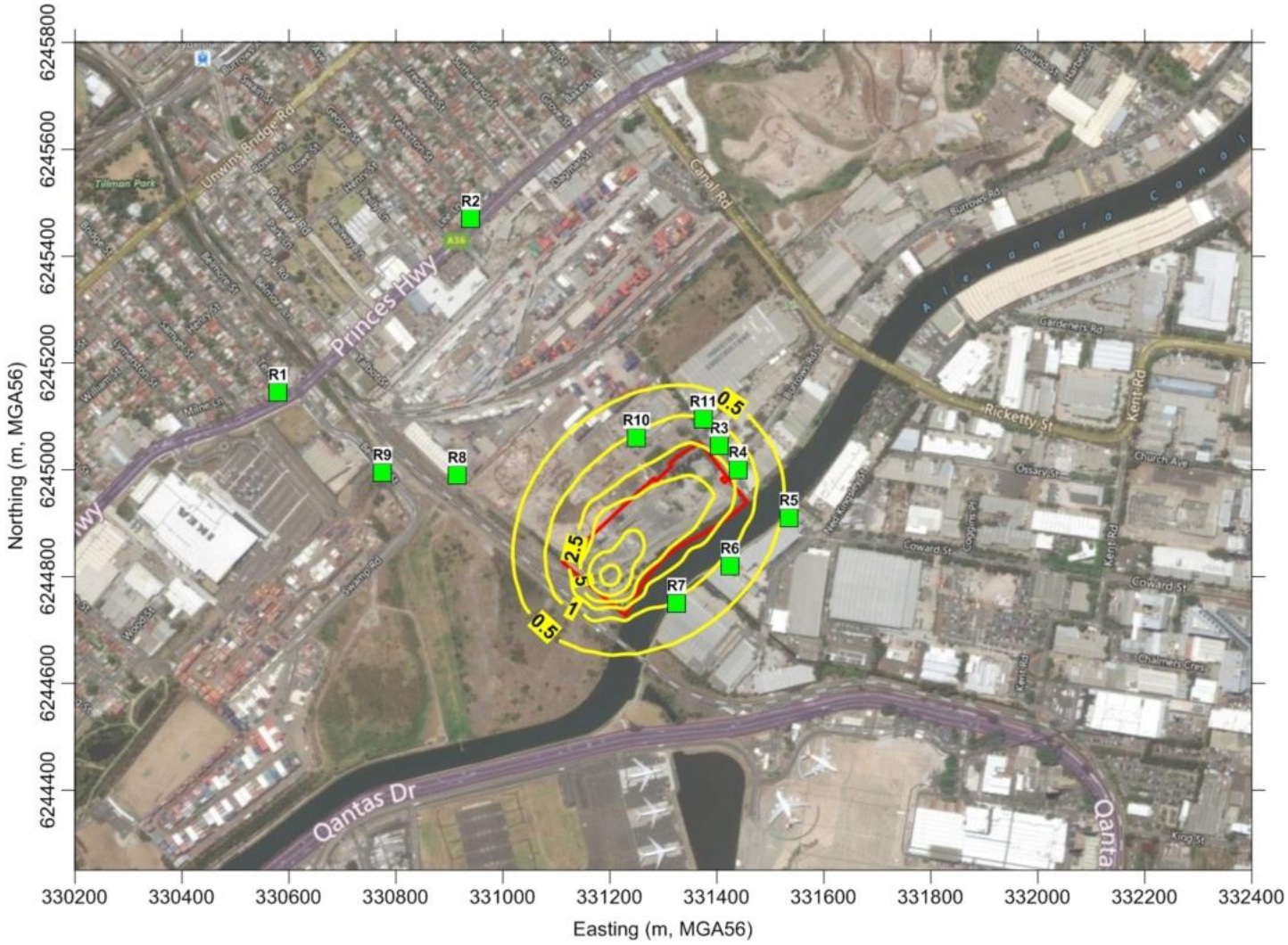


Figure A3.6 Predicted Incremental Annual Average PM_{10} Concentrations (µg/m³) - Future

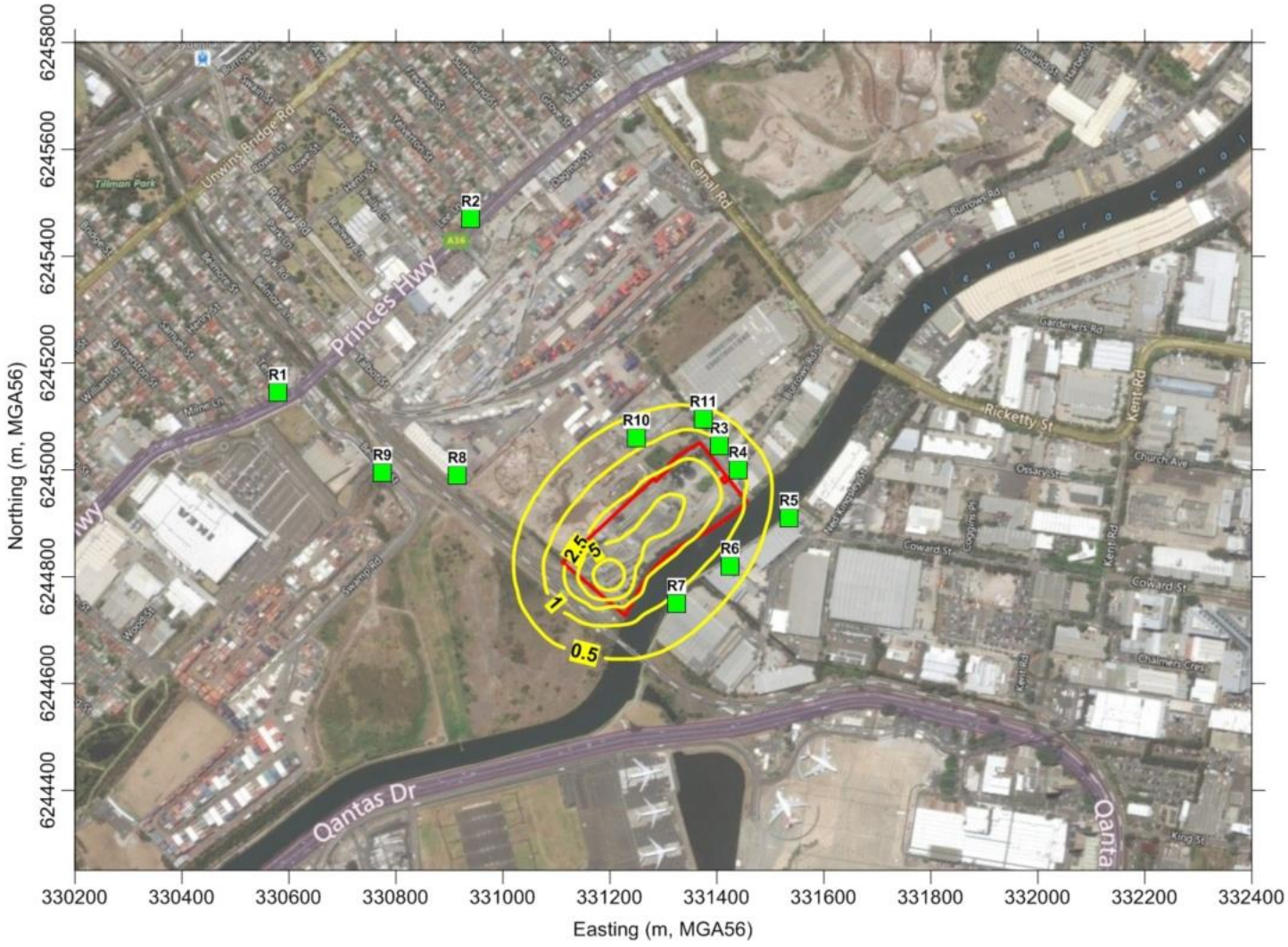


Figure A3.7 Predicted Incremental Maximum 24-hour Average $PM_{2.5}$ Concentrations (µg/m³) - Current

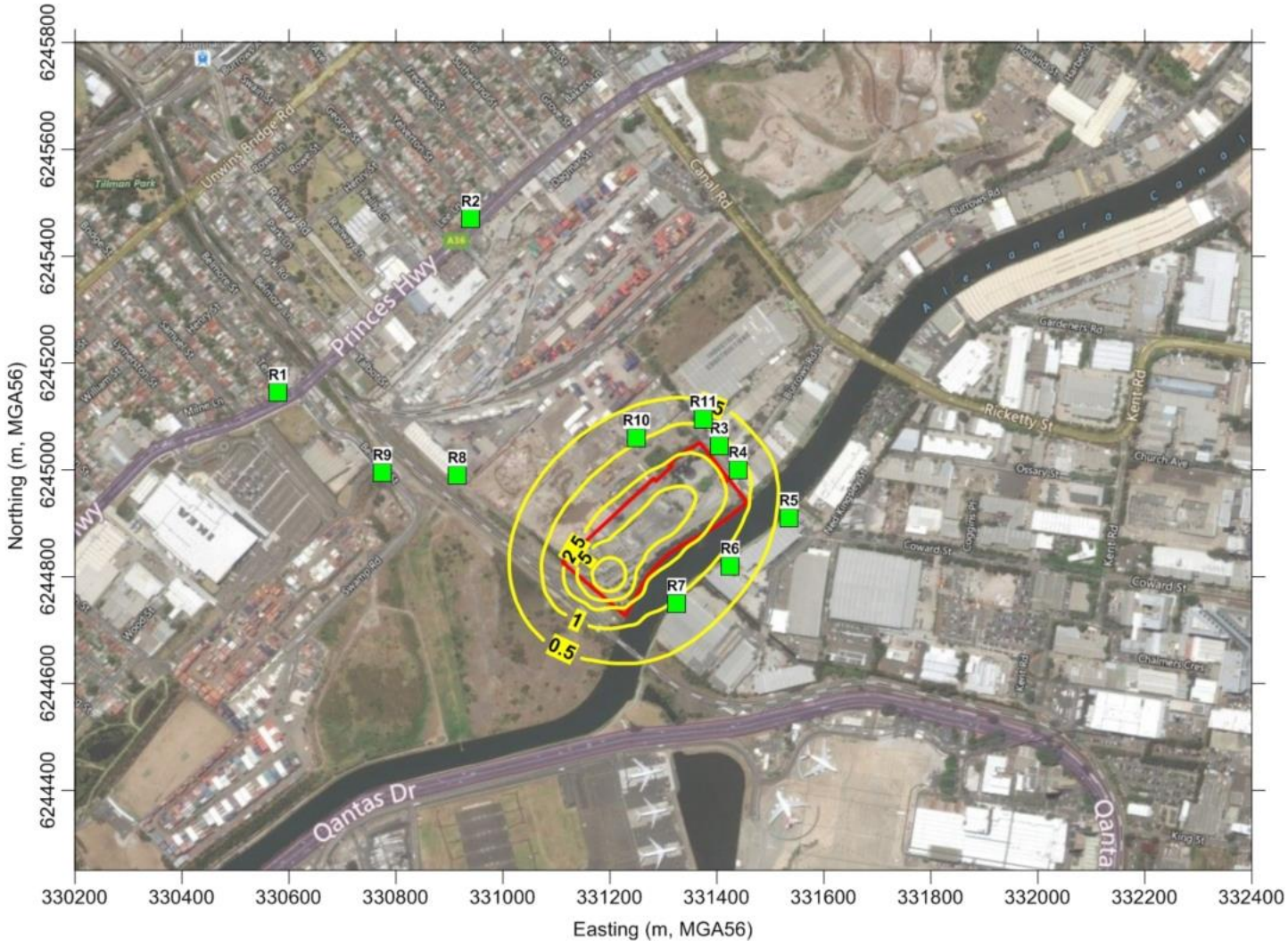


Figure A3.8 Predicted Incremental Maximum 24-hour Average $PM_{2.5}$ Concentrations (µg/m³) - Future



Figure A3.9 Predicted Incremental Annual Average $PM_{2.5}$ Concentrations (µg/m³) - Current



Figure A3.10 Predicted Incremental Annual Average $PM_{2.5}$ Concentrations (µg/m³) - Future

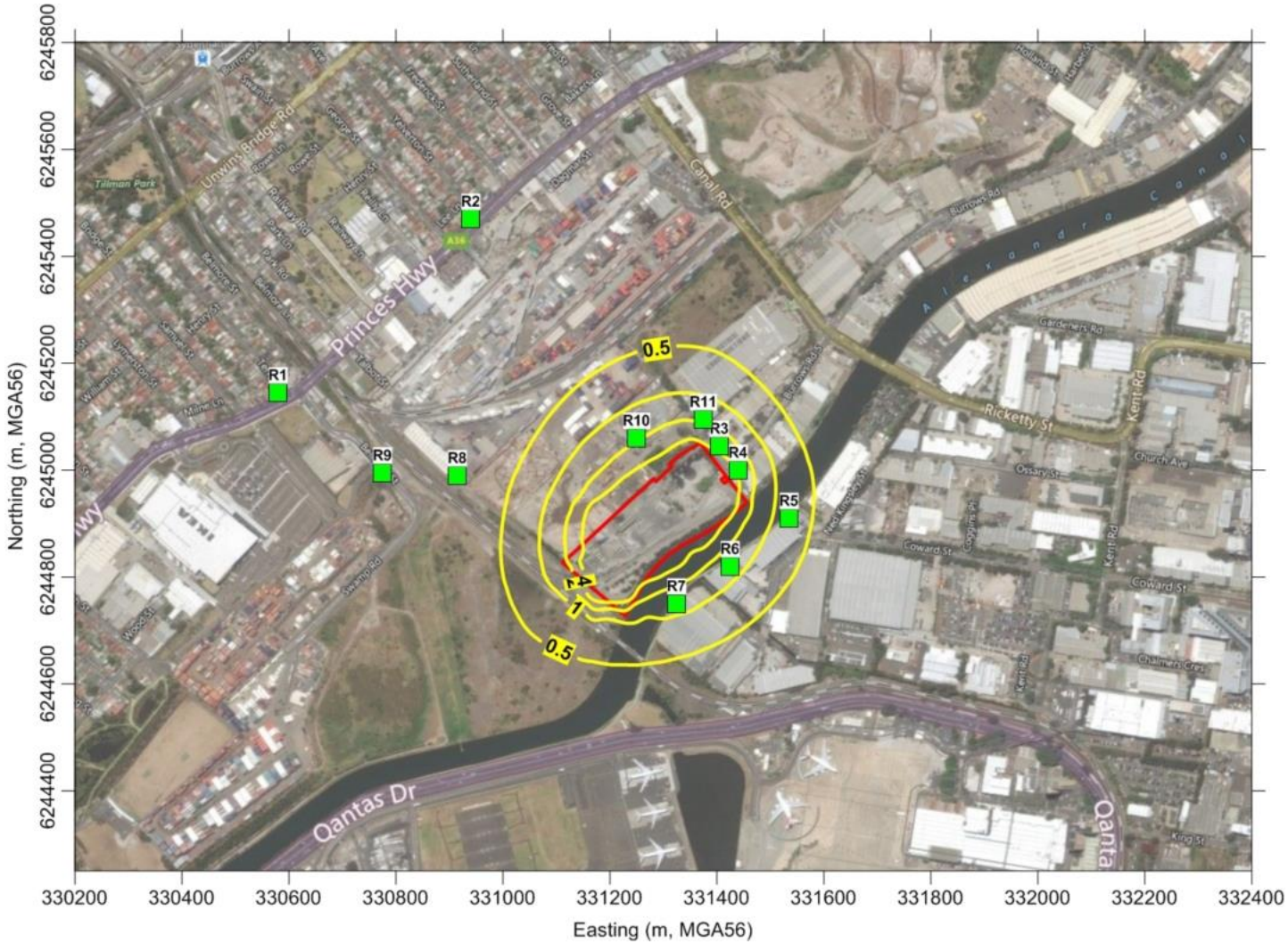


Figure A3.11 Predicted Incremental Annual Average Dust Deposition Levels (g/m^2/month) – Current

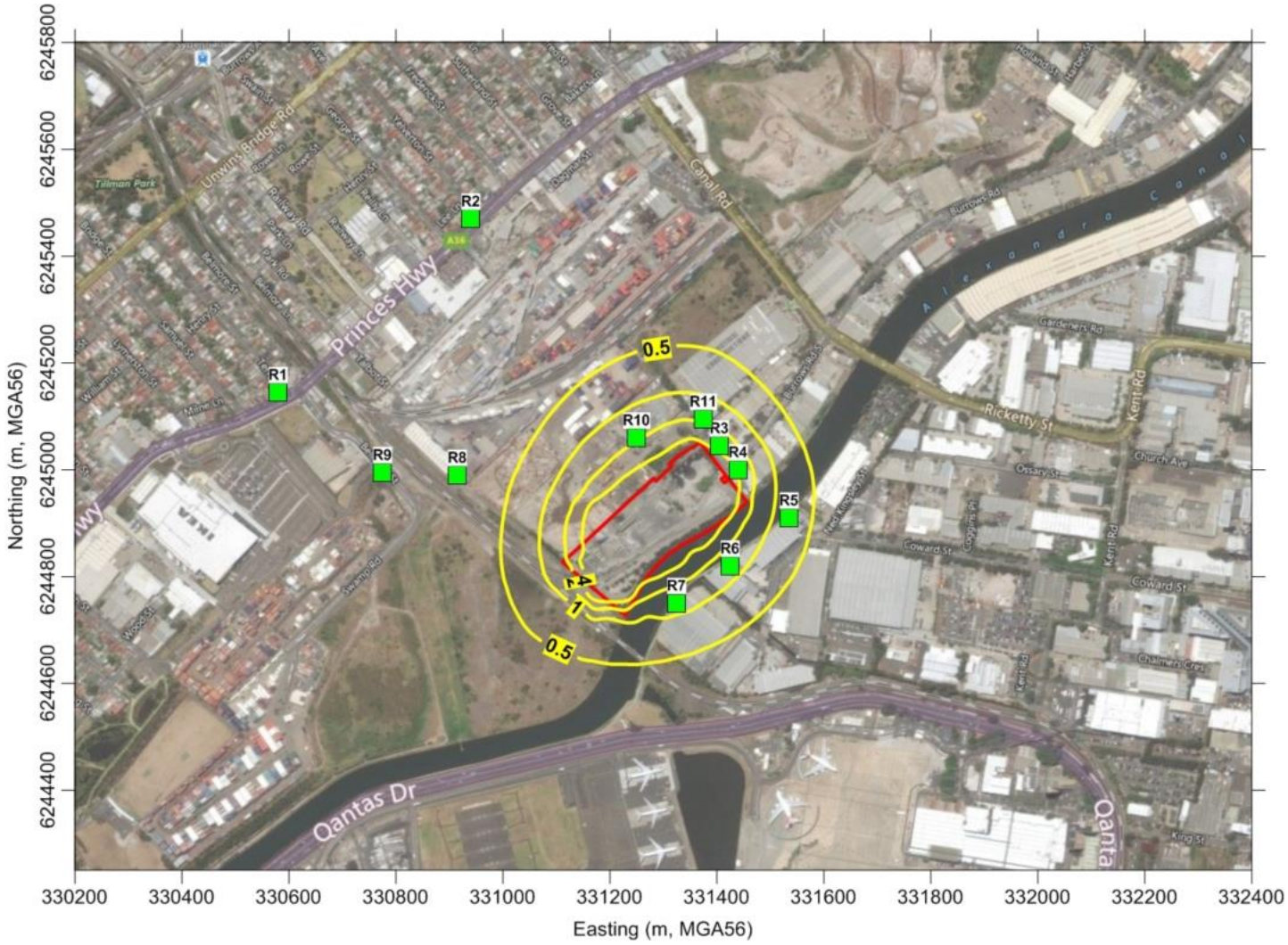


Figure A3.12 Predicted Incremental Annual Average Dust Deposition Levels (g/m^2/month) – Future

Appendix G

Traffic assessment

Boral St Peters
Concrete batching plant and quarry materials handling facility

Traffic assessment

Prepared for Boral Resources (NSW) Pty Limited | July 2016



Traffic assessment

Modification of development consent

Prepared for Boral Resources (NSW) Pty Limited | 21 July 2016

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Traffic assessment

Final

Report J15100RPT | Prepared for Boral Resources (NSW) Pty Limited | 21 July 2016

Prepared by	**Tim Brooker**	Approved by	**Brett McLennan**
Position	Senior Transport Planner	Position	Director
Signature		Signature	
Date	21 July 2016	Date	21 July 2016

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1 Introduction

Boral Resources (NSW) Pty Ltd (Boral) owns and operates a concrete batching plant (CBP) and construction materials handling facility (the handling facility) at 25 Burrows Road South, St Peters (the site). The site location and the surrounding regional road network are shown in Figure 1.1.

The site receives bulk construction materials (aggregate, sand and cement) predominantly by rail from Boral's Peppertree and Dunmore quarries and Berrima Cement Works. All concrete and construction materials are despatched from the site by truck.

Production and throughput is currently regulated by a condition of consent restricting total daily vehicle movements (light and heavy vehicles) which dates from the time when the site operated with the CBP and materials handling facility as well as an asphalt plant.

A modification to the site's development consent is proposed. It is largely an administrative modification of the development consent under section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to simplify it (ie remove complexity) and remove irrelevant conditions. In addition, the application seeks to set production and throughput limits for the CBP and the handling facility and remove the condition restricting daily vehicle movements. The production limit sought for the CBP will result in a 10% increase in the combined production rates of the CBP and asphalt plant described in the original environmental impact statement (EIS) that accompanied the DA for the site in 1996 (noting that the asphalt plant no longer operates). This application is referred to as the administrative modification (or the modification).

This traffic impact assessment has been prepared in accordance with the Roads and Traffic Authority (RTA), now Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments* (RTA 2002), to assess the impact of the modification on the surrounding road network.



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Site Location

Boral St Peters
Concrete batching plant and materials handling facility
Traffic Impact Assessment
Figure 1.1

2 Existing conditions

2.1 Site location and access

The site is located approximately 7 kilometres (km) south-west of the Sydney CBD. The site access is via Burrows Road South, approximately 300 metres (m) south of the intersection with Canal Road and Ricketty Street. The Princes Highway is approximately 570 m further to the west via Canal Road, from the intersection with Burrows Road South and Ricketty Street.

The site's location in relation to the surrounding road networks is shown on Figure 2.1. Additional site plans showing the layout of the site and corresponding internal traffic circulation paths are shown in Appendix A.

The current speed limit on Burrows Road South is 50 kilometres per hour (km/hr). On the external major roads in the locality, Canal Road, Ricketty Street and the Princes Highway, the speed limit is higher (60 km/hr). The currently approved B double access routes in the Burrows Road area of St Peters are shown in Figure 2.2. Burrows Road South is identified by Roads and Maritime Services (RMS) as being potentially suitable for B Double truck access.

Views of Burrows Road South at the site frontage, in the vicinity of the two site access driveways are shown in Photographs 2.1 and 2.2. Additional views of Burrows Road South, north of the site, looking north and south and Canal Road west of Burrows Road, looking east and west towards Ricketty Street and The Princes Highway are shown in Photographs 2.3 to 2.6.

2.2 Road network

The majority of the site traffic travels to and from the site via Canal Road and the Princes Highway. The roads which are most likely to be used by site traffic locally are:

- Burrows Road South – a local industrial road, south of Canal Road, generally a wide two lane road, with parking permitted along both sides, except in the vicinity of the Canal Road intersection.
- Canal Road – a significant arterial road which connects to the Princes Highway, is between four to six lanes wide between the intersection with Burrows Road South (at Ricketty Street) and the intersection with the Princes Highway. Car parking is not permitted on either side of the road.
- Princes Highway – a significant arterial road, which is generally at least six lanes wide. The road has peak hourly tidal flow arrangements at the intersection with Canal Road, which change the direction of the central traffic lane on The Princes Highway, south of the intersection to maximise the peak hourly traffic capacity of the intersection.

2.3 Intersections

The two intersections which will be used by most of the site traffic, shown on Figure 2.1, are:

- Canal Road, Ricketty Street, Burrows Road and Burrows Road South; and
- Princes Highway, Canal Road and Mary Street.



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Site location plan

Boral St Peters Modification of Development Consent
Traffic Impact Assessment
Figure 2.1



RMS map of B double access routes near Burrows Road, St Peters

Boral St Peters Modification of Development Consent
Traffic Impact Assessment
Figure 2.2



Photograph 2.1 **Burrows Road South at the corner looking into the site (Driveway 1)**



Photograph 2.2 **Burrows Road South looking south-east at the site exit (Driveway 2)**



Photograph 2.3 **Burrows Road South looking south to the site entry**



Photograph 2.4 **Burrows Road South looking north from the site entry**



Photograph 2.5 Canal Road looking east at the Burrows Road/Burrows Road South/Ricketty Street intersection



Photograph 2.6 Canal Road looking west from the Burrows Road intersection

Based on the observed truck traffic distributions from the Canal Road, Ricketty Street, Burrows Road and Burrows Road South intersection, the largest proportion of the site truck traffic from the CBP and materials handling facility (approximately 40%) normally travels either south or west via Canal Road and The Princes Highway, when travelling to or from the site. Significant proportions also use the other major traffic routes in the locality which are Burrows Road north of Canal Road (30%) and Ricketty Street to the east (30%).

The site employee light vehicle car traffic and other visitors also use these routes, but have a slightly higher proportion (approximately 50%) travelling via the Canal Road and Princes Highway routes.

The existing peak hourly traffic volumes of the existing major road intersections are assessed in Section 2.5, based on the existing peak hourly traffic volumes which are summarised in Section 2.4.

2.4 Traffic volumes

The existing traffic volumes using the road network in the locality of Burrows Road at St Peters were determined by peak hourly traffic surveys at the two main intersections, Figure 2.1, which are at Canal Road, Ricketty Street, Burrows Road and Burrows Road South, in October 2015 and at Princes Highway, Canal Road and Mary Street in March 2016.

In addition, the site peak hourly traffic volumes at the two driveway access points to Burrows Road South were also surveyed in October 2015, to determine the current site peak hourly traffic volumes, for car and truck traffic.

The full intersection traffic survey details are shown in Appendix B and the site traffic survey results are included in Appendix C. The hourly traffic volumes for the local road network are summarised in Table 2.1, including the estimated daily traffic volumes and heavy vehicle traffic proportions.

Table 2.1 Summary of existing traffic volumes from intersection traffic surveys

Road	Intersection survey location	Morning peak hour volume	Afternoon peak hour volume	Estimated daily traffic*	Average week day heavy vehicles*	% heavy vehicles
Burrows Road South	South of Canal Road	270	274	3,300	1,000	30.3
Canal Road	West of Ricketty Street	2,635	2,490	30,800	2,100	6.8
Ricketty Street	East of Canal Road	2,959	2,789	34,500	2,300	6.7
Burrows Road	North of Canal Road	706	751	8,700	1,300	14.9
Canal Road	East of Princes Highway	2,863	2,636	33,000	1,500	4.5
Princes Highway	South of Canal Road	4,294	4,530	52,900	2,200	4.2
Princes Highway	North of Canal Road	2,111	2,704	28,900	800	2.8
Mary Street	West of Princes Highway	486	552	6,200	0	0.0

Notes: **Average daily traffic is estimated as 12 times the average peak hourly traffic for all roads. Daily heavy vehicle numbers and their % have been extrapolated from the am and pm peak hourly heavy vehicle traffic proportions.*

The proportion of heavy vehicles using Burrows Road South between the site and Canal Road is approximately 30% of all traffic. This high proportion is a reflection of the industrial nature of land uses in the area which primarily generate heavy vehicle traffic.

On the major traffic routes in the locality (such as Canal Road, Ricketty Street and the Princes Highway) the surveyed proportions of heavy vehicles are generally within the normal range for major roads at

between 4% to 5% on the Princes Highway south of Canal Road, approximately 6% to 7% on Canal Road and Ricketty Street near Burrows Road, but relatively low on the Princes Highway north of Canal Road (2.8%) and very low (effectively 0%) on Mary Street, west of the Princes Highway, where there is a load limit restricting heavy vehicle access.

2.5 Intersection performance

The existing morning and afternoon peak hourly traffic operations and the levels of service at the two major road intersections have been determined using the SIDRA intersection traffic model. The SIDRA intersection program measures the intersection capacity and performance by calculating parameters such as average vehicle delay, maximum queue length, degree of saturation and level of service, based on the RTA/RMS Guide to traffic generating developments standards (Roads and Traffic Authority, 2002) which were developed from the international Highway Capacity Manual standards.

The existing intersection levels of service (LoS) for the morning and afternoon peak hour periods have been measured according to RMS defined ranges (Table 2.2) which range from A (best) to F (worst).

Table 2.2 LoS definitions

Description	LoS	Average vehicle delay (sec)
Very good	A	<14.5
Good	B	14.5 to ≤28.5
Satisfactory	C	28.5 to ≤42.5
Near capacity	D	42.5 to ≤56.5
At capacity	E	56.5 to ≤70.5
Over capacity	F	≥70.5

The SIDRA intersection results for the two peak hours analysed are provided in Appendix D and summarised in Table 2.3.

Table 2.3 Existing SIDRA intersection traffic operations summary

Intersection	Peak hour	Traffic demand flow (vehicles)[1]	Average delay (seconds)	Level of service (LoS)	Degree of saturation	Maximum queue length (m)
Canal Road, Ricketty Street, Burrows Road and Burrows Road south	7.30 to 8.30 am	3,458	48.2	D	1.000	407 (Canal Rd)
	3.15 to 4.15 pm	3,318	41.6	C	1.000	344 (Ricketty St)
Princes Highway, Canal Road and Mary Street	7.30 to 8.30 am	5,134	51.2	D	1.000	610 (Princes Highway northbound)
	3.45 to 4.45 pm	5,433	47.3	D	0.937	295 (Princes Highway southbound)

Note 1: The SIDRA intersection program automatically adds 5% to all surveyed intersection traffic volumes as a contingency measure

The peak hour traffic signal operations at both intersections are currently satisfactory, but have near capacity peak hour traffic volumes. The average intersection delays of between 42 and 52 seconds per vehicle correspond to LoS C or D.

The highest peak hour traffic queues occur in the directions of the main peak hourly traffic flows at each intersection which are:

- on Canal Road in the east bound direction (407 m) during the morning peak and on Ricketty Street in the west bound direction (344 m) in the afternoon commuter traffic peak; and
- on the Princes Highway in the northbound direction (610 m) and travelling southbound (295 m) during the morning and afternoon commuter peak traffic periods, respectively.

2.6 Existing site traffic and parking

The site's peak hourly traffic movements for the morning and afternoon commuter peak traffic periods for the locality were recorded during the daytime site traffic survey on Thursday 16 October 2015. The following peak hourly traffic volumes were recorded for the site for the relevant morning and afternoon commuter peak hourly traffic periods:

- morning commuter traffic peak hour, 7.30 to 8.30 am – 57 hourly traffic movements (5 cars in, 5 cars out, 15 trucks in, 32 trucks out); and
- afternoon commuter traffic peak hour, 3.15 to 4.15 pm – 42 hourly traffic movements (0 cars in, 4 cars out, 22 trucks in, 16 trucks out).

The heavy vehicle traffic distributions for the site are generally:

- approximately 40% travelling south and west via Canal Road and The Princes Highway, south of Canal Road;
- approximately 30% travelling east via Ricketty Street east of Canal Road, and
- approximately 30% travelling north via Burrows Road north of Canal Road.

There are two existing car parking areas for the site employees and visitors; a car park for the CBP in the southern most corner adjacent to the CBP with capacity for 40 cars, shown in Photograph 2.6, and a smaller car park for the materials handling facility near the Burrows Road South exit which has capacity for 27 cars.

The two site car parks currently have adequate capacity for the combined site employee and visitor car parking demand for the combined site operations. In October 2015, the combined occupancy of both car parks was 52 vehicles, which represented 78% occupancy for the combined site car parking capacity of 67 cars.



Photograph 2.7 Existing CBP site car park occupancy in October 2015

2.7 Public transport

The site is located over 1 km walking distance from the nearest railway station at Sydenham. Public bus services via Canal Road and Ricketty Street in the St Peters area are provided by Sydney Buses route 418 which is a cross regional service operating from Bondi Junction to Burwood. There are bus stops on the route 418 service located on Canal Road and Ricketty Street near the intersection with Burrows Road South. These bus stops are within approximately 400 m walking distance from the site.

The bus route 418 journey times from St Peters are approximately 40 minutes each way to Bondi Junction Rail Station and 45 minutes each way to Burwood railway station.

The route 418 bus service operates with between 38 to 39 daily bus trips in each direction, which provides an approximate half hourly service through the major part of the day on weekdays, with some additional weekday peak hourly services in both directions between 7-9 am and 3-6 pm.

2.8 Pedestrian and cycling access

There are paved footpaths provides on both sides of the road along both Burrows Road South and Canal Road in the vicinity of the site, which are shown in Photographs 2.3 to 2.5.

Pedestrian and cyclist access is generally feasible to and from the CBP and handling facility site via these roads. Cyclists would likely travel via the roadway along Burrows Road South, but would probably travel via the footpaths along Canal Road, due to the significantly busier car and truck traffic volumes on Canal Road (see Table 2.1).

2.9 Traffic safety

Traffic safety on the major roads in urban areas, where most intersections are controlled by traffic signals, is generally good, in particular where the right turning traffic is controlled by right turn traffic signal arrows and does not need to make filter turns through an opposing traffic stream.

This is generally the case for the right turn access at the two intersections analysed, at Canal Road/Princes Highway and at Canal Road/Ricketty Street/Burrows Road/Burrows Road South for the turning traffic movements which are used by the Boral site traffic.

Also, the major road approaches at these two intersections are generally straight and reasonably level, which provides excellent sight lines for the approaching traffic to proceed through or stop safely at the intersection.

3 The modification

3.1 Site layout

The site has two driveways to Burrows Road South; the main driveway (Driveway 1) located in the middle of the site's boundary with Burrows Road South, and a second driveway (Driveway 2) located on the north-western boundary. The original layout of the site has been modified a number of times since the original consent to improve overall operation and efficiency and to account for the demolition of the asphalt plant. There are no proposed changes to site access and circulation for this modification.

The internal site layout and traffic circulation are shown on Figure 3.1. Key truck access and egress routes are shown for the materials handling facility, sand and aggregate delivery trucks, the fly ash tanker deliveries and the concrete agitator trucks travelling to and from their respective cleaning and loading points within the site. A site survey plan showing additional details of the site is attached as Appendix A.

The truck loading areas within the site have been designed to current industrial site access standards, and comply with the current requirements of AS 2890.2 for the design of industrial site vehicle access movements for heavy vehicle traffic. Truck loading operations for the CBP and the materials handling facility are shown in Photograph 3.1 and Photograph 3.2.

The site has two car parking areas currently. The CBP operations car park is located in the southern corner of the site adjacent to the Alexandra Canal, and has a sealed pavement with line markings. A separate sealed car park and office for the handling facility is located near Burrows Road South, between the two site driveways.

3.1.1 Traffic generation

i Heavy vehicle traffic

A substantial proportion of bulk construction materials are transported to the site (both CBP and handling facility) by rail, with some transport by road. All concrete and bulk materials despatched from the site are transported by road. The total site daily truck traffic is approximately 600 daily vehicle movements from both the CBP operations and the handling facility.

The current annual throughput of bulk construction materials (sand and aggregate) used for concrete production at the CBP is approximately 465,000 tonnes (t) (excluding cement and admixtures). This is summarised in Table 1.1.

Table 3.1 Bulk construction material requirements for CBP production

Material received	Annual quantity
Aggregate	262,000 t
Sand	203,000 t
Cement/fly ash	118,000 t
Admixtures	400,000 litres (L)

The CBP produces approximately 254,200 cubic metres (m^3) of concrete per annum currently. This production corresponds to the combined approved production for cement concrete and asphalt concrete at the site (the latter is no longer produced).



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Site Layout

Boral St Peters
Modification of development consent
Traffic Impact Assessment
Figure 3.1



Photograph 3.1 **Trucks loading at the CBP loading tower and slump stand area**



Photograph 3.2 **Trucks loading at the materials handling facility storage area**

Independent of the CBP operations, a further 759,000 t of sand and aggregate are currently received by rail and road each year at the handling facility and transported by road to Boral sites and other customers within the Sydney Region. This corresponds to approximately 70 daily truck loads (140 daily truck movements) on an average day and a maximum of 110 daily truck loads (220 movements). Volumes of bulk construction materials transported to and from the handling facility would not change with the modification.

ii Light vehicles

The total site car traffic for the workforce and site visitors is approximately 150 daily vehicle movements. This car traffic is not anticipated to increase with the proposal. This traffic is also currently uniformly geographically distributed between the potential traffic approach routes, with equal proportions travelling from the north, east, west and south of St Peters.

This traffic is already included in the existing site generated daily and peak hourly traffic volumes on the surrounding road network and will not change with the proposal.

3.2 Increase in production of CBP

The CBP produces an estimated 254,200 m^3 of concrete per annum. This production corresponds to the combined approved production for concrete and asphalt at the site (the latter is no longer produced). A production increase of approximately 10% is sought, to enable the production of 280,000 m^3 of concrete per annum. The increase would not necessitate any modifications/alterations to the existing CBP.

The additional 25,400 m^3 of concrete produced per annum would not result in any additional road transport of bulk construction materials to the site; additional materials would be received by either rail, or transferred to the CBP internally from the handling facility.

There would be approximately 20 additional daily concrete agitator truck deliveries generated by the proposed CBP production increase using Burrows Road South and the major connecting roads and a small daily increase in the number of cement/fly ash and admixtures truck deliveries to the CBP which is also considered in this traffic assessment.

3.3 Haulage routes

The primary haulage route for the site concrete (agitator) truck deliveries and fly ash tanker deliveries is via Burrows Road South, north of the site, continuing to Canal Road, from where this traffic may travel to and from the west via Canal Road and south via the Princes Highway, north via Burrows Road or east via Ricketty Street. Trucks from the site would not use Mary Street, west of the Princes Highway due to the load limit restrictions on this route.

3.4 Site car and truck parking

On-site parking will continue to be provided for the site based agitator truck fleet, site employees and occasional site visitors.

The current car parking provision at the site is more than adequate for the project, with approximately 15 vacant car parking spaces observed at the two site car parks in October 2015. The concrete agitator truck fleet is generally be parked at the site during non-operational hours, where approximately 30 trucks are parked each evening and night time.

The maximum number of site visitor cars requiring parking at the site would be typically low (a maximum of two or three cars at any one time) and this parking is typically accommodated within either of the two site employee/visitor car parking area at all times.

It is normally accepted for this type of industrial development that on site car and truck parking should be provided for all the actual site car and truck parking demand, which is the case for the project.

3.5 Predicted traffic generation and distribution

Daily traffic generation for site truck traffic has been calculated in Table 3.1 for the existing site operations associated with annual concrete production at the CBP of 254,000 m^3, and the proposed increase in concrete production at the CBP to 280,000 m^3 per annum. The truck traffic generated by the materials handling facility is also included as part of the total daily site traffic generation estimate.

Table 3.2 Current and proposed daily site traffic generation (heavy vehicles)

Type of material	Current quantity	Daily truck loads	Proposed quantity	Daily truck loads
CBP				
Product concrete (despatched by agitator trucks)	254,200 m^3 (635,000 t)	165 average (203 maximum)	280,000 m^3 (700,000 t)	182 average (224 maximum)
Cement powder tanker deliveries	118,000 t	6 average (12 maximum)	130,000 t	7 average (14 maximum)
Liquid admixtures	400,000 (L)	0.2 average (1 maximum)	560,000 (L)	0.2 average (1 maximum)
Handling facility				
Bulk construction materials (total quantity is delivered by a combination of road and rail)	759,000 t	70 average (110 maximum)	759,000 t (no change)	70 average (110 maximum)
Total daily truck loads		**241.2 average (326 maximum)**		**259.2 average (349 maximum)**

Notes: Site traffic information provided by Boral 2 May 2016

The summary of the existing and proposed site daily truck movements in Table 3.1 indicates that the proposed 10% increase in the CBP production will result in an approximate 7% increase in the overall site daily truck movements.

When considering the current site peak hourly truck traffic movements which were reported in Section 2.5, the additional 7% truck traffic increase from the CBP would typically generate three additional peak hourly truck movements during the morning commuter traffic peak hour (7.30 to 8.30 am) and three additional peak hourly truck movements during the normal afternoon commuter traffic peak hour (3.15 to 4.15 pm) on the roads in the locality.

There would typically be three additional trucks per hour travelling outbound from the site during the morning peak hour and three additional trucks per hour travelling inbound to the site during the afternoon peak hour, from the increased site concrete production. There would be no change in the site employee or visitor car traffic during these traffic peak hours.

4 Traffic impact assessment

4.1 External traffic impact at intersections

Road network impacts of the additional traffic associated with the increased CBP production under the modification have been assessed at the following two intersections:

- Canal Road, Ricketty Street, Burrows Road and Burrows Road South; and
- Princes Highway, Canal Road and Mary Street.

The future traffic impacts are assessed for the morning and afternoon peak hour traffic periods for the surrounding commuter traffic.

The detailed SIDRA intersection analysis results are included in Appendix D and a summary of the results for each intersection is provided in Table 4.1 and Table 4.2.

Table 4.1 Traffic operations at Canal Road/Ricketty Street/ Burrows Road and Burrows Road South intersection

Situation	Peak hour	Traffic demand flow (vehicles)[1]	Average delay (seconds)	Level of service (LoS)	Degree of saturation	Maximum queue length (m)
Existing	7.30 to 8.30 am	3,458	48.2	D	1.000	407 (Canal Rd)
	3.15 to 4.15 pm	3,318	41.6	C	1.000	344 (Ricketty St)
Future	7.30 to 8.30 am	3,461	48.5	D	1.000	407 (Canal Rd)
	3.15 to 4.15 pm	3,321	41.7	C	1.000	344 (Ricketty St)

Note 1: The SIDRA intersection program automatically adds 5% to all surveyed intersection traffic volumes as a contingency measure

Table 4.2 Traffic operations at Princes Highway/Canal Road/Mary Street intersection

Situation	Peak hour	Traffic demand flow (vehicles)[1]	Average delay (seconds)	Level of service (LoS)	Degree of saturation	Maximum queue length (m)
Existing	7.30 to 8.30 am	5,134	51.2	D	1.000	610 (Princes Highway northbound)
	3.45 to 4.45 pm	5,433	47.3	D	0.937	295 (Princes Highway southbound)
Future	7.30 to 8.30 am	5,137	51.2	D	1.000	610 (Princes Highway northbound)
	3.45 to 4.45 pm	5,436	47.6	D	0.937	295 (Princes Highway southbound)

Note 1: The SIDRA intersection program automatically adds 5% to all surveyed intersection traffic volumes as a contingency measure

During the normal morning and afternoon commuter traffic peak periods at both the intersections, there will be only marginal changes to average traffic delays as a result of the additional traffic generated by the proposed production increase at the CBP.

There will be no changes to the intersection LoS which would remain at either 'C' or 'D' during all the future morning and afternoon peak hour traffic conditions assessed at the Canal Road, Ricketty Street, Burrows Road and Burrows Road South intersection and 'D' during all the future morning and afternoon peak hour traffic conditions assessed at the Princes Highway, Canal Road and Mary Street intersection.

At the Canal Road, Ricketty Street, Burrows Road and Burrows Road South intersection, the average intersection traffic delay will increase by between 0.1 and 0.3 seconds per vehicle with the additional project traffic (three vehicle movements hourly through the intersection).

At the Princes Highway, Canal Road and Mary Street intersection, the average intersection traffic delay will increase by between 0.0 and 0.3 seconds per vehicle with the additional project traffic (one vehicle movements hourly through the intersection). Due to the future dispersal of the site traffic to different approach routes, the actual project traffic increase may only be one vehicle movement hourly through the intersection. However, to be conservative, three vehicle movements hourly has been assumed.

There will be no measurable changes to the maximum traffic queue lengths at either intersection with the future CBP site traffic during either of the peak hourly traffic periods.

4.2 External traffic impacts on local roads

The predicted daily truck traffic generation is summarised in Table 3.1 for both an average day and a maximum operating day for the combined CBP and materials handling facility. The proposed CBP production increase of approximately 10% would generate the following additional daily truck traffic movements at the site:

- on an average production day, an additional 18 daily truck loads (36 daily truck movements); and
- on a maximum production day, an additional 23 daily truck loads (46 daily truck movements).

The effect of these daily traffic increases on a maximum production day, for the additional daily truck traffic movements distributed via Burrows Road South to Canal Road and other surrounding roads is presented in Table 4.3 in relation to the existing locality traffic volumes which were determined from the intersection traffic surveys in October 2015 and March 2016. The percentage daily traffic increases to each route, for a maximum production day in the future at the CBP facility, are also presented in Table 4.3.

Table 4.3 Effect of the additional CBP generated daily truck movements on the road network

Road	Survey location	Existing average weekday traffic*	Existing average weekday heavy vehicles*	Additional future CBP generated daily heavy vehicle movements (on a maximum production day)	% Daily traffic increase
Burrows Road South	South of Canal Road	3,300	1,000	46	1.39
Canal Road	West of Ricketty Street	30,800	2,100	18	0.06
Ricketty Street	East of Canal Road	34,500	2,300	14	0.04
Burrows Road	North of Canal Road	8,700	1,300	14	0.16
Canal Road	East of Princes Highway	33,000	1,500	14	0.04
Princes Highway	South of Canal Road	52,900	2,200	14	0.03
Princes Highway	North of Canal Road	28,900	800	0	0
Mary Street	West of Princes Highway	6,200	0	0	0

*Notes: *Existing daily vehicle numbers have been determined from the am and pm peak period heavy vehicle traffic proportions.*

The additional daily truck traffic movements would be proportionately greatest on the section of Burrows Road South between the site entry and exit driveways and the intersection where Canal Road meets Ricketty Street, Burrows Road and Burrows Road South.

The future CBP site generated daily traffic increases on the relevant section of Burrows Road South would be an increase of approximately 1.4%. This section of Burrows Road South has a relatively high proportion of truck traffic (approximately 30% of all traffic) and the effect of the additional CBP generated truck traffic would generally not be noticeable on this route.

On the other traffic routes which are considered in Table 4.3, the future CBP production generated daily traffic increases would be minimal (less than 0.1% typically on any of the major road routes) and would have no effect on the existing traffic conditions or traffic delays on these routes.

4.3 Safety and traffic management

The future potential road safety related traffic impacts from the modification have primarily been considered for Burrows Road South between the site access driveways and at the intersection of Canal Road, Ricketty Street, Burrows Road and Burrows Road South.

The two existing site access driveways, which are shown in Photograph 2.1 and Photograph 2.2 are well constructed with heavy duty concrete pavements and are considered to have adequate width to accommodate all the proposed turning traffic movements by large trucks. The two driveways both have good visibility of the approaching traffic in both directions on Burrows Road South and the proposed additional truck traffic movements would have minimal effects on traffic safety at these driveways.

At the intersection of Canal Road, Ricketty Street, Burrows Road and Burrows Road South, the existing intersection visibility for left and right turning traffic from Burrows Road South is considered to be relatively good as both Burrows Road and Burrows Road South are straight and level at the intersection.

The left and right truck turning movements from the two major roads at the intersection (ie Canal Road and Ricketty Street) are controlled by the traffic signal phasing which has right turning arrows. No additional traffic safety improvements will be required at the intersection for the proposed additional CBP truck traffic movements.

4.4 Provision of car and truck parking

The current total provision of the site car parking (67 spaces) is considered to be more than adequate for the actual demand for this parking from the current site employees and visitor cars (52 cars were observed parked at the site in October 2015) which corresponds to 78% occupancy. There is no proposed increase in the site workforce and no additional car parking is therefore required.

All the site car parking space dimensions and surfacing has been designed to comply with the requirements of the Australian Standard AS 2890.1.

The existing site truck parking area has adequate capacity for the number of agitator trucks based at the site, which is approximately 30 vehicles.

4.5 Pedestrian, cycling and public transport access

The current arrangement for public transport, pedestrian and cyclist access to and from Burrows Road South at St Peters, which are summarised in Sections 2.6 and 2.7, show this access is generally adequate for the current site access requirements.

The Boral St Peters CBP and handling facility sites provide adequate on-site car and truck parking for all the anticipated travel demand by either site employees or visitors.

The anticipated travel demand for persons walking, cycling or travelling by public transport to and from the site will be minimal and no improvement to the locality public transport, pedestrian and cyclist access is necessary.

5 Summary and conclusions

This report has assessed the traffic impacts of the administrative modification proposed at the site, which is located on Burrows Road South, approximately 300 m south of the major road access intersection at Canal Road, Ricketty Street and Burrows Road. The modification includes a minor increase to the production from the CBP.

The CBP site is co-located with the handling facility, which receives bulk construction materials by road and rail, and supplies sand and aggregate to the CBP for concrete production as well as product by road to Boral sites and other customers in the Sydney region, independently of the CBP operations.

The throughput of the handling facility would not change with the proposed CBP production increase. The proposed CBP production increase is from 254,000 m^3 per annum to 280,000 m^3 which corresponds to a future average daily production of approximately 182 loads of concrete, with approximately 224 loads on a maximum production day. The additional daily truck loads and truck movements which would be generated correspond to an additional 18-23 daily truck loads (36- 46 daily truck movements), which would be distributed via Burrows Road South to Canal Road and other routes on the local major road network.

This additional daily traffic corresponds to three additional peak hourly truck movements during the normal morning commuter traffic peak hour (7.30 to 8.30 am) and three additional peak hourly truck movements during the normal afternoon commuter traffic peak hour (3.15 to 4.15 pm). Typically there would be three additional trucks per hour travelling outbound from the site during the morning peak hour and three additional trucks per hour travelling inbound to the site during the afternoon peak hour. There would be no change in the site employee or visitor car traffic during these traffic peak hours.

The external road network impacts of this additional traffic have been assessed at the intersections of:

- Canal Road, Ricketty Street, Burrows Road and Burrows Road South; and
- Princes Highway, Canal Road and Mary Street

The SIDRA intersection analysis shows that there would be only minimal changes to the existing intersection peak hour average traffic delays (of between 0.0 to 0.3 seconds per vehicle at each intersection), with no changes to the future intersection maximum traffic queue lengths or levels of service, which would remain at LoS C/D and LoS D respectively.

Average daily traffic movements would increase on Burrows Road South by 1.4% on a maximum production day, which would have minimal effect to the existing traffic volumes and proportions of heavy vehicle traffic using the route.

Elsewhere within the St Peters locality, on other routes such as Canal Road, Ricketty Street, Princes Highway south of Canal Road and Burrows Road, north of Canal Road, the future average daily traffic increases from the site traffic would be less than 0.1%, typically. These traffic increases would not generally be noticeable on these routes and would not result in any changes to the existing traffic flow conditions or traffic safety on the routes.

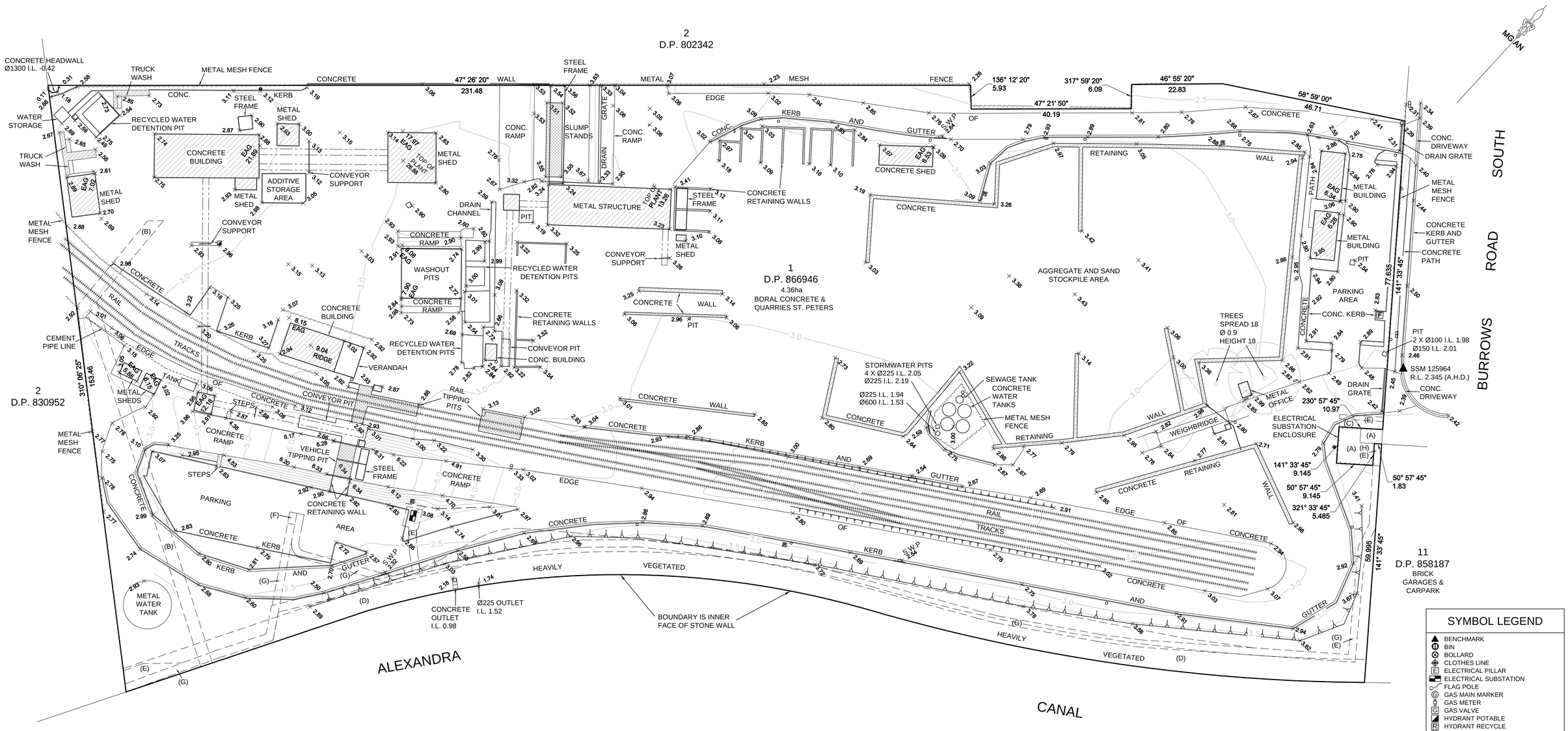
The current and future proposed on site car and truck parking areas and the site's accessibility for walking, cycling and public transport users have also been reviewed in this assessment and found to be satisfactory for the anticipated levels of car and truck parking usage and travel by non car-based travel modes.

References

Roads and Traffic Authority (2002) *Guide to Traffic Generating Developments*.

Appendix A

Site layout plan



IMPORTANT NOTES

1 THE LEVELS AND SURVEY DETAIL SHOWN HEREON HAVE BEEN DETERMINED BY TRIGONOMETRICAL METHODS AND ARE WITHIN THE GENERALLY ACCEPTED ACCURACY FOR SUCH A SURVEY.

2 ANY UTILITIES SHOWN HEREON HAVE BEEN PREPARED FROM A COMBINATION OF FIELD SURVEY AND OFFICE CALCULATION. THE PLAN MAY NOT SHOW THE FULL EXTENT OF ABOVE GROUND STRUCTURES OR SUB SURFACE UTILITIES AND SHOULD NOT BE USED FOR LOCATING SUB SURFACE PIPES, CABLES, CONDUITS OR STRUCTURES. PRIOR TO ANY EXCAVATION OR CONSTRUCTION IT IS RECOMMENDED A FULL DIAL BEFORE YOU DIG SEARCH BE UNDERTAKEN BY CONTACTING DBYD ON PH. 1100 OR WWW.1100.COM.AU.

3 THE RELATIONSHIP OF IMPROVEMENTS TO PROPERTY BOUNDARIES IS DIAGRAMMATIC ONLY. IF ANY WORK IS PLANNED WHICH RELIES ON CRITICAL SETBACKS FROM ANY BOUNDARY IT IS IMPERATIVE THAT FURTHER SURVEY WORK BE CARRIED OUT TO DETERMINE PROPERTY BOUNDARIES. DO NOT RELY ON SCALED DIMENSIONS.

4 THE LOT DIMENSIONS SHOWN HEREON HAVE BEEN COMPILED FROM PLANS SUPPLIED BY LAND AND PROPERTY INFORMATION NSW.

5 THE SPREAD OF THE CROWN OF THE TREES SHOWN HEREON IS DIAGRAMMATIC ONLY BASED ON THE AVERAGE SPREAD OBSERVED ON SITE. IT IS RECOMMENDED THAT TREE SPREADS BE VERIFIED BY SITE INSPECTION SHOULD A DEVELOPMENT PROPOSAL BE AFFECTED BY TREES.

6 ALL LEVELS MUST BE REFERRED BACK TO THE BENCHMARK SSM 125964 R.L. 2.347 (A.H.D.)
THE ORIGIN OF THIS LEVEL IS S.C.I.M.S.

7 THE CONTOUR INTERVAL IN METRES IS 0.5

THE ABOVE NOTES ARE AN INTEGRAL PART OF THIS PLAN

(A) AUSGRID SUB-STATION SITE, LOT 1 D.P. 109101 & LOT 1 D.P. 339419
(B) DRAINAGE EASEMENT 3.05 WIDE - C588175
(C) EASEMENT FOR ELECTRICITY PURPOSES 0.915 WIDE - N242491
(D) EASEMENT FOR ACCESS 5.79 WIDE - C588175
(E) RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES 1.83, 2 & 4 WIDE & VARIABLE - AJ71566
(F) EASEMENT FOR ELECTRICITY PURPOSES 1.83, 0.425 & 0.075 WIDE - N242491
(G) EASEMENT FOR ELECTRICITY PURPOSES 1.83 WIDE - N242491
(H) EASEMENT FOR TRANSMISSION LINE - G226822

DIAL BEFORE YOU DIG www.1100.com.au

Scale 1:500 (A1) Scale 1:1000 (A3) 0 10 20 30 40 50 metres

SYMBOL LEGEND

- BENCHMARK
- BIN
- BOLLARD
- CLOTHES LINE
- ELECTRICAL PILLAR
- ELECTRICAL SUBSTATION
- FLAG POLE
- GAS MAIN MARKER
- GAS METER
- GAS VALVE
- HYDRANT POTABLE
- HYDRANT RECYCLE
- FIRE HYDRANT
- LIGHTPOLE
- PHONE BOX
- POWER POLE
- PVC RISER
- SEWER INSPECTION POINT
- SEWER MANHOLE
- SEWER VENT
- SEWER MAINTENANCE SHAFT
- SIGN
- STOP VALVE POTABLE
- STOP VALVE RECYCLE
- TELSTRA PILLAR
- TELSTRA PIT SINGLE
- TELSTRA PIT DOUBLE
- TRAFFIC LIGHTS
- TRAFFIC LIGHTS CONTROL BOX
- TREE STUMP
- WATER AIR VALVE
- WATER METER
- SUBSOIL FLUSHING POINT
- SURVEY MARK (CONC. BLOCK)
- SURVEY MARK (D.H. & W.)
- SURVEY MARK (G.I.P.)
- SURVEY MARK (PEG)
- SURVEY MARK (S.S.M. & P.M.)
- SURVEY MARK (TRAVERSE STATION)
- TOP OF GUTTER LEVEL
- RIDGE LEVEL
- FLOOR LEVEL
- CHIMNEY LEVEL
- PARAPET LEVEL
- TOP OF BATTER

No.	AMENDMENT DESCRIPTION	BY	DATE
B	AMEND SOME LABELS	C.P.	3/05/16
A	FIRST ISSUE	B.W.	5/04/16

mepstead & ASSOCIATES
REGISTERED SURVEYORS AND DEVELOPMENT CONSULTANTS
Sydney
10/4 Central Avenue, Thornleigh N.S.W. 2120
Phone 02 9875 4500 **Fax** 02 9875 4833
Postal
PO BOX 208, Pennant Hills N.S.W. 1715
Internet
mepstead@mepstead.com.au
www.mepstead.com.au

Designed:	Scale: 1:500	Principal: BORAL	Drg. No. 5444-DET1_B
Drawn: B.W.	Datum: A.H.D.	Project: PLAN OF DETAIL & LEVELS OVER LOT 1 IN D.P. 866946 KNOWN AS No. 25-27 BURROWS ROAD SOUTH, ST. PETERS.	Sheet No. 1 of 1 sheets
Checked: C.P.	Date: 5/04/16		Our Ref: 5444
L.G.A: MARRICKVILLE	A1		

Appendix B

Intersection traffic counts

R.O.A.R. DATA

Reliable, Original & Authentic Results

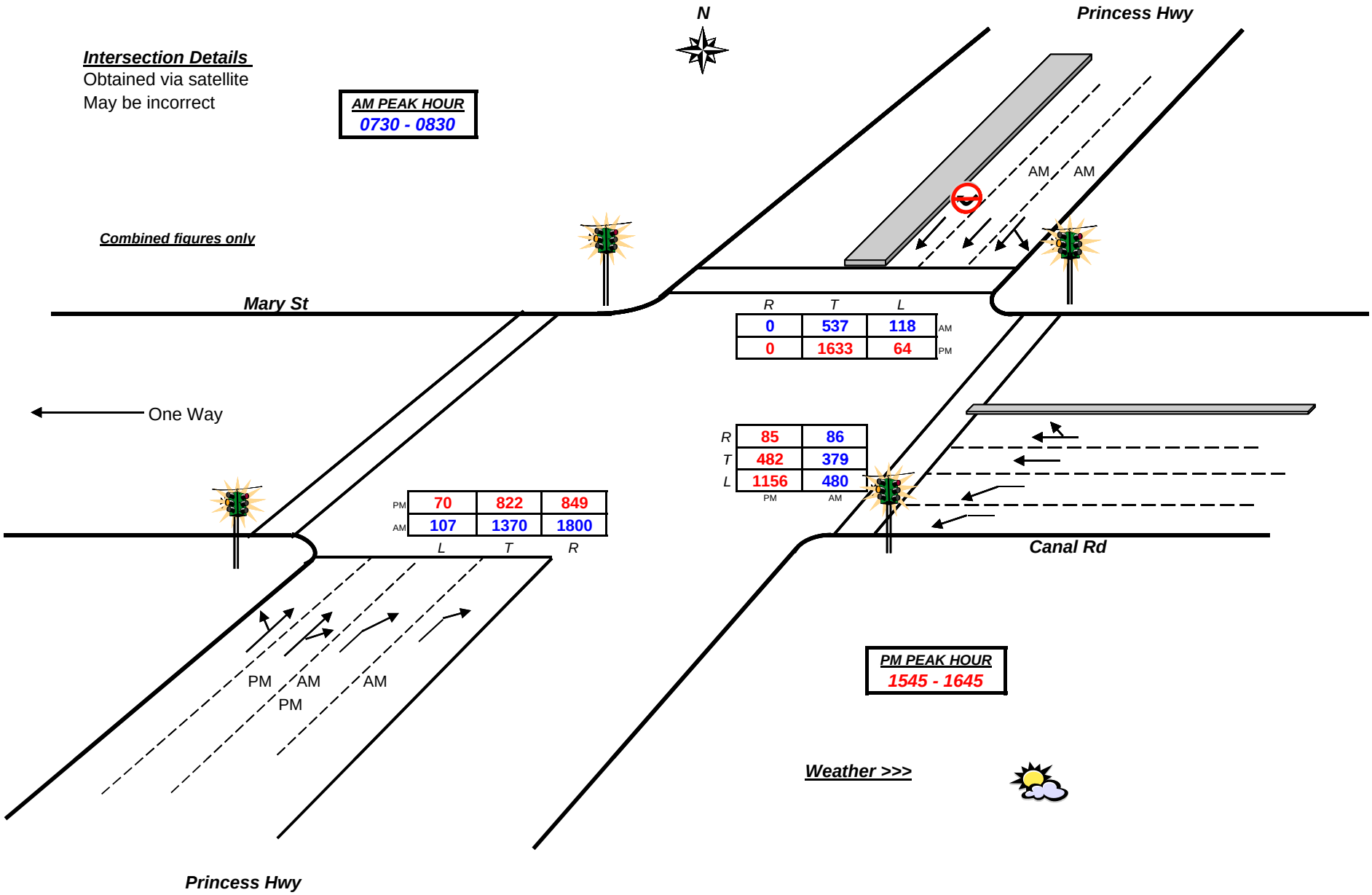
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5963 ST PETERS Canal Rd
Day/Date : Thursday 10th March 2016

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0730 - 0830

Combined figures only



PM PEAK HOUR
1545 - 1645

Weather >>>

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5963 ST PETERS Canal Rd
Day/Date : Thursday 10th March 2016

Lights

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0615	15	74	0	0	0	0	10	303	358	58	51	12	**881**
0615 - 0630	14	87	0	0	0	0	23	277	426	58	80	13	**978**
0630 - 0645	21	100	0	0	0	0	32	253	397	70	75	28	**976**
0645 - 0700	23	120	0	0	0	0	18	228	407	76	86	29	**987**
0700 - 0715	27	131	0	0	0	0	13	214	322	54	87	15	**863**
0715 - 0730	15	106	0	0	0	0	19	256	396	84	115	18	**1009**
0730 - 0745	22	107	0	0	0	0	28	377	416	99	96	25	**1170**
0745 - 0800	36	141	0	0	0	0	30	349	449	114	79	17	**1215**
0800 - 0815	30	136	0	0	0	0	24	320	405	99	118	26	**1158**
0815 - 0830	28	120	0	0	0	0	25	288	477	70	86	14	**1108**
0830 - 0845	25	104	0	0	0	0	27	226	279	78	80	20	**839**
0845 - 0900	30	103	0	0	0	0	28	188	290	89	67	14	**809**
Period End	**286**	**1329**	**0**	**0**	**0**	**0**	**277**	**3279**	**4622**	**949**	**1020**	**231**	**11993**

Lights

Peak Time	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0700	73	381	0	0	0	0	83	1061	1588	262	292	82	**3822**
0615 - 0715	85	438	0	0	0	0	86	972	1552	258	328	85	**3804**
0630 - 0730	86	457	0	0	0	0	82	951	1522	284	363	90	**3835**
0645 - 0745	87	464	0	0	0	0	78	1075	1541	313	384	87	**4029**
0700 - 0800	100	485	0	0	0	0	90	1196	1583	351	377	75	**4257**
0715 - 0815	103	490	0	0	0	0	101	1302	1666	396	408	86	**4552**
0730 - 0830	116	504	0	0	0	0	107	1334	1747	382	379	82	**4651**
0745 - 0845	119	501	0	0	0	0	106	1183	1610	361	363	77	**4320**
0800 - 0900	113	463	0	0	0	0	104	1022	1451	336	351	74	**3914**
PEAK HOUR	**116**	**504**	**0**	**0**	**0**	**0**	**107**	**1334**	**1747**	**382**	**379**	**82**	**4651**

Heavies

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0615	1	3	0	0	0	0	0	13	11	8	0	1	**37**
0615 - 0630	0	2	0	0	0	0	0	9	10	11	0	1	**33**
0630 - 0645	0	5	0	0	0	0	0	8	12	15	0	0	**40**
0645 - 0700	0	9	0	0	0	0	0	9	14	21	0	2	**55**
0700 - 0715	0	5	0	0	0	0	0	13	10	39	0	2	**69**
0715 - 0730	0	4	0	0	0	0	0	13	11	31	0	3	**62**
0730 - 0745	1	4	0	0	0	0	0	8	9	29	0	0	**51**
0745 - 0800	1	11	0	0	0	0	0	9	13	26	0	0	**60**
0800 - 0815	0	9	0	0	0	0	0	10	20	20	0	2	**61**
0815 - 0830	0	9	0	0	0	0	0	9	11	23	0	2	**54**
0830 - 0845	0	5	0	0	0	0	0	12	11	13	0	2	**43**
0845 - 0900	1	5	0	0	0	0	0	9	12	23	0	1	**51**
Period End	**4**	**71**	**0**	**0**	**0**	**0**	**0**	**122**	**144**	**259**	**0**	**16**	**616**

Heavies

Peak Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0700	1	19	0	0	0	0	0	39	47	55	0	4	**165**
0615 - 0715	0	21	0	0	0	0	0	39	46	86	0	5	**197**
0630 - 0730	0	23	0	0	0	0	0	43	47	106	0	7	**226**
0645 - 0745	1	22	0	0	0	0	0	43	44	120	0	7	**237**
0700 - 0800	2	24	0	0	0	0	0	43	43	125	0	5	**242**
0715 - 0815	2	28	0	0	0	0	0	40	53	106	0	5	**234**
0730 - 0830	2	33	0	0	0	0	0	36	53	98	0	4	**226**
0745 - 0845	1	34	0	0	0	0	0	40	55	82	0	6	**218**
0800 - 0900	1	28	0	0	0	0	0	40	54	79	0	7	**209**
PEAK HOUR	**2**	**33**	**0**	**0**	**0**	**0**	**0**	**36**	**53**	**98**	**0**	**4**	**226**

Combined

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0615	16	77	0	0	0	0	10	316	369	66	51	13	**918**
0615 - 0630	14	89	0	0	0	0	23	286	436	69	80	14	**1011**
0630 - 0645	21	105	0	0	0	0	32	261	409	85	75	28	**1016**
0645 - 0700	23	129	0	0	0	0	18	237	421	97	86	31	**1042**
0700 - 0715	27	136	0	0	0	0	13	227	332	93	87	17	**932**
0715 - 0730	15	110	0	0	0	0	19	269	407	115	115	21	**1071**
0730 - 0745	23	111	0	0	0	0	28	385	425	128	96	25	**1221**
0745 - 0800	37	152	0	0	0	0	30	358	462	140	79	17	**1275**
0800 - 0815	30	145	0	0	0	0	24	330	425	119	118	28	**1219**
0815 - 0830	28	129	0	0	0	0	25	297	488	93	86	16	**1162**
0830 - 0845	25	109	0	0	0	0	27	238	290	91	80	22	**882**
0845 - 0900	31	108	0	0	0	0	28	197	302	112	67	15	**860**
Period End	**290**	**1400**	**0**	**0**	**0**	**0**	**277**	**3401**	**4766**	**1208**	**1020**	**247**	**12609**

Combined

Peak Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
0600 - 0700	74	400	0	0	0	0	83	1100	1635	317	292	86	**3987**
0615 - 0715	85	459	0	0	0	0	86	1011	1598	344	328	90	**4001**
0630 - 0730	86	480	0	0	0	0	82	994	1569	390	363	97	**4061**
0645 - 0745	88	486	0	0	0	0	78	1118	1585	433	384	94	**4266**
0700 - 0800	102	509	0	0	0	0	90	1239	1626	476	377	80	**4499**
0715 - 0815	105	518	0	0	0	0	101	1342	1719	502	408	91	**4786**
0730 - 0830	118	537	0	0	0	0	107	1370	1800	480	379	86	**4877**
0745 - 0845	120	535	0	0	0	0	106	1223	1665	443	363	83	**4538**
0800 - 0900	114	491	0	0	0	0	104	1062	1505	415	351	81	**4123**
PEAK HOUR	**118**	**537**	**0**	**0**	**0**	**0**	**107**	**1370**	**1800**	**480**	**379**	**86**	**4877**

R.O.A.R DATA

Reliable, Original & Authentic Results

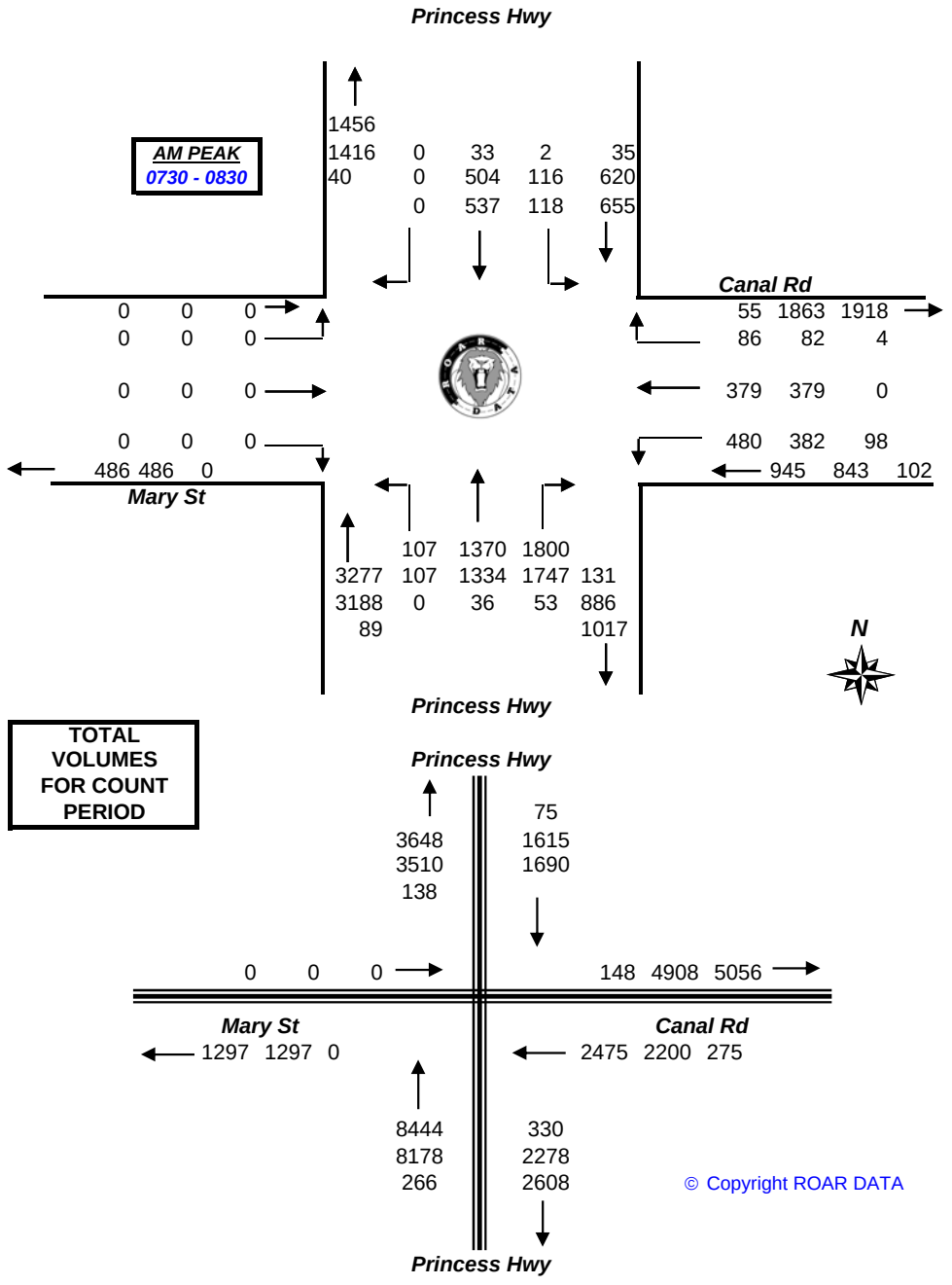
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5963 ST PETERS Canal Rd
Day/Date : Thursday 10th March 2016

Peds	NORTH	WEST	SOUTH	EAST	
	Princess Hwy	*Mary St*	*Princess Hwy*	*Canal Rd*	
Time Per	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**TOT**
0600 - 0615	2	2	0	0	**4**
0615 - 0630	1	0	0	0	**1**
0630 - 0645	0	0	0	1	**1**
0645 - 0700	0	2	0	2	**4**
0700 - 0715	3	2	0	3	**8**
0715 - 0730	1	2	0	0	**3**
0730 - 0745	7	2	0	4	**13**
0745 - 0800	3	2	0	4	**9**
0800 - 0815	2	1	0	2	**5**
0815 - 0830	8	1	0	4	**13**
0830 - 0845	9	1	0	2	**12**
0845 - 0900	2	1	0	7	**10**
Period End	**38**	**16**	**0**	**29**	**83**

Peds	NORTH	WEST	SOUTH	EAST	
	Princess Hwy	*Mary St*	*Princess Hwy*	*Canal Rd*	
Peak Per	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**TOT**
0600 - 0700	3	4	0	3	**10**
0615 - 0715	4	4	0	6	**14**
0630 - 0730	4	6	0	6	**16**
0645 - 0745	11	8	0	9	**28**
0700 - 0800	14	8	0	11	**33**
0715 - 0815	13	7	0	10	**30**
0730 - 0830	20	6	0	14	**40**
0745 - 0845	22	5	0	12	**39**
0800 - 0900	21	4	0	15	**40**

PEAK HR	**20**	**6**	**0**	**14**	**40**



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R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5963 ST PETERS Canal Rd
Day/Date : Thursday 10th March 2016

Lights

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1515	25	368	0	0	0	0	16	181	182	227	113	20	**1132**
1515 - 1530	25	316	0	0	0	0	24	174	183	287	151	33	**1193**
1530 - 1545	13	382	0	0	0	0	25	163	179	239	112	14	**1127**
1545 - 1600	19	393	0	0	0	0	14	170	210	289	132	17	**1244**
1600 - 1615	13	397	0	0	0	0	11	175	185	276	129	21	**1207**
1615 - 1630	14	406	0	0	0	0	25	246	234	262	110	20	**1317**
1630 - 1645	18	401	0	0	0	0	20	210	182	283	111	26	**1251**
1645 - 1700	14	450	0	0	0	0	13	205	193	242	91	21	**1229**
1700 - 1715	24	398	0	0	0	0	15	193	184	258	95	25	**1192**
1715 - 1730	19	462	0	0	0	0	24	226	179	323	102	19	**1354**
1730 - 1745	8	370	0	0	0	0	18	177	206	316	136	28	**1259**
1745 - 1800	8	389	0	0	0	0	24	229	178	205	119	18	**1170**
Period End	**200**	**4732**	**0**	**0**	**0**	**0**	**229**	**2349**	**2295**	**3207**	**1401**	**262**	**14675**

Lights

Peak Time	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1600	82	1459	0	0	0	0	79	688	754	1042	508	84	**4696**
1515 - 1615	70	1488	0	0	0	0	74	682	757	1091	524	85	**4771**
1530 - 1630	59	1578	0	0	0	0	75	754	808	1066	483	72	**4895**
1545 - 1645	64	1597	0	0	0	0	70	801	811	1110	482	84	**5019**
1600 - 1700	59	1654	0	0	0	0	69	836	794	1063	441	88	**5004**
1615 - 1715	70	1655	0	0	0	0	73	854	793	1045	407	92	**4989**
1630 - 1730	75	1711	0	0	0	0	72	834	738	1106	399	91	**5026**
1645 - 1745	65	1680	0	0	0	0	70	801	762	1139	424	93	**5034**
1700 - 1800	59	1619	0	0	0	0	81	825	747	1102	452	90	**4975**
PEAK HOUR	**64**	**1597**	**0**	**0**	**0**	**0**	**70**	**801**	**811**	**1110**	**482**	**84**	**5019**

Heavies

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1515	1	12	0	0	0	0	0	16	11	24	0	0	**64**
1515 - 1530	0	9	0	0	0	0	0	10	7	19	0	0	**45**
1530 - 1545	1	10	0	0	0	0	0	4	14	12	0	1	**42**
1545 - 1600	0	13	0	0	0	0	0	5	4	11	0	0	**33**
1600 - 1615	0	11	0	0	0	0	0	5	13	13	0	0	**42**
1615 - 1630	0	4	0	0	0	0	0	5	11	16	0	0	**36**
1630 - 1645	0	8	0	0	0	0	0	6	10	6	0	1	**31**
1645 - 1700	1	7	0	0	0	0	0	8	9	7	1	0	**33**
1700 - 1715	0	6	0	0	0	0	0	3	6	10	0	0	**25**
1715 - 1730	1	4	0	0	0	0	0	4	8	11	0	0	**28**
1730 - 1745	1	8	0	0	0	0	0	7	5	5	0	0	**26**
1745 - 1800	0	8	0	0	0	0	0	4	0	11	0	0	**23**
Period End	**5**	**100**	**0**	**0**	**0**	**0**	**0**	**77**	**98**	**145**	**1**	**2**	**428**

Heavies

Peak Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1600	2	44	0	0	0	0	0	35	36	66	0	1	**184**
1515 - 1615	1	43	0	0	0	0	0	24	38	55	0	1	**162**
1530 - 1630	1	38	0	0	0	0	0	19	42	52	0	1	**153**
1545 - 1645	0	36	0	0	0	0	0	21	38	46	0	1	**142**
1600 - 1700	1	30	0	0	0	0	0	24	43	42	1	1	**142**
1615 - 1715	1	25	0	0	0	0	0	22	36	39	1	1	**125**
1630 - 1730	2	25	0	0	0	0	0	21	33	34	1	1	**117**
1645 - 1745	3	25	0	0	0	0	0	22	28	33	1	0	**112**
1700 - 1800	2	26	0	0	0	0	0	18	19	37	0	0	**102**
PEAK HOUR	**0**	**36**	**0**	**0**	**0**	**0**	**0**	**21**	**38**	**46**	**0**	**1**	**142**

Combined

Time Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1515	26	380	0	0	0	0	16	197	193	251	113	20	**1196**
1515 - 1530	25	325	0	0	0	0	24	184	190	306	151	33	**1238**
1530 - 1545	14	392	0	0	0	0	25	167	193	251	112	15	**1169**
1545 - 1600	19	406	0	0	0	0	14	175	214	300	132	17	**1277**
1600 - 1615	13	408	0	0	0	0	11	180	198	289	129	21	**1249**
1615 - 1630	14	410	0	0	0	0	25	251	245	278	110	20	**1353**
1630 - 1645	18	409	0	0	0	0	20	216	192	289	111	27	**1282**
1645 - 1700	15	457	0	0	0	0	13	213	202	249	92	21	**1262**
1700 - 1715	24	404	0	0	0	0	15	196	190	268	95	25	**1217**
1715 - 1730	20	466	0	0	0	0	24	230	187	334	102	19	**1382**
1730 - 1745	9	378	0	0	0	0	18	184	211	321	136	28	**1285**
1745 - 1800	8	397	0	0	0	0	24	233	178	216	119	18	**1193**
Period End	**205**	**4832**	**0**	**0**	**0**	**0**	**229**	**2426**	**2393**	**3352**	**1402**	**264**	**15103**

Combined

Peak Per	NORTH Princess Hwy L	T	R	WEST Mary St L	T	R	SOUTH Princess Hwy L	T	R	EAST Canal Rd L	T	R	TOT
1500 - 1600	84	1503	0	0	0	0	79	723	790	1108	508	85	**4880**
1515 - 1615	71	1531	0	0	0	0	74	706	795	1146	524	86	**4933**
1530 - 1630	60	1616	0	0	0	0	75	773	850	1118	483	73	**5048**
1545 - 1645	64	1633	0	0	0	0	70	822	849	1156	482	85	**5161**
1600 - 1700	60	1684	0	0	0	0	69	860	837	1105	442	89	**5146**
1615 - 1715	71	1680	0	0	0	0	73	876	829	1084	408	93	**5114**
1630 - 1730	77	1736	0	0	0	0	72	855	771	1140	400	92	**5143**
1645 - 1745	68	1705	0	0	0	0	70	823	790	1172	425	93	**5146**
1700 - 1800	61	1645	0	0	0	0	81	843	766	1139	452	90	**5077**
PEAK HOUR	**64**	**1633**	**0**	**0**	**0**	**0**	**70**	**822**	**849**	**1156**	**482**	**85**	**5161**

R.O.A.R DATA

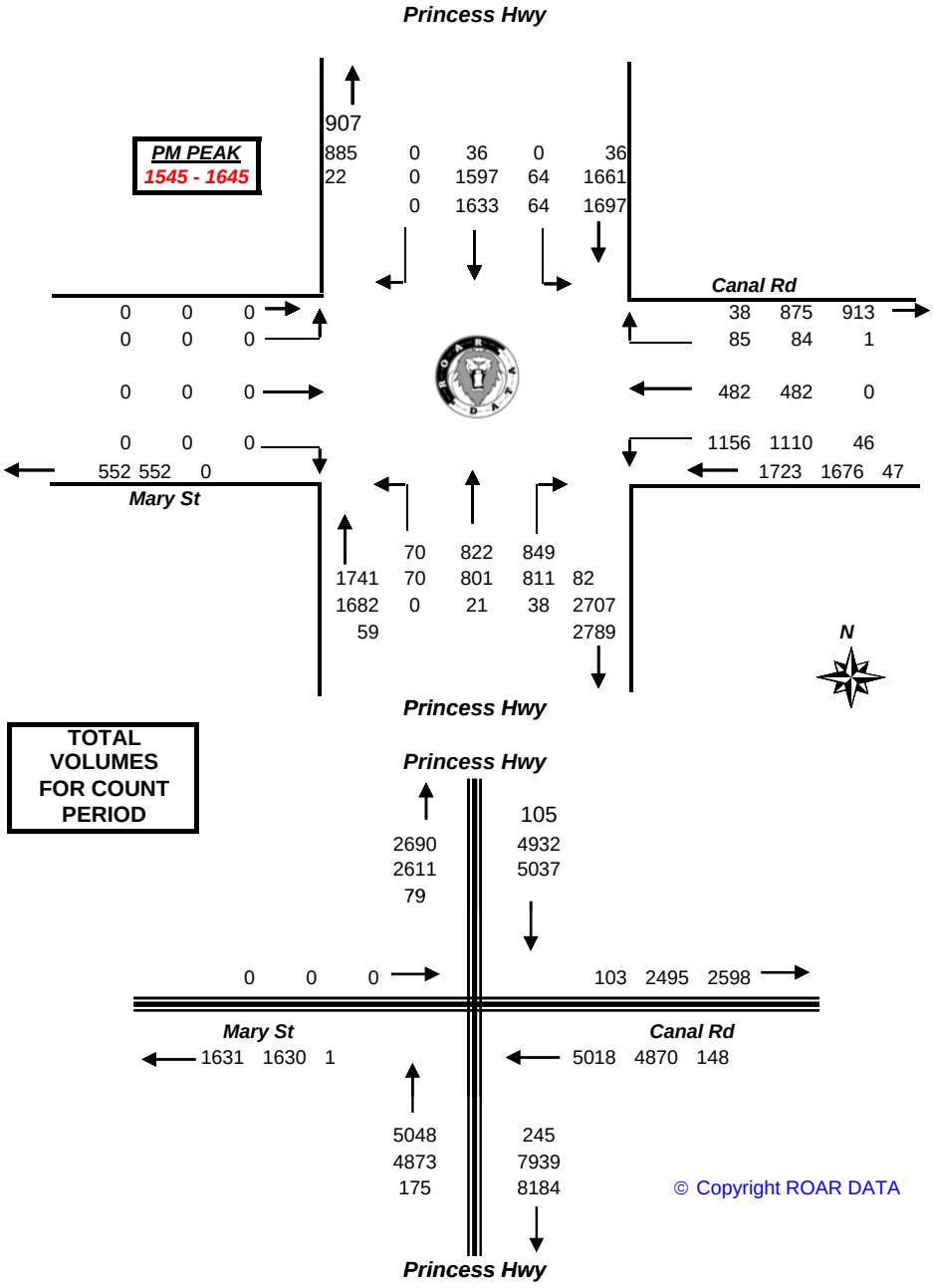
Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5963 ST PETERS Canal Rd
Day/Date : Thursday 10th March 2016

Peds	NORTH	WEST	SOUTH	EAST	
	Princess Hwy	*Mary St*	*Princess Hwy*	*Canal Rd*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1515	1	1	0	2	**4**
1515 - 1530	3	1	0	0	**4**
1530 - 1545	1	2	0	2	**5**
1545 - 1600	5	1	0	7	**13**
1600 - 1615	6	2	0	3	**11**
1615 - 1630	5	1	0	6	**12**
1630 - 1645	3	1	0	5	**9**
1645 - 1700	0	0	0	3	**3**
1700 - 1715	11	1	0	8	**20**
1715 - 1730	5	1	0	10	**16**
1730 - 1745	2	0	0	3	**5**
1745 - 1800	3	1	0	7	**11**
Period End	**45**	**12**	**0**	**56**	**113**

Peds	NORTH	WEST	SOUTH	EAST	
	Princess Hwy	*Mary St*	*Princess Hwy*	*Canal Rd*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1600	10	5	0	11	**26**
1515 - 1615	15	6	0	12	**33**
1530 - 1630	17	6	0	18	**41**
1545 - 1645	19	5	0	21	**45**
1600 - 1700	14	4	0	17	**35**
1615 - 1715	19	3	0	22	**44**
1630 - 1730	19	3	0	26	**48**
1645 - 1745	18	2	0	24	**44**
1700 - 1800	21	3	0	28	**52**
PEAK HR	**19**	**5**	**0**	**21**	**45**



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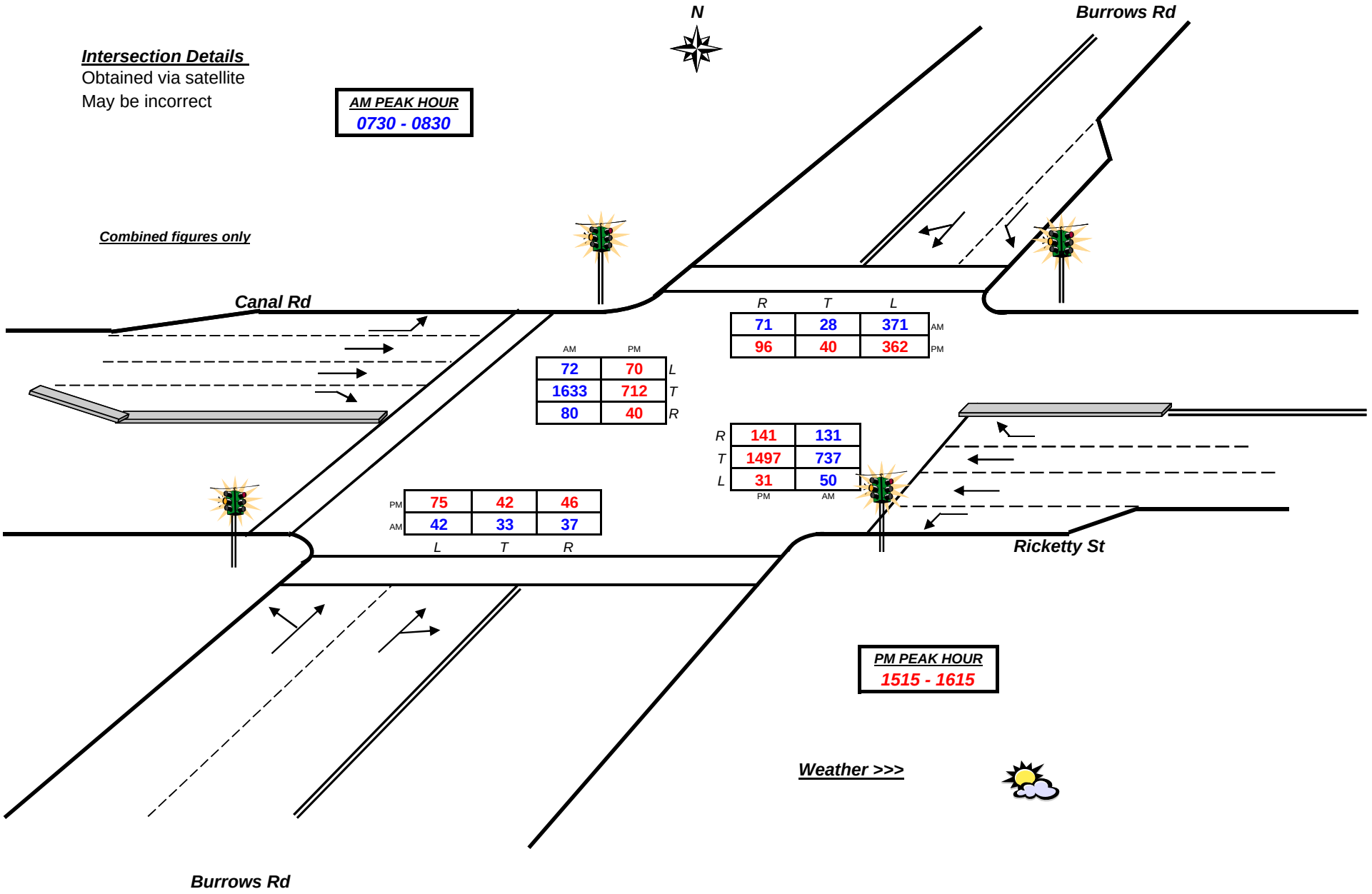
Ph.88196847, Mob.0418-239019

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0730 - 0830

Combined figures only



PM PEAK HOUR
1515 - 1615

Weather >>>

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

Lights

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0615	53	2	1	28	263	11	4	3	4	4	70	12	**455**
0615 - 0630	77	6	6	28	291	12	0	4	3	4	108	14	**553**
0630 - 0645	76	3	3	17	312	17	3	1	6	8	132	17	**595**
0645 - 0700	81	6	7	19	341	11	1	1	5	5	146	15	**638**
0700 - 0715	82	8	4	11	364	16	0	1	11	4	142	26	**669**
0715 - 0730	90	9	13	17	348	11	4	3	4	4	163	6	**672**
0730 - 0745	74	4	7	13	387	12	4	3	5	12	167	23	**711**
0745 - 0800	112	7	8	19	393	13	4	7	4	11	185	26	**789**
0800 - 0815	97	4	13	12	369	19	5	3	4	8	165	27	**726**
0815 - 0830	77	5	12	16	422	14	10	4	3	11	159	39	**772**
0830 - 0845	95	6	7	12	380	12	7	5	11	16	126	21	**698**
0845 - 0900	80	3	6	27	356	7	6	6	10	16	159	6	**682**
Period End	**994**	**63**	**87**	**219**	**4226**	**155**	**48**	**41**	**70**	**103**	**1722**	**232**	**7960**

Lights

Peak Time	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0700	287	17	17	92	1207	51	8	9	18	21	456	58	**2241**
0615 - 0715	316	23	20	75	1308	56	4	7	25	21	528	72	**2455**
0630 - 0730	329	26	27	64	1365	55	8	6	26	21	583	64	**2574**
0645 - 0745	327	27	31	60	1440	50	9	8	25	25	618	70	**2690**
0700 - 0800	358	28	32	60	1492	52	12	14	24	31	657	81	**2841**
0715 - 0815	373	24	41	61	1497	55	17	16	17	35	680	82	**2898**
0730 - 0830	360	20	40	60	1571	58	23	17	16	42	676	115	**2998**
0745 - 0845	381	22	40	59	1564	58	26	19	22	46	635	113	**2985**
0800 - 0900	349	18	38	67	1527	52	28	18	28	51	609	93	**2878**
PEAK HOUR	**360**	**20**	**40**	**60**	**1571**	**58**	**23**	**17**	**16**	**42**	**676**	**115**	**2998**

Heavies

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0615	6	1	2	1	9	5	2	3	3	1	24	1	**58**
0615 - 0630	8	1	4	3	14	4	3	1	8	2	10	5	**63**
0630 - 0645	3	2	4	4	15	2	7	3	6	1	9	8	**64**
0645 - 0700	4	2	1	5	12	2	6	5	10	4	12	3	**66**
0700 - 0715	2	1	3	12	11	3	3	2	2	1	17	4	**61**
0715 - 0730	5	4	8	4	21	5	3	4	4	2	11	7	**78**
0730 - 0745	1	1	10	3	21	4	8	3	4	1	21	6	**83**
0745 - 0800	4	1	10	1	16	3	2	5	9	3	10	5	**69**
0800 - 0815	1	2	4	5	14	8	3	2	6	0	10	3	**58**
0815 - 0830	5	4	7	3	11	7	6	6	2	4	20	2	**77**
0830 - 0845	6	3	4	1	11	5	12	3	9	5	9	10	**78**
0845 - 0900	4	7	3	2	12	3	7	1	11	3	14	11	**78**
Period End	**49**	**29**	**60**	**44**	**167**	**51**	**62**	**38**	**74**	**27**	**167**	**65**	**833**

Heavies

Peak Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0700	21	6	11	13	50	13	18	12	27	8	55	17	**251**
0615 - 0715	17	6	12	24	52	11	19	11	26	8	48	20	**254**
0630 - 0730	14	9	16	25	59	12	19	14	22	8	49	22	**269**
0645 - 0745	12	8	22	24	65	14	20	14	20	8	61	20	**288**
0700 - 0800	12	7	31	20	69	15	16	14	19	7	59	22	**291**
0715 - 0815	11	8	32	13	72	20	16	14	23	6	52	21	**288**
0730 - 0830	11	8	31	12	62	22	19	16	21	8	61	16	**287**
0745 - 0845	16	10	25	10	52	23	23	16	26	12	49	20	**282**
0800 - 0900	16	16	18	11	48	23	28	12	28	12	53	26	**291**
PEAK HOUR	**11**	**8**	**31**	**12**	**62**	**22**	**19**	**16**	**21**	**8**	**61**	**16**	**287**

Combined

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0615	59	3	3	29	272	16	6	6	7	5	94	13	**513**
0615 - 0630	85	7	10	31	305	16	3	5	11	6	118	19	**616**
0630 - 0645	79	5	7	21	327	19	10	4	12	9	141	25	**659**
0645 - 0700	85	8	8	24	353	13	7	6	15	9	158	18	**704**
0700 - 0715	84	9	7	23	375	19	3	3	13	5	159	30	**730**
0715 - 0730	95	13	21	21	369	16	7	7	8	6	174	13	**750**
0730 - 0745	75	5	17	16	408	16	12	6	9	13	188	29	**794**
0745 - 0800	116	8	18	20	409	16	6	12	13	14	195	31	**858**
0800 - 0815	98	6	17	17	383	27	8	5	10	8	175	30	**784**
0815 - 0830	82	9	19	19	433	21	16	10	5	15	179	41	**849**
0830 - 0845	101	9	11	13	391	17	19	8	20	21	135	31	**776**
0845 - 0900	84	10	9	29	368	10	13	7	21	19	173	17	**760**
Period End	**1043**	**92**	**147**	**263**	**4393**	**206**	**110**	**79**	**144**	**130**	**1889**	**297**	**8793**

Combined

Peak Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
0600 - 0700	308	23	28	105	1257	64	26	21	45	29	511	75	**2492**
0615 - 0715	333	29	32	99	1360	67	23	18	51	29	576	92	**2709**
0630 - 0730	343	35	43	89	1424	67	27	20	48	29	632	86	**2843**
0645 - 0745	339	35	53	84	1505	64	29	22	45	33	679	90	**2978**
0700 - 0800	370	35	63	80	1561	67	28	28	43	38	716	103	**3132**
0715 - 0815	384	32	73	74	1569	75	33	30	40	41	732	103	**3186**
0730 - 0830	371	28	71	72	1633	80	42	33	37	50	737	131	**3285**
0745 - 0845	397	32	65	69	1616	81	49	35	48	58	684	133	**3267**
0800 - 0900	365	34	56	78	1575	75	56	30	56	63	662	119	**3169**
PEAK HOUR	**371**	**28**	**71**	**72**	**1633**	**80**	**42**	**33**	**37**	**50**	**737**	**131**	**3285**

R.O.A.R DATA

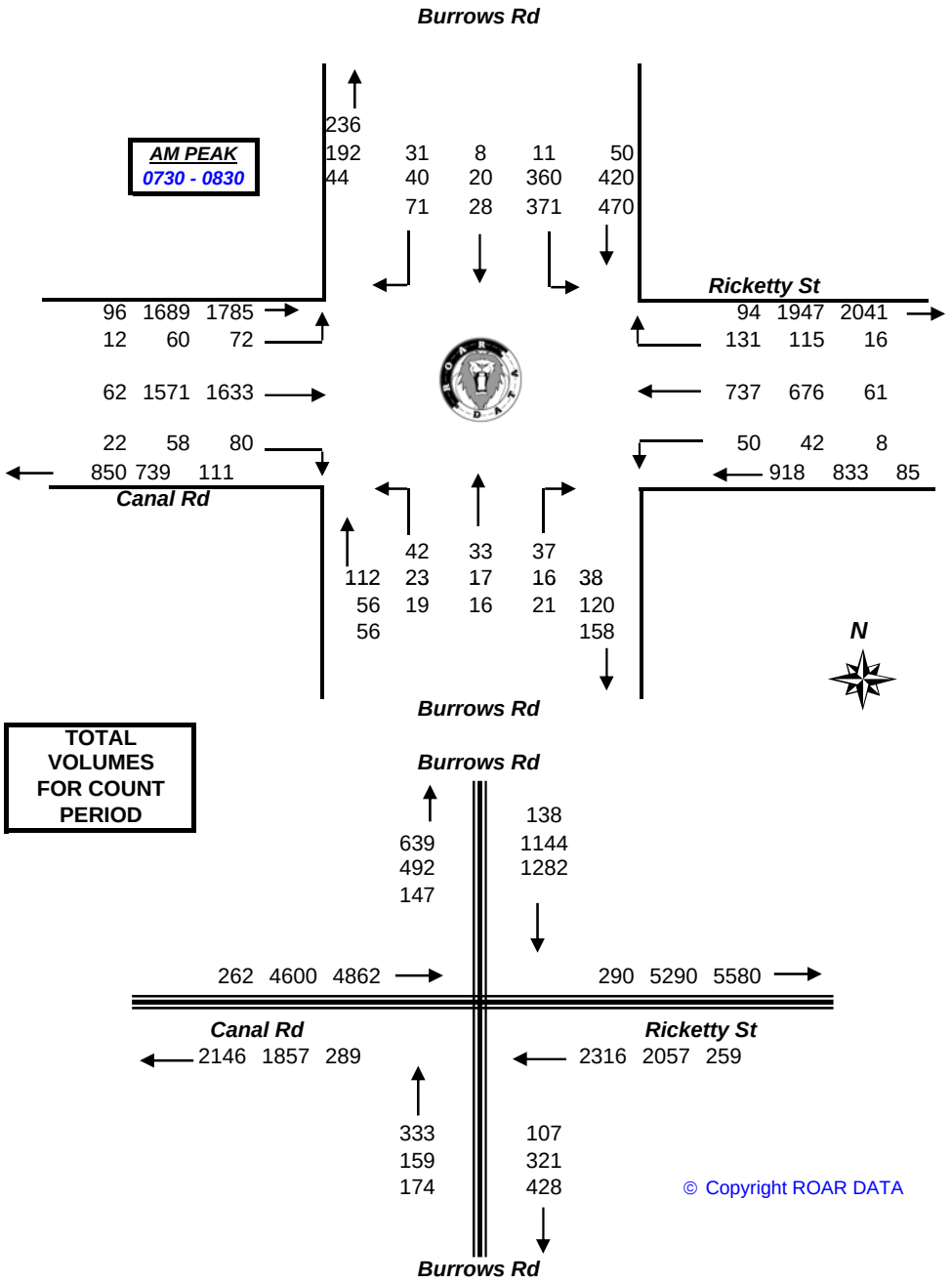
Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

Peds	NORTH	WEST	SOUTH	EAST	
	Burrows Rd	*Canal Rd*	*Burrows Rd*	*Ricketty St*	
Time Per	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**TOT**
0600 - 0615					**0**
0615 - 0630					**0**
0630 - 0645		NOT	REQUESTED		**0**
0645 - 0700					**0**
0700 - 0715					**0**
0715 - 0730					**0**
0730 - 0745					**0**
0745 - 0800					**0**
0800 - 0815					**0**
0815 - 0830					**0**
0830 - 0845					**0**
0845 - 0900					**0**
Period End	**0**	**0**	**0**	**0**	**0**

Peds	NORTH	WEST	SOUTH	EAST	
	Burrows Rd	*Canal Rd*	*Burrows Rd*	*Ricketty St*	
Peak Per	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**UNCLASSIFIED**	**TOT**
0600 - 0700	0	0	0	0	**0**
0615 - 0715	0	0	0	0	**0**
0630 - 0730	0	0	0	0	**0**
0645 - 0745	0	0	0	0	**0**
0700 - 0800	0	0	0	0	**0**
0715 - 0815	0	0	0	0	**0**
0730 - 0830	0	0	0	0	**0**
0745 - 0845	0	0	0	0	**0**
0800 - 0900	0	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**	**0**



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Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

Lights

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1515	94	8	16	14	140	6	12	14	8	2	335	23	**672**
1515 - 1530	83	9	11	19	173	11	22	7	5	6	378	24	**748**
1530 - 1545	97	6	35	15	163	5	12	7	13	6	373	25	**757**
1545 - 1600	92	9	16	14	164	7	14	13	8	2	329	20	**688**
1600 - 1615	77	3	23	9	170	5	16	6	5	4	358	4	**680**
1615 - 1630	101	8	12	9	215	7	5	7	6	6	327	28	**731**
1630 - 1645	99	3	17	7	194	10	18	7	7	6	360	11	**739**
1645 - 1700	82	11	25	7	145	4	11	7	7	3	342	25	**669**
1700 - 1715	82	0	24	9	185	5	20	8	10	2	430	30	**805**
1715 - 1730	91	4	16	12	184	3	13	4	5	2	347	24	**705**
1730 - 1745	71	0	16	12	181	2	14	2	6	0	331	15	**650**
1745 - 1800	73	2	20	8	166	5	17	5	6	2	324	21	**649**
Period End	**1042**	**63**	**231**	**135**	**2080**	**70**	**174**	**87**	**86**	**41**	**4234**	**250**	**8493**

Lights

Peak Time	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1600	366	32	78	62	640	29	60	41	34	16	1415	92	**2865**
1515 - 1615	349	27	85	57	670	28	64	33	31	18	1438	73	**2873**
1530 - 1630	367	26	86	47	712	24	47	33	32	18	1387	77	**2856**
1545 - 1645	369	23	68	39	743	29	53	33	26	18	1374	63	**2838**
1600 - 1700	359	25	77	32	724	26	50	27	25	19	1387	68	**2819**
1615 - 1715	364	22	78	32	739	26	54	29	30	17	1459	94	**2944**
1630 - 1730	354	18	82	35	708	22	62	26	29	13	1479	90	**2918**
1645 - 1745	326	15	81	40	695	14	58	21	28	7	1450	94	**2829**
1700 - 1800	317	6	76	41	716	15	64	19	27	6	1432	90	**2809**
PEAK HOUR	**349**	**27**	**85**	**57**	**670**	**28**	**64**	**33**	**31**	**18**	**1438**	**73**	**2873**

Heavies

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1515	5	5	2	7	10	5	7	3	2	7	12	4	**69**
1515 - 1530	4	2	2	6	11	4	6	2	6	4	20	8	**75**
1530 - 1545	3	5	6	1	9	2	3	4	2	4	16	9	**64**
1545 - 1600	4	5	2	4	10	1	0	1	6	3	12	31	**79**
1600 - 1615	2	1	1	2	12	5	2	2	1	2	11	20	**61**
1615 - 1630	4	2	5	5	17	2	3	1	4	1	10	4	**58**
1630 - 1645	5	1	4	2	12	1	1	0	1	2	13	5	**47**
1645 - 1700	6	6	0	1	7	1	2	3	1	1	5	7	**40**
1700 - 1715	1	3	2	3	8	4	4	1	3	5	8	3	**45**
1715 - 1730	3	4	1	1	8	2	4	0	4	2	7	1	**37**
1730 - 1745	1	3	0	0	6	2	2	0	0	3	7	0	**24**
1745 - 1800	1	1	0	3	5	1	1	0	2	2	5	2	**23**
Period End	**39**	**38**	**25**	**35**	**115**	**30**	**35**	**17**	**32**	**36**	**126**	**94**	**622**

Heavies

Peak Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1600	16	17	12	18	40	12	16	10	16	18	60	52	**287**
1515 - 1615	13	13	11	13	42	12	11	9	15	13	59	68	**279**
1530 - 1630	13	13	14	12	48	10	8	8	13	10	49	64	**262**
1545 - 1645	15	9	12	13	51	9	6	4	12	8	46	60	**245**
1600 - 1700	17	10	10	10	48	9	8	6	7	6	39	36	**206**
1615 - 1715	16	12	11	11	44	8	10	5	9	9	36	19	**190**
1630 - 1730	15	14	7	7	35	8	11	4	9	10	33	16	**169**
1645 - 1745	11	16	3	5	29	9	12	4	8	11	27	11	**146**
1700 - 1800	6	11	3	7	27	9	11	1	9	12	27	6	**129**
PEAK HOUR	**13**	**13**	**11**	**13**	**42**	**12**	**11**	**9**	**15**	**13**	**59**	**68**	**279**

Combined

Time Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1515	99	13	18	21	150	11	19	17	10	9	347	27	**741**
1515 - 1530	87	11	13	25	184	15	28	9	11	10	398	32	**823**
1530 - 1545	100	11	41	16	172	7	15	11	15	10	389	34	**821**
1545 - 1600	96	14	18	18	174	8	14	14	14	5	341	51	**767**
1600 - 1615	79	4	24	11	182	10	18	8	6	6	369	24	**741**
1615 - 1630	105	10	17	14	232	9	8	8	10	7	337	32	**789**
1630 - 1645	104	4	21	9	206	11	19	7	8	8	373	16	**786**
1645 - 1700	88	17	25	8	152	5	13	10	8	4	347	32	**709**
1700 - 1715	83	3	26	12	193	9	24	9	13	7	438	33	**850**
1715 - 1730	94	8	17	13	192	5	17	4	9	4	354	25	**742**
1730 - 1745	72	3	16	12	187	4	16	2	6	3	338	15	**674**
1745 - 1800	74	3	20	11	171	6	18	5	8	4	329	23	**672**
Period End	**1081**	**101**	**256**	**170**	**2195**	**100**	**209**	**104**	**118**	**77**	**4360**	**344**	**9115**

Combined

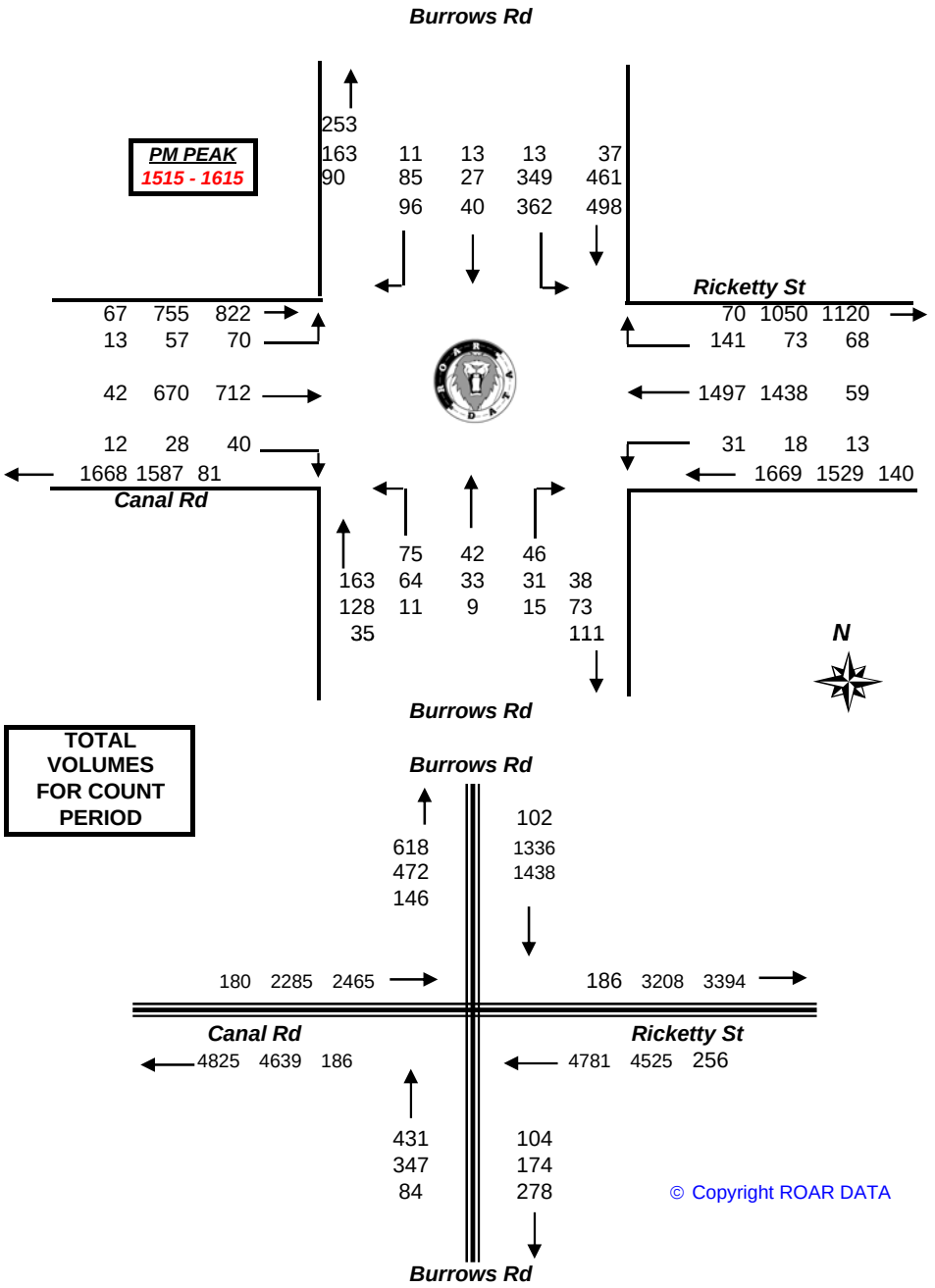
Peak Per	NORTH Burrows Rd L	T	R	WEST Canal Rd L	T	R	SOUTH Burrows Rd L	T	R	EAST Ricketty St L	T	R	TOT
1500 - 1600	382	49	90	80	680	41	76	51	50	34	1475	144	**3152**
1515 - 1615	362	40	96	70	712	40	75	42	46	31	1497	141	**3152**
1530 - 1630	380	39	100	59	760	34	55	41	45	28	1436	141	**3118**
1545 - 1645	384	32	80	52	794	38	59	37	38	26	1420	123	**3083**
1600 - 1700	376	35	87	42	772	35	58	33	32	25	1426	104	**3025**
1615 - 1715	380	34	89	43	783	34	64	34	39	26	1495	113	**3134**
1630 - 1730	369	32	89	42	743	30	73	30	38	23	1512	106	**3087**
1645 - 1745	337	31	84	45	724	23	70	25	36	18	1477	105	**2975**
1700 - 1800	323	17	79	48	743	24	75	20	36	18	1459	96	**2938**
PEAK HOUR	**362**	**40**	**96**	**70**	**712**	**40**	**75**	**42**	**46**	**31**	**1497**	**141**	**3152**

Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

Peds	NORTH	WEST	SOUTH	EAST	
	Burrows Rd	*Canal Rd*	*Burrows Rd*	*Ricketty St*	
Time Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1500 - 1515					0
1515 - 1530					0
1530 - 1545		NOT	REQUESTED		0
1545 - 1600					0
1600 - 1615					0
1615 - 1630					0
1630 - 1645					0
1645 - 1700					0
1700 - 1715					0
1715 - 1730					0
1730 - 1745					0
1745 - 1800					0
Period End	**0**	**0**	**0**	**0**	**0**

Peds	NORTH	WEST	SOUTH	EAST	
	Burrows Rd	*Canal Rd*	*Burrows Rd*	*Ricketty St*	
Peak Per	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1530 - 1630	0	0	0	0	0
1545 - 1645	0	0	0	0	0
1600 - 1700	0	0	0	0	0
1615 - 1715	0	0	0	0	0
1630 - 1730	0	0	0	0	0
1645 - 1745	0	0	0	0	0
1700 - 1800	0	0	0	0	0
1715 - 1815	0	0	0	0	0
1730 - 1830	0	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**	**0**



TOTAL VOLUMES FOR COUNT PERIOD

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Appendix C

Site traffic survey

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

AM

Client : EMGA

Job No/Name : 5808 ST PETERS Boral

Day/Date : Thursday 16th October 2015

	WEST Access *Lights*		
Time Per	**IN**	**OUT**	**Total**
0600 - 0615	0	0	**0**
0615 - 0630	0	0	**0**
0630 - 0645	0	1	**1**
0645 - 0700	0	0	**0**
0700 - 0715	0	0	**0**
0715 - 0730	0	1	**1**
0730 - 0745	0	2	**2**
0745 - 0800	0	0	**0**
0800 - 0815	0	2	**2**
0815 - 0830	0	1	**1**
0830 - 0845	0	1	**1**
0845 - 0900	0	1	**1**
0900 - 0915	0	0	**0**
0915 - 0930	0	0	**0**
0930 - 0945	0	0	**0**
0945 - 1000	0	0	**0**
1000 - 1015	0	0	**0**
1015 - 1030	0	0	**0**
1030 - 1045	0	1	**1**
1045 - 1100	0	0	**0**
1100 - 1115	0	0	**0**
1115 - 1130	0	0	**0**
1130 - 1145	0	0	**0**
1145 - 1200	0	3	**3**
Period End	**0**	**13**	**13**

	WEST Access *Heavies*		
IN	**OUT**	**Total**
0	0	**0**
0	1	**1**
0	0	**0**
0	1	**1**
0	0	**0**
0	1	**1**
0	6	**6**
0	5	**5**
0	6	**6**
0	7	**7**
0	7	**7**
0	6	**6**
0	9	**9**
0	7	**7**
0	6	**6**
0	6	**6**
0	8	**8**
0	9	**9**
0	6	**6**
0	6	**6**
0	8	**8**
0	7	**7**
0	8	**8**
0	9	**9**
0	**129**	**129**

	WEST Access *All Vehicles*	
IN	**OUT**	**Total**
0	0	**0**
0	1	**1**
0	1	**1**
0	1	**1**
0	0	**0**
0	2	**2**
0	8	**8**
0	5	**5**
0	8	**8**
0	8	**8**
0	8	**8**
0	7	**7**
0	9	**9**
0	7	**7**
0	6	**6**
0	6	**6**
0	8	**8**
0	9	**9**
0	7	**7**
0	6	**6**
0	8	**8**
0	7	**7**
0	8	**8**
0	12	**12**
0	**142**	**142**

	EAST Access *Lights*		
Time Per	**IN**	**OUT**	**Total**
0600 - 0615	2	0	**2**
0615 - 0630	6	0	**6**
0630 - 0645	7	1	**8**
0645 - 0700	5	0	**5**
0700 - 0715	6	0	**6**
0715 - 0730	3	0	**3**
0730 - 0745	2	0	**2**
0745 - 0800	0	0	**0**
0800 - 0815	3	0	**3**
0815 - 0830	0	0	**0**
0830 - 0845	1	1	**2**
0845 - 0900	1	2	**3**
0900 - 0915	0	0	**0**
0915 - 0930	2	0	**2**
0930 - 0945	1	0	**1**
0945 - 1000	3	1	**4**
1000 - 1015	3	1	**4**
1015 - 1030	0	2	**2**
1030 - 1045	2	0	**2**
1045 - 1100	1	1	**2**
1100 - 1115	0	0	**0**
1115 - 1130	1	0	**1**
1130 - 1145	3	2	**5**
1145 - 1200	2	2	**4**
Period End	**54**	**13**	**67**

	EAST Access *Heavies*	
IN	**OUT**	**Total**
2	4	**6**
1	7	**8**
1	3	**4**
2	1	**3**
3	1	**4**
2	2	**4**
7	1	**8**
1	3	**4**
2	1	**3**
5	3	**8**
8	3	**11**
10	1	**11**
6	5	**11**
10	4	**14**
14	1	**15**
9	2	**11**
10	2	**12**
12	4	**16**
6	2	**8**
18	3	**21**
9	5	**14**
8	2	**10**
11	2	**13**
16	5	**21**
173	**67**	**240**

	EAST Access *All Vehicles*	
IN	**OUT**	**Total**
4	4	**8**
7	7	**14**
8	4	**12**
7	1	**8**
9	1	**10**
5	2	**7**
9	1	**10**
1	3	**4**
5	1	**6**
5	3	**8**
9	4	**13**
11	3	**14**
6	5	**11**
12	4	**16**
15	1	**16**
12	3	**15**
13	3	**16**
12	6	**18**
8	2	**10**
19	4	**23**
9	5	**14**
9	2	**11**
14	4	**18**
18	7	**25**
227	**80**	**307**

R.O.A.R. DATA

Reliable, Original & Authentic I

Ph.88196847, Mob.0418-239019

AM

Client : EMGA

Job No/Name : 5808 ST PETERS Boral

Day/Date : Thursday 16th October 2015

	WEST Access *Lights*		
Peak Per	IN	OUT	Total
0600 - 0700	0	1	**1**
0615 - 0715	0	1	**1**
0630 - 0730	0	2	**2**
0645 - 0745	0	3	**3**
0700 - 0800	0	3	**3**
0715 - 0815	0	5	**5**
0730 - 0830	0	5	**5**
0745 - 0845	0	4	**4**
0800 - 0900	0	5	**5**
0815 - 0915	0	3	**3**
0830 - 0930	0	2	**2**
0845 - 0945	0	1	**1**
0900 - 1000	0	0	**0**
0915 - 1015	0	0	**0**
0930 - 1030	0	0	**0**
0945 - 1045	0	1	**1**
1000 - 1100	0	1	**1**
1015 - 1115	0	1	**1**
1030 - 1130	0	1	**1**
1045 - 1145	0	0	**0**
1100 - 1200	0	3	**3**
PEAK HR	**0**	**3**	**3**

	WEST Access *Heavies*		
	IN	OUT	Total
0600 - 0700	0	2	**2**
0615 - 0715	0	2	**2**
0630 - 0730	0	2	**2**
0645 - 0745	0	8	**8**
0700 - 0800	0	12	**12**
0715 - 0815	0	18	**18**
0730 - 0830	0	24	**24**
0745 - 0845	0	25	**25**
0800 - 0900	0	26	**26**
0815 - 0915	0	29	**29**
0830 - 0930	0	29	**29**
0845 - 0945	0	28	**28**
0900 - 1000	0	28	**28**
0915 - 1015	0	27	**27**
0930 - 1030	0	29	**29**
0945 - 1045	0	29	**29**
1000 - 1100	0	29	**29**
1015 - 1115	0	29	**29**
1030 - 1130	0	27	**27**
1045 - 1145	0	29	**29**
1100 - 1200	0	32	**32**
PEAK HR	**0**	**32**	**32**

	WEST Access *All Vehicles*		
	IN	OUT	Total
0600 - 0700	0	3	**3**
0615 - 0715	0	3	**3**
0630 - 0730	0	4	**4**
0645 - 0745	0	11	**11**
0700 - 0800	0	15	**15**
0715 - 0815	0	23	**23**
0730 - 0830	0	29	**29**
0745 - 0845	0	29	**29**
0800 - 0900	0	31	**31**
0815 - 0915	0	32	**32**
0830 - 0930	0	31	**31**
0845 - 0945	0	29	**29**
0900 - 1000	0	28	**28**
0915 - 1015	0	27	**27**
0930 - 1030	0	29	**29**
0945 - 1045	0	30	**30**
1000 - 1100	0	30	**30**
1015 - 1115	0	30	**30**
1030 - 1130	0	28	**28**
1045 - 1145	0	29	**29**
1100 - 1200	0	35	**35**
PEAK HR	**0**	**35**	**35**

	EAST Access *Lights*		
Peak Per	IN	OUT	Total
0600 - 0700	20	1	**21**
0615 - 0715	24	1	**25**
0630 - 0730	21	1	**22**
0645 - 0745	16	0	**16**
0700 - 0800	11	0	**11**
0715 - 0815	8	0	**8**
0730 - 0830	5	0	**5**
0745 - 0845	4	1	**5**
0800 - 0900	5	3	**8**
0815 - 0915	2	3	**5**
0830 - 0930	4	3	**7**
0845 - 0945	4	2	**6**
0900 - 1000	6	1	**7**
0915 - 1015	9	2	**11**
0930 - 1030	7	4	**11**
0945 - 1045	8	4	**12**
1000 - 1100	6	4	**10**
1015 - 1115	3	3	**6**
1030 - 1130	4	1	**5**
1045 - 1145	5	3	**8**
1100 - 1200	6	4	**10**
PEAK HR	**6**	**4**	**10**

	EAST Access *Heavies*		
	IN	OUT	Total
0600 - 0700	6	15	**21**
0615 - 0715	7	12	**19**
0630 - 0730	8	7	**15**
0645 - 0745	14	5	**19**
0700 - 0800	13	7	**20**
0715 - 0815	12	7	**19**
0730 - 0830	15	8	**23**
0745 - 0845	16	10	**26**
0800 - 0900	25	8	**33**
0815 - 0915	29	12	**41**
0830 - 0930	34	13	**47**
0845 - 0945	40	11	**51**
0900 - 1000	39	12	**51**
0915 - 1015	43	9	**52**
0930 - 1030	45	9	**54**
0945 - 1045	37	10	**47**
1000 - 1100	46	11	**57**
1015 - 1115	45	14	**59**
1030 - 1130	41	12	**53**
1045 - 1145	46	12	**58**
1100 - 1200	44	14	**58**
PEAK HR	**44**	**14**	**58**

	EAST Access *All Vehicles*		
	IN	OUT	Total
0600 - 0700	26	16	**42**
0615 - 0715	31	13	**44**
0630 - 0730	29	8	**37**
0645 - 0745	30	5	**35**
0700 - 0800	24	7	**31**
0715 - 0815	20	7	**27**
0730 - 0830	20	8	**28**
0745 - 0845	20	11	**31**
0800 - 0900	30	11	**41**
0815 - 0915	31	15	**46**
0830 - 0930	38	16	**54**
0845 - 0945	44	13	**57**
0900 - 1000	45	13	**58**
0915 - 1015	52	11	**63**
0930 - 1030	52	13	**65**
0945 - 1045	45	14	**59**
1000 - 1100	52	15	**67**
1015 - 1115	48	17	**65**
1030 - 1130	45	13	**58**
1045 - 1145	51	15	**66**
1100 - 1200	50	18	**68**
PEAK HR	**50**	**18**	**68**

R.O.A.R. DATA

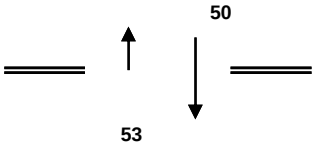
Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

AM

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

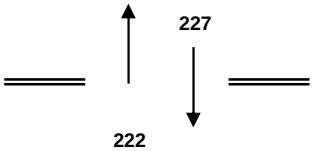
	ACCESSES *Combined*		
Time Per	**IN**	**OUT**	**Total**
0600 - 0615	4	4	**8**
0615 - 0630	7	8	**15**
0630 - 0645	8	5	**13**
0645 - 0700	7	2	**9**
0700 - 0715	9	1	**10**
0715 - 0730	5	4	**9**
0730 - 0745	9	9	**18**
0745 - 0800	1	8	**9**
0800 - 0815	5	9	**14**
0815 - 0830	5	11	**16**
0830 - 0845	9	12	**21**
0845 - 0900	11	10	**21**
0900 - 0915	6	14	**20**
0915 - 0930	12	11	**23**
0930 - 0945	15	7	**22**
0945 - 1000	12	9	**21**
1000 - 1015	13	11	**24**
1015 - 1030	12	15	**27**
1030 - 1045	8	9	**17**
1045 - 1100	19	10	**29**
1100 - 1115	9	13	**22**
1115 - 1130	9	9	**18**
1130 - 1145	14	12	**26**
1145 - 1200	18	19	**37**
Period End	**227**	**222**	**449**



Boral

TOTAL VOLUMES for PERIOD

Combined



Boral

	ACCESSES *Combined*		
Peak Per	**IN**	**OUT**	**Total**
0600 - 0700	26	19	**45**
0615 - 0715	31	16	**47**
0630 - 0730	29	12	**41**
0645 - 0745	30	16	**46**
0700 - 0800	24	22	**46**
0715 - 0815	20	30	**50**
0730 - 0830	20	37	**57**
0745 - 0845	20	40	**60**
0800 - 0900	30	42	**72**
0815 - 0915	31	47	**78**
0830 - 0930	38	47	**85**
0845 - 0945	44	42	**86**
0900 - 1000	45	41	**86**
0915 - 1015	52	38	**90**
0930 - 1030	52	42	**94**
0945 - 1045	45	44	**89**
1000 - 1100	52	45	**97**
1015 - 1115	48	47	**95**
1030 - 1130	45	41	**86**
1045 - 1145	51	44	**95**
1100 - 1200	50	53	**103**

PEAK HR	**50**	**53**	**103**

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

PM

Client : EMGA
Job No/Name : 5808 ST PETERS Boral
Day/Date : Thursday 16th October 2015

	WEST Access *Lights*		
Time Per	IN	OUT	Total
1200 - 1215	0	0	**0**
1215 - 1230	0	1	**1**
1230 - 1245	0	0	**0**
1245 - 1300	0	0	**0**
1300 - 1315	0	0	**0**
1315 - 1330	0	1	**1**
1330 - 1345	0	0	**0**
1345 - 1400	0	0	**0**
1400 - 1415	0	1	**1**
1415 - 1430	0	0	**0**
1430 - 1445	0	0	**0**
1445 - 1500	0	0	**0**
1500 - 1515	0	0	**0**
1515 - 1530	0	0	**0**
1530 - 1545	0	0	**0**
1545 - 1600	0	0	**0**
1600 - 1615	0	0	**0**
1615 - 1630	0	0	**0**
1630 - 1645	0	0	**0**
1645 - 1700	0	0	**0**
1700 - 1715	0	0	**0**
1715 - 1730	0	0	**0**
1730 - 1745	0	0	**0**
1745 - 1800	0	0	**0**
Period End	**0**	**3**	**3**

	WEST Access *Heavies*		
IN	OUT	Total
0	5	**5**
0	6	**6**
0	7	**7**
0	2	**2**
0	7	**7**
0	8	**8**
0	4	**4**
0	6	**6**
0	8	**8**
0	7	**7**
0	2	**2**
0	6	**6**
0	4	**4**
0	4	**4**
0	4	**4**
0	4	**4**
0	1	**1**
0	3	**3**
0	3	**3**
0	0	**0**
0	2	**2**
0	0	**0**
0	0	**0**
0	1	**1**
0	**94**	**94**

	WEST Access *All Vehicles*	
IN	OUT	Total
0	5	**5**
0	7	**7**
0	7	**7**
0	2	**2**
0	7	**7**
0	9	**9**
0	4	**4**
0	6	**6**
0	9	**9**
0	7	**7**
0	2	**2**
0	6	**6**
0	4	**4**
0	4	**4**
0	4	**4**
0	4	**4**
0	1	**1**
0	3	**3**
0	3	**3**
0	0	**0**
0	2	**2**
0	0	**0**
0	0	**0**
0	1	**1**
0	**97**	**97**

	EAST Access *Lights*		
Time Per	IN	OUT	Total
1200 - 1215	0	0	**0**
1215 - 1230	1	1	**2**
1230 - 1245	0	0	**0**
1245 - 1300	1	1	**2**
1300 - 1315	0	3	**3**
1315 - 1330	0	0	**0**
1330 - 1345	0	0	**0**
1345 - 1400	1	3	**4**
1400 - 1415	0	0	**0**
1415 - 1430	0	0	**0**
1430 - 1445	0	0	**0**
1445 - 1500	0	0	**0**
1500 - 1515	1	0	**1**
1515 - 1530	0	0	**0**
1530 - 1545	0	1	**1**
1545 - 1600	0	2	**2**
1600 - 1615	0	1	**1**
1615 - 1630	0	0	**0**
1630 - 1645	0	4	**4**
1645 - 1700	1	0	**1**
1700 - 1715	0	0	**0**
1715 - 1730	0	6	**6**
1730 - 1745	0	0	**0**
1745 - 1800	0	0	**0**
Period End	**5**	**22**	**27**

	EAST Access *Heavies*		
IN	OUT	Total
10	4	**14**
8	2	**10**
6	2	**8**
10	2	**12**
16	2	**18**
10	5	**15**
7	3	**10**
8	4	**12**
9	5	**14**
4	2	**6**
7	1	**8**
7	1	**8**
7	2	**9**
6	3	**9**
7	0	**7**
5	0	**5**
4	0	**4**
2	1	**3**
4	0	**4**
4	0	**4**
6	2	**8**
5	1	**6**
8	2	**10**
1	3	**4**
161	**47**	**208**

	EAST Access *All Vehicles*	
IN	OUT	Total
10	4	**14**
9	3	**12**
6	2	**8**
11	3	**14**
16	5	**21**
10	5	**15**
7	3	**10**
9	7	**16**
9	5	**14**
4	2	**6**
7	1	**8**
7	1	**8**
8	2	**10**
6	3	**9**
7	1	**8**
5	2	**7**
4	1	**5**
2	1	**3**
4	4	**8**
5	0	**5**
6	2	**8**
5	7	**12**
8	2	**10**
1	3	**4**
166	**69**	**235**

R.O.A.R. DATA

Reliable, Original & Authentic I

Ph.88196847, Mob.0418-239019

PM

Client : EMGA

Job No/Name : 5808 ST PETERS Boral

Day/Date : Thursday 16th October 2015

	WEST Access *Lights*		
Peak Per	**IN**	**OUT**	**Total**
1200 - 1300	0	1	**1**
1215 - 1315	0	1	**1**
1230 - 1330	0	1	**1**
1245 - 1345	0	1	**1**
1300 - 1400	0	1	**1**
1315 - 1415	0	2	**2**
1330 - 1430	0	1	**1**
1345 - 1445	0	1	**1**
1400 - 1500	0	1	**1**
1415 - 1515	0	0	**0**
1430 - 1530	0	0	**0**
1445 - 1545	0	0	**0**
1500 - 1600	0	0	**0**
1515 - 1615	0	0	**0**
1530 - 1630	0	0	**0**
1545 - 1645	0	0	**0**
1600 - 1700	0	0	**0**
1615 - 1715	0	0	**0**
1630 - 1730	0	0	**0**
1645 - 1745	0	0	**0**
1700 - 1800	0	0	**0**
PEAK HR	**0**	**1**	**1**

	WEST Access *Heavies*		
IN	**OUT**	**Total**
0	20	**20**
0	22	**22**
0	24	**24**
0	21	**21**
0	25	**25**
0	26	**26**
0	25	**25**
0	23	**23**
0	23	**23**
0	19	**19**
0	16	**16**
0	18	**18**
0	16	**16**
0	13	**13**
0	12	**12**
0	11	**11**
0	7	**7**
0	8	**8**
0	5	**5**
0	2	**2**
0	3	**3**
0	**25**	**25**

	WEST Access *All Vehicles*		
IN	**OUT**	**Total**
0	21	**21**
0	23	**23**
0	25	**25**
0	22	**22**
0	26	**26**
0	28	**28**
0	26	**26**
0	24	**24**
0	24	**24**
0	19	**19**
0	16	**16**
0	18	**18**
0	16	**16**
0	13	**13**
0	12	**12**
0	11	**11**
0	7	**7**
0	8	**8**
0	5	**5**
0	2	**2**
0	3	**3**
0	**26**	**26**

	EAST Access *Lights*		
Peak Per	**IN**	**OUT**	**Total**
1200 - 1300	2	2	**4**
1215 - 1315	2	5	**7**
1230 - 1330	1	4	**5**
1245 - 1345	1	4	**5**
1300 - 1400	1	6	**7**
1315 - 1415	1	3	**4**
1330 - 1430	1	3	**4**
1345 - 1445	1	3	**4**
1400 - 1500	0	0	**0**
1415 - 1515	1	0	**1**
1430 - 1530	1	0	**1**
1445 - 1545	1	1	**2**
1500 - 1600	1	3	**4**
1515 - 1615	0	4	**4**
1530 - 1630	0	4	**4**
1545 - 1645	0	7	**7**
1600 - 1700	1	5	**6**
1615 - 1715	1	4	**5**
1630 - 1730	1	10	**11**
1645 - 1745	1	6	**7**
1700 - 1800	0	6	**6**
PEAK HR	**1**	**6**	**7**

	EAST Access *Heavies*		
IN	**OUT**	**Total**
34	10	**44**
40	8	**48**
42	11	**53**
43	12	**55**
41	14	**55**
34	17	**51**
28	14	**42**
28	12	**40**
27	9	**36**
25	6	**31**
27	7	**34**
27	6	**33**
25	5	**30**
22	3	**25**
18	1	**19**
15	1	**16**
14	1	**15**
16	3	**19**
19	3	**22**
23	5	**28**
20	8	**28**
41	**14**	**55**

	EAST Access *All Vehicles*		
IN	**OUT**	**Total**
36	12	**48**
42	13	**55**
43	15	**58**
44	16	**60**
42	20	**62**
35	20	**55**
29	17	**46**
29	15	**44**
27	9	**36**
26	6	**32**
28	7	**35**
28	7	**35**
26	8	**34**
22	7	**29**
18	5	**23**
15	8	**23**
15	6	**21**
17	7	**24**
20	13	**33**
24	11	**35**
20	14	**34**
42	**20**	**62**

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

PM

Client : EMGA

Job No/Name : 5808 ST PETERS Boral

Day/Date : Thursday 16th October 2015

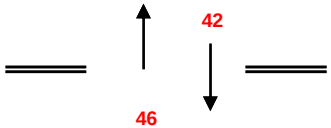
	ACCESSES Combined		
Time Per	**IN**	**OUT**	**Total**
1200 - 1215	10	9	**19**
1215 - 1230	9	10	**19**
1230 - 1245	6	9	**15**
1245 - 1300	11	5	**16**
1300 - 1315	16	12	**28**
1315 - 1330	10	14	**24**
1330 - 1345	7	7	**14**
1345 - 1400	9	13	**22**
1400 - 1415	9	14	**23**
1415 - 1430	4	9	**13**
1430 - 1445	7	3	**10**
1445 - 1500	7	7	**14**
1500 - 1515	8	6	**14**
1515 - 1530	6	7	**13**
1530 - 1545	7	5	**12**
1545 - 1600	5	6	**11**
1600 - 1615	4	2	**6**
1615 - 1630	2	4	**6**
1630 - 1645	4	7	**11**
1645 - 1700	5	0	**5**
1700 - 1715	6	4	**10**
1715 - 1730	5	7	**12**
1730 - 1745	8	2	**10**
1745 - 1800	1	4	**5**
Period End	**166**	**166**	**332**

PEAK HOUR

1300 - 1400

Combined

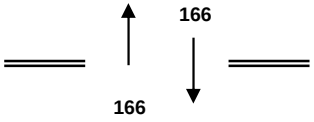
Burrows Rd



Boral

TOTAL VOLUMES for PERIOD

Combined

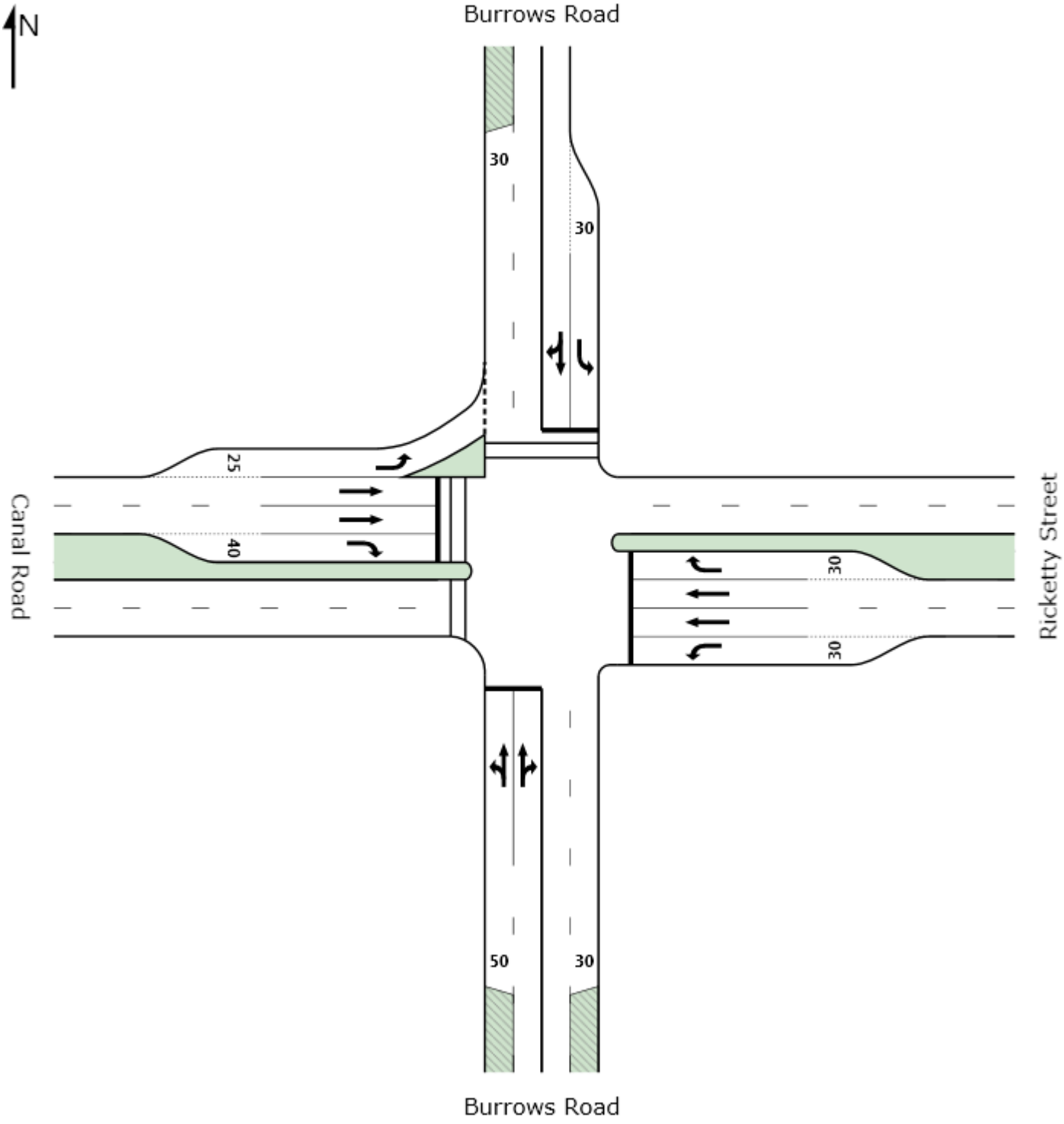


Boral

	ACCESSES Combined		
Peak Per	**IN**	**OUT**	**Total**
1200 - 1300	36	33	**69**
1215 - 1315	42	36	**78**
1230 - 1330	43	40	**83**
1245 - 1345	44	38	**82**
1300 - 1400	42	46	**88**
1315 - 1415	35	48	**83**
1330 - 1430	29	43	**72**
1345 - 1445	29	39	**68**
1400 - 1500	27	33	**60**
1415 - 1515	26	25	**51**
1430 - 1530	28	23	**51**
1445 - 1545	28	25	**53**
1500 - 1600	26	24	**50**
1515 - 1615	22	20	**42**
1530 - 1630	18	17	**35**
1545 - 1645	15	19	**34**
1600 - 1700	15	13	**28**
1615 - 1715	17	15	**32**
1630 - 1730	20	18	**38**
1645 - 1745	24	13	**37**
1700 - 1800	20	17	**37**
PEAK HR	**42**	**46**	**88**

Appendix D

SIDRA intersection analysis results


N
Burrows Road
30
30
25
40
Canal Road
30
30
Ricketty Street
50
30
Burrows Road

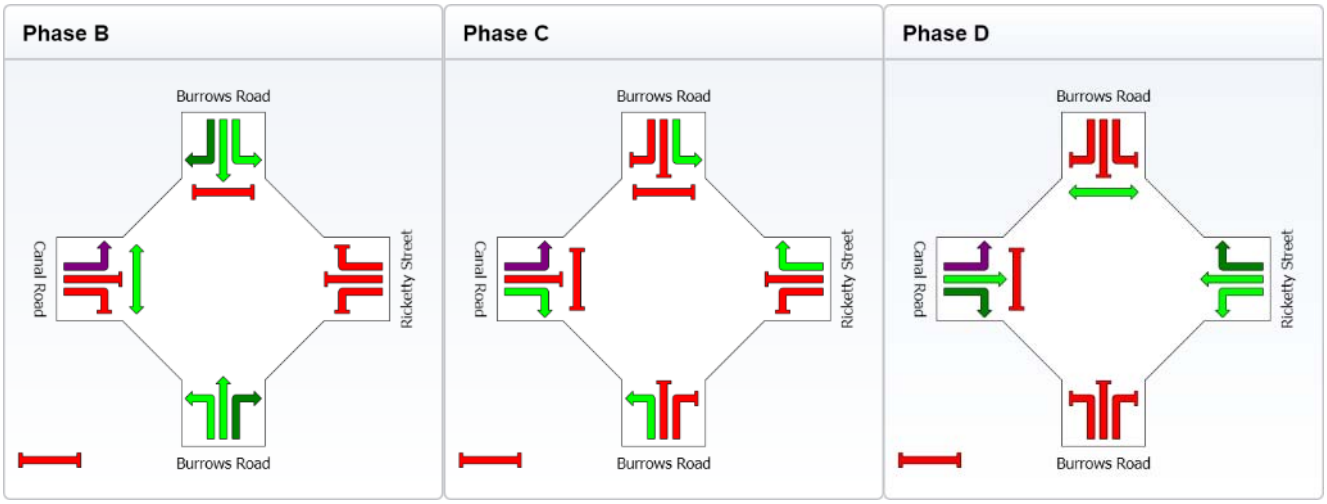
PHASING SUMMARY

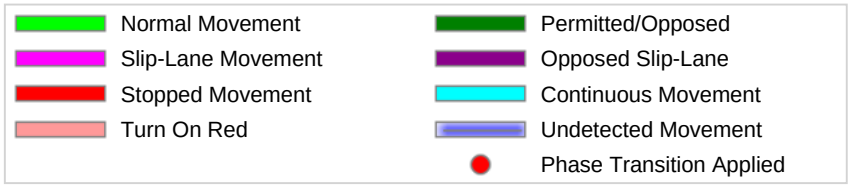
Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: B, C, D
Output Sequence: B, C, D

Phase Timing Results

Phase	B	C	D
Green Time (sec)	22	6	39
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	28	12	45
Phase Split	33 %	14 %	53 %





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MOVEMENT SUMMARY

Site: Canal Road _ Ricketty Street
2015 AM Peak

Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Burrows Road											
1	L	44	45.2	0.163	26.9	LOS B	1.1	11.0	0.65	0.73	35.4
2	T	35	48.5	0.365	33.5	LOS C	2.8	28.4	0.90	0.72	29.1
3	R	39	56.8	0.365	43.2	LOS D	2.8	28.4	0.90	0.79	28.7
Approach		118	50.0	0.365	34.2	LOS C	2.8	28.4	0.81	0.75	31.0
East: Ricketty Street											
4	L	53	16.0	0.222	22.5	LOS B	1.2	9.6	0.59	0.72	37.4
5	T	776	8.3	0.457	17.0	LOS B	11.0	82.6	0.73	0.64	39.0
6	R	138	12.2	0.665	31.4	LOS C	3.5	26.7	1.00	0.81	32.4
Approach		966	9.3	0.665	19.3	LOS B	11.0	82.6	0.76	0.67	37.8
North: Burrows Road											
7	L	238	3.0	1.000[3]	33.8	LOS C	6.8	49.0	0.98	0.82	31.1
8	T	182	28.6	0.980	79.7	LOS F	17.3	139.9	1.00	1.28	17.7
9	R	75	43.7	0.980	89.0	LOS F	17.3	139.9	1.00	1.28	17.7
Approach		495	10.6	1.000	59.0	LOS E	17.3	139.9	0.99	1.06	22.3
West: Canal Road											
10	L	76	16.7	0.117	8.8	LOS A	0.4	2.8	0.19	0.63	48.7
11	T	1719	3.8	0.984	65.4	LOS E	56.2	406.5	1.00	1.36	20.7
12	R	84	27.5	0.290	20.2	LOS B	1.6	14.1	0.70	0.75	39.2
Approach		1879	5.4	0.984	61.1	LOS E	56.2	406.5	0.95	1.31	21.7
All Vehicles		3458	8.7	1.000	48.2	LOS D	56.2	406.5	0.90	1.07	25.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	18.4	LOS B	0.1	0.1	0.66	0.66
P7	Across W approach	53	35.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		106	27.1	LOS C			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: Canal Road _ Ricketty Street
2015 AM Peak with + 3 vehicles site traffic

Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Burrows Road											
1	L	45	46.5	0.168	27.0	LOS B	1.2	11.4	0.65	0.73	35.4
2	T	36	50.0	0.378	33.6	LOS C	2.9	29.6	0.91	0.72	29.0
3	R	40	57.9	0.378	43.4	LOS D	2.9	29.6	0.91	0.79	28.7
Approach		121	51.3	0.378	34.3	LOS C	2.9	29.6	0.81	0.75	31.0
East: Ricketty Street											
4	L	53	16.0	0.222	22.5	LOS B	1.2	9.6	0.59	0.72	37.4
5	T	776	8.3	0.457	17.0	LOS B	11.0	82.6	0.73	0.64	39.0
6	R	138	12.2	0.665	31.4	LOS C	3.5	26.7	1.00	0.81	32.4
Approach		966	9.3	0.665	19.3	LOS B	11.0	82.6	0.76	0.67	37.8
North: Burrows Road											
7	L	238	3.0	1.000[3]	33.8	LOS C	6.8	49.0	0.98	0.82	31.1
8	T	182	28.6	0.987	83.5	LOS F	17.8	143.4	1.00	1.30	17.2
9	R	75	43.7	0.987	92.7	LOS F	17.8	143.4	1.00	1.30	17.2
Approach		495	10.6	1.000	61.0	LOS E	17.8	143.4	0.99	1.07	21.9
West: Canal Road											
10	L	76	16.7	0.117	8.8	LOS A	0.4	2.8	0.19	0.63	48.7
11	T	1719	3.8	0.984	65.4	LOS E	56.2	406.5	1.00	1.36	20.7
12	R	84	27.5	0.290	20.2	LOS B	1.6	14.1	0.70	0.75	39.2
Approach		1879	5.4	0.984	61.1	LOS E	56.2	406.5	0.95	1.31	21.7
All Vehicles		3461	8.8	1.000	48.5	LOS D	56.2	406.5	0.90	1.07	25.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	18.4	LOS B	0.1	0.1	0.66	0.66
P7	Across W approach	53	35.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		106	27.1	LOS C			0.79	0.79

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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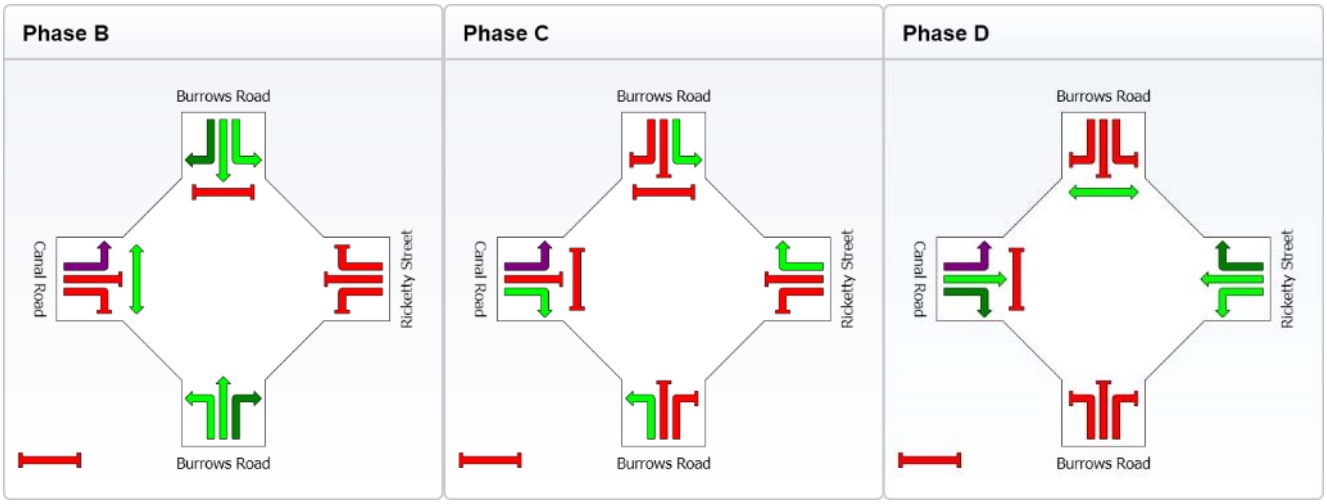
PHASING SUMMARY

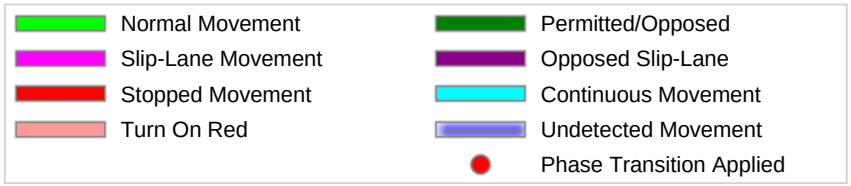
Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: Leading Right Turn
Input Sequence: B, C, D
Output Sequence: B, C, D

Phase Timing Results

Phase	B	C	D
Green Time (sec)	22	6	34
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	28	12	40
Phase Split	35 %	15 %	50 %





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MOVEMENT SUMMARY

Site: Canal Road _ Ricketty Street
2015 PM Peak

Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Burrows Road											
1	L	79	14.7	0.218	23.6	LOS B	1.9	14.6	0.63	0.74	36.7
2	T	44	21.4	0.370	30.5	LOS C	3.2	28.1	0.90	0.72	30.3
3	R	48	32.6	0.370	39.4	LOS C	3.2	28.1	0.90	0.80	29.9
Approach		172	21.5	0.370	29.8	LOS C	3.2	28.1	0.78	0.75	32.8
East: Ricketty Street											
4	L	33	41.9	0.165	24.3	LOS B	0.7	7.1	0.61	0.71	36.9
5	T	1576	3.9	0.975	60.4	LOS E	47.6	344.3	1.00	1.35	21.8
6	R	148	48.2	0.646	24.5	LOS B	3.3	33.0	0.82	0.83	36.9
Approach		1757	8.4	0.975	56.7	LOS E	47.6	344.3	0.98	1.30	22.7
North: Burrows Road											
7	L	258	3.6	1.000[3]	31.3	LOS C	6.8	49.0	0.98	0.83	32.3
8	T	165	32.5	0.780	34.7	LOS C	11.0	84.0	0.98	0.93	28.0
9	R	101	11.5	0.780	42.9	LOS D	11.0	84.0	0.98	0.95	27.8
Approach		524	7.4	1.000	34.6	LOS C	11.0	84.0	0.98	0.88	29.9
West: Canal Road											
10	L	74	18.6	0.121	9.2	LOS A	0.4	3.1	0.23	0.64	48.5
11	T	749	5.9	0.470	17.9	LOS B	10.6	77.6	0.77	0.66	38.3
12	R	42	30.0	0.217	28.4	LOS B	0.9	7.6	0.94	0.73	34.2
Approach		865	8.2	0.470	17.6	LOS B	10.6	77.6	0.73	0.66	38.8
All Vehicles		3318	8.9	1.000	41.6	LOS C	47.6	344.3	0.90	1.04	27.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	19.6	LOS B	0.1	0.1	0.70	0.70
P7	Across W approach	53	33.3	LOS D	0.1	0.1	0.91	0.91
All Pedestrians		106	26.5	LOS C			0.81	0.81

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: Canal Road _ Ricketty Street
2015 PM Peak with + 3 vehicles
site traffic

Four Way Traffic Signal Controlled Intersection
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Burrows Road											
1	L	79	14.7	0.218	23.6	LOS B	1.9	14.6	0.63	0.74	36.7
2	T	44	21.4	0.371	30.5	LOS C	3.2	28.1	0.90	0.72	30.3
3	R	48	32.6	0.371	39.4	LOS C	3.2	28.1	0.90	0.80	29.9
Approach		172	21.5	0.371	29.8	LOS C	3.2	28.1	0.78	0.75	32.8
East: Ricketty Street											
4	L	34	43.8	0.172	24.4	LOS B	0.8	7.4	0.61	0.71	36.9
5	T	1576	3.9	0.975	60.4	LOS E	47.6	344.3	1.00	1.35	21.8
6	R	148	48.2	0.646	24.5	LOS B	3.3	33.0	0.82	0.83	36.9
Approach		1758	8.4	0.975	56.7	LOS E	47.6	344.3	0.98	1.30	22.7
North: Burrows Road											
7	L	258	3.6	1.000[3]	31.3	LOS C	6.8	49.0	0.98	0.83	32.3
8	T	166	34.1	0.785	35.4	LOS C	11.1	85.1	0.99	0.94	27.7
9	R	101	11.5	0.785	43.7	LOS D	11.1	85.1	0.99	0.95	27.6
Approach		525	7.6	1.000	35.0	LOS C	11.1	85.1	0.99	0.89	29.7
West: Canal Road											
10	L	74	18.6	0.121	9.2	LOS A	0.4	3.1	0.23	0.64	48.5
11	T	749	5.9	0.470	17.9	LOS B	10.6	77.6	0.77	0.66	38.3
12	R	43	31.7	0.225	28.5	LOS C	0.9	7.9	0.94	0.73	34.2
Approach		866	8.3	0.470	17.6	LOS B	10.6	77.6	0.73	0.66	38.8
All Vehicles		3321	8.9	1.000	41.7	LOS C	47.6	344.3	0.90	1.04	27.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

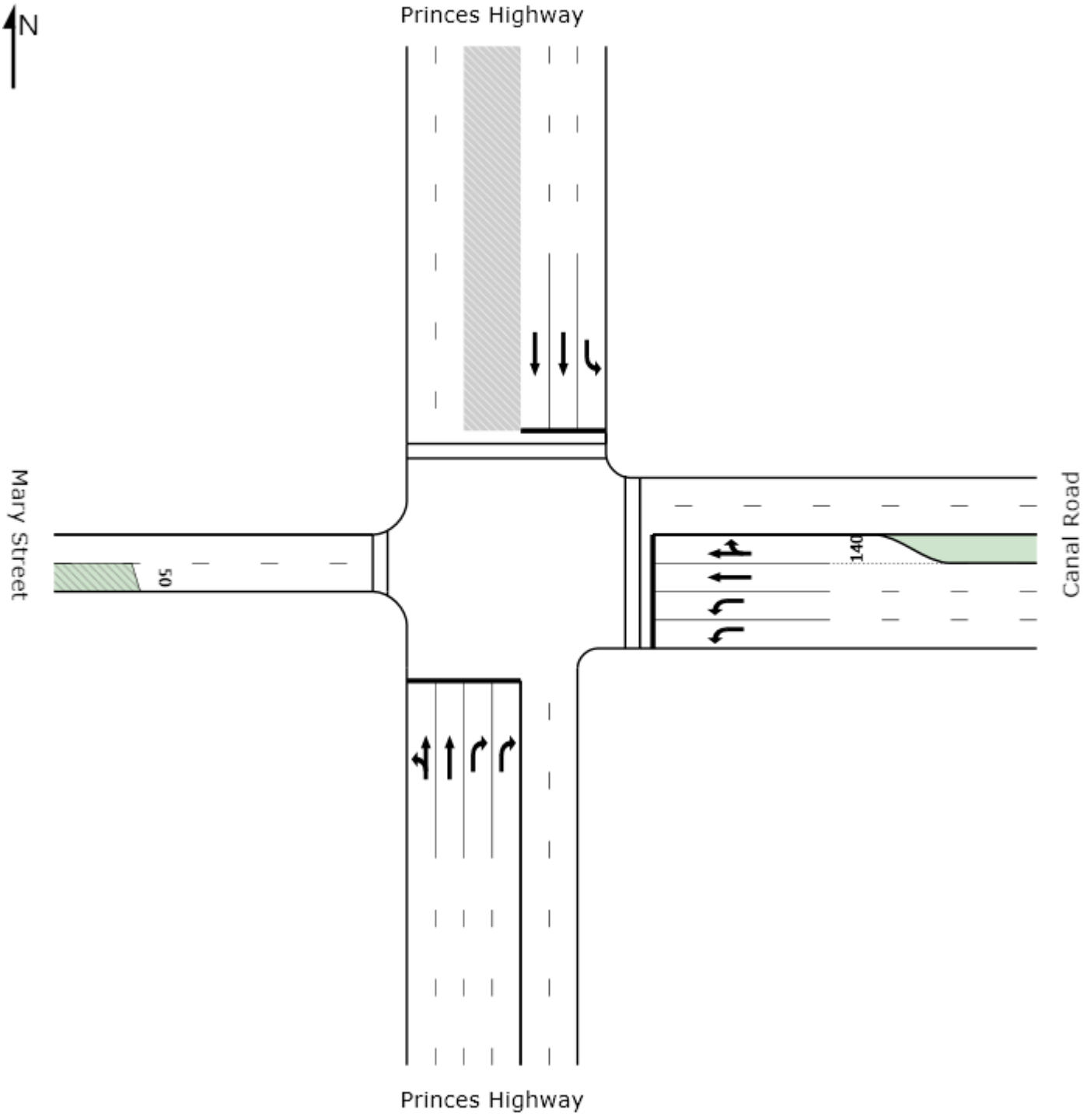
3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	19.6	LOS B	0.1	0.1	0.70	0.70
P7	Across W approach	53	33.3	LOS D	0.1	0.1	0.91	0.91
All Pedestrians		106	26.5	LOS C			0.81	0.81

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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N
Princes Highway
Mary Street
50
140
Canal Road
Princes Highway

PHASING SUMMARY

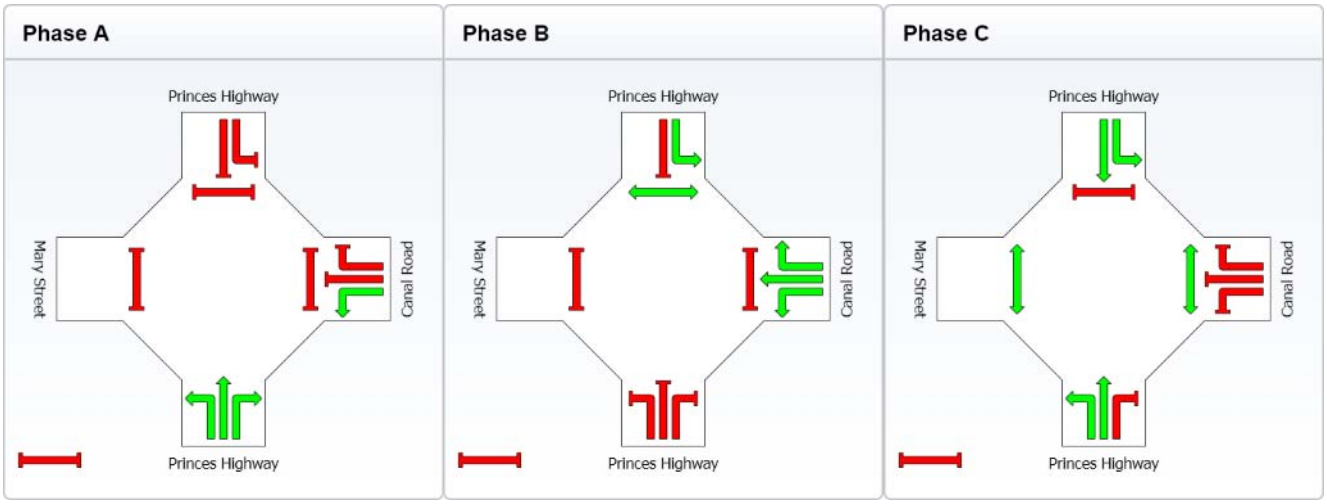
Site: Princes Highway Canal Road Intersection AM Peak

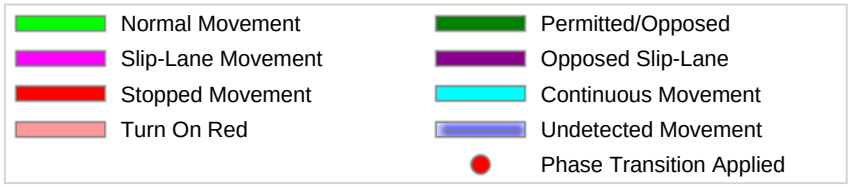
Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	81	27	24
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	87	33	30
Phase Split	58 %	22 %	20 %





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MOVEMENT SUMMARY

Site: Princes Highway Canal Road Intersection AM Peak

Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L	113	0.0	0.549	16.4	LOS B	24.2	172.7	0.48	0.99	41.7
2	T	1442	2.6	0.549	8.9	LOS A	24.3	174.0	0.48	0.44	46.3
3	R	1895	2.9	0.965	73.6	LOS F	85.0	609.7	1.00	1.03	19.9
Approach		3449	2.7	0.965	44.7	LOS D	85.0	609.7	0.76	0.78	26.7
East: Canal Road											
4	L	505	20.4	0.205	14.3	LOS A	5.1	42.0	0.30	0.73	43.7
5	T	399	0.0	1.000[3]	88.1	LOS F	32.3	228.5	0.98	1.01	16.5
6	R	91	4.7	1.000[3]	111.4	LOS F	32.3	228.5	1.00	1.14	15.1
Approach		995	10.8	1.000	52.7	LOS D	32.3	228.5	0.64	0.88	24.0
North: Princes Highway											
7	L	124	1.7	0.178	40.9	LOS C	5.9	42.2	0.70	0.77	28.2
8	T	565	6.1	0.942	90.5	LOS F	24.8	182.9	1.00	1.10	16.7
Approach		689	5.3	0.942	81.5	LOS F	24.8	182.9	0.95	1.04	18.1
All Vehicles		5134	4.6	1.000	51.2	LOS D	85.0	609.7	0.76	0.84	24.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	15	67.2	LOS F	0.1	0.1	0.95	0.95
P5	Across N approach	21	61.7	LOS F	0.1	0.1	0.91	0.91
P7	Across W approach	6	57.2	LOS E	0.0	0.0	0.87	0.87
All Pedestrians		42	63.0	LOS F			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: Princes Highway Canal Road Intersection AM Peak with +3 vehicles site traffic

Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L	113	0.0	0.549	16.4	LOS B	24.2	172.7	0.48	0.99	41.7
2	T	1442	2.6	0.549	8.9	LOS A	24.3	174.0	0.48	0.44	46.3
3	R	1895	2.9	0.965	73.6	LOS F	85.0	609.7	1.00	1.03	19.9
Approach		3449	2.7	0.965	44.7	LOS D	85.0	609.7	0.76	0.78	26.7
East: Canal Road											
4	L	508	20.9	0.207	14.3	LOS A	5.2	42.5	0.31	0.73	43.7
5	T	399	0.0	1.000[3]	88.1	LOS F	32.3	228.5	0.98	1.01	16.5
6	R	91	4.7	1.000[3]	111.4	LOS F	32.3	228.5	1.00	1.14	15.1
Approach		998	11.1	1.000	52.6	LOS D	32.3	228.5	0.64	0.88	24.1
North: Princes Highway											
7	L	124	1.7	0.178	40.9	LOS C	5.9	42.2	0.70	0.77	28.2
8	T	565	6.1	0.942	90.5	LOS F	24.8	182.9	1.00	1.10	16.7
Approach		689	5.3	0.942	81.5	LOS F	24.8	182.9	0.95	1.04	18.1
All Vehicles		5137	4.7	1.000	51.2	LOS D	85.0	609.7	0.76	0.84	24.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

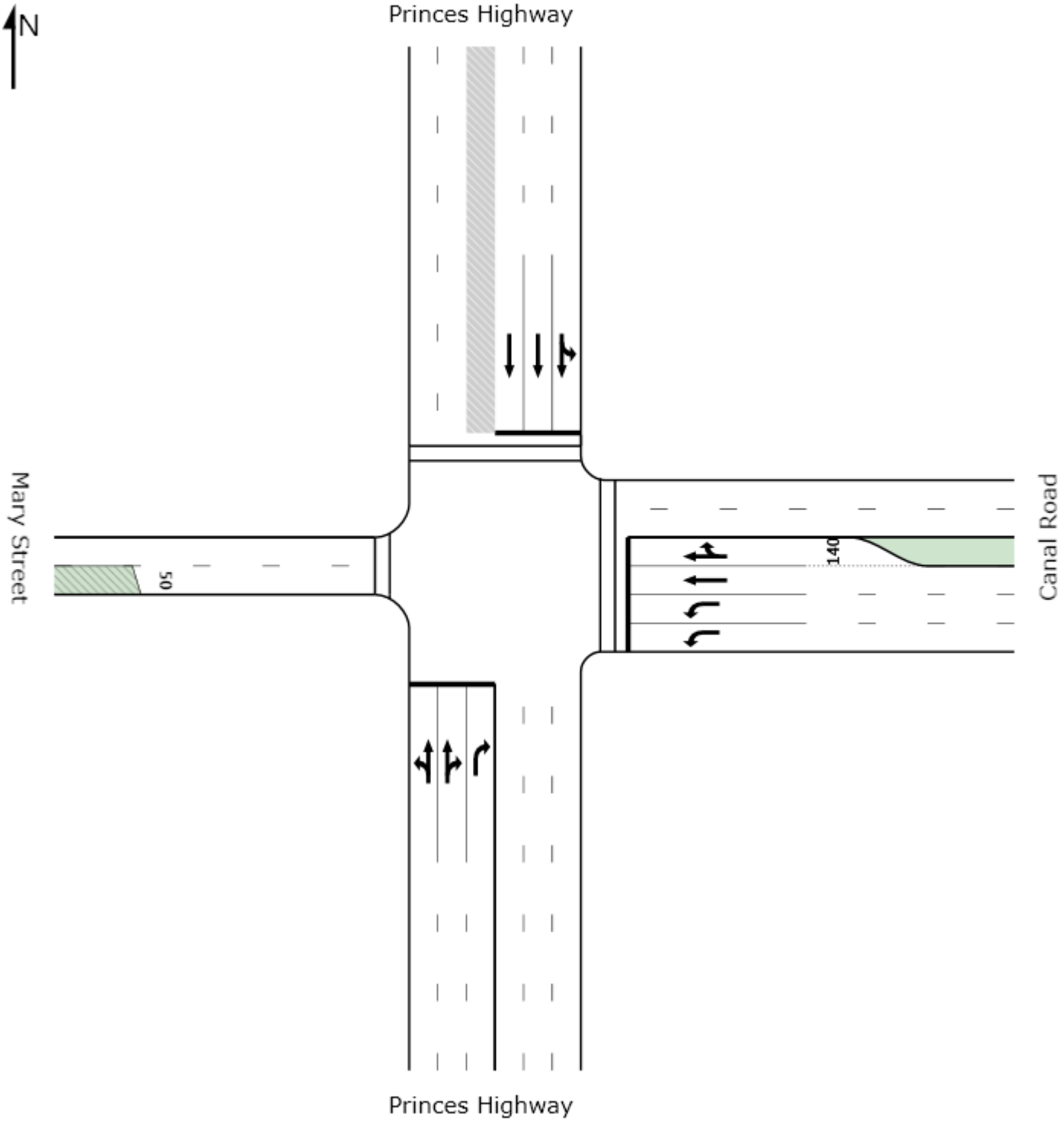
3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	15	67.2	LOS F	0.1	0.1	0.95	0.95
P5	Across N approach	21	61.7	LOS F	0.1	0.1	0.91	0.91
P7	Across W approach	6	57.2	LOS E	0.0	0.0	0.87	0.87
All Pedestrians		42	63.0	LOS F			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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N
Princes Highway
Mary Street
Canal Road
50
140
Princes Highway

PHASING SUMMARY

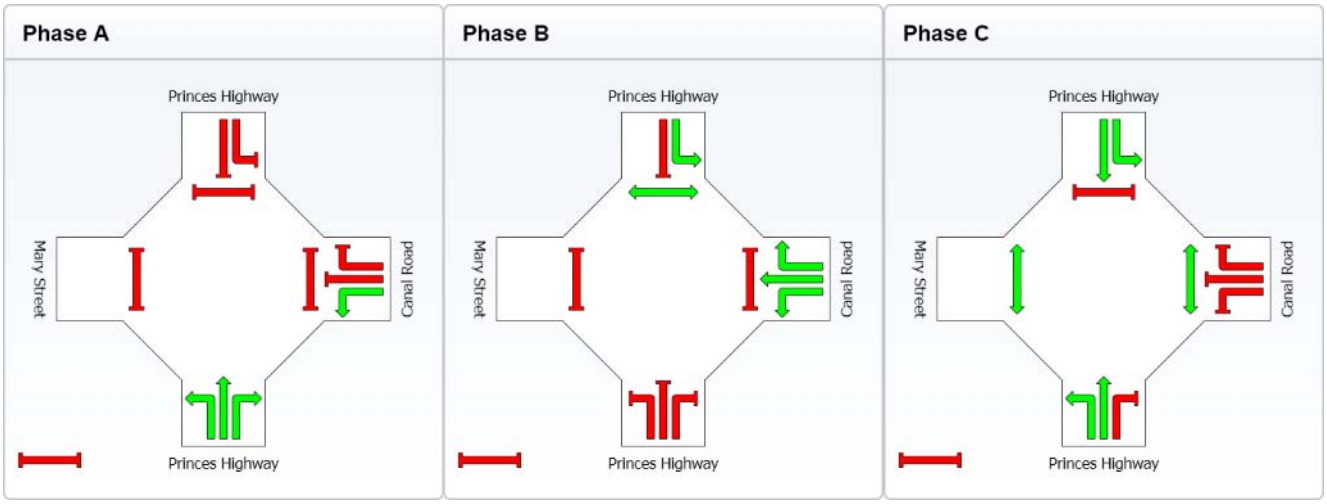
Site: Princes Highway Canal Road Intersection PM Peak

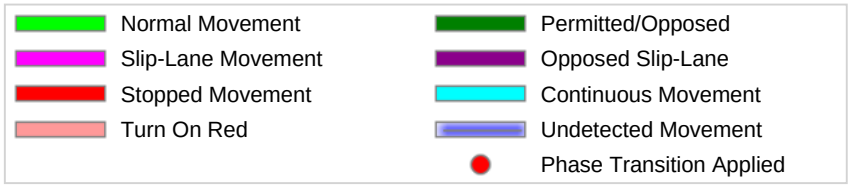
Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	31	28	38
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	37	34	44
Phase Split	32 %	30 %	38 %





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MOVEMENT SUMMARY

Site: Princes Highway Canal Road Intersection PM Peak

Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L	74	0.0	0.753	21.9	LOS B	35.4	252.9	0.74	0.97	38.5
2	T	865	2.6	0.753	14.5	LOS A	35.4	252.9	0.74	0.69	40.6
3	R	894	4.5	0.921	70.7	LOS F	30.2	219.9	1.00	1.02	20.5
Approach		1833	3.4	0.921	42.2	LOS C	35.4	252.9	0.87	0.86	27.4
East: Canal Road											
4	L	1217	4.0	0.596	25.8	LOS B	22.1	160.0	0.71	0.83	35.2
5	T	507	0.0	0.937	59.7	LOS E	30.6	214.3	0.96	1.01	21.3
6	R	89	1.2	0.937	75.6	LOS F	30.6	214.3	1.00	1.14	20.1
Approach		1814	2.7	0.937	37.7	LOS C	30.6	214.3	0.79	0.90	29.0
North: Princes Highway											
7	L	67	0.0	0.937	70.0	LOS E	41.5	295.4	1.00	1.13	21.2
8	T	1719	2.2	0.937	62.0	LOS E	41.5	295.4	1.00	1.13	21.4
Approach		1786	2.1	0.937	62.3	LOS E	41.5	295.4	1.00	1.13	21.4
All Vehicles		5433	2.8	0.937	47.3	LOS D	41.5	295.4	0.89	0.96	25.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	22	37.6	LOS D	0.1	0.1	0.81	0.81
P5	Across N approach	20	43.5	LOS E	0.1	0.1	0.87	0.87
P7	Across W approach	5	29.2	LOS C	0.0	0.0	0.71	0.71
All Pedestrians		47	39.2	LOS D			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: Princes Highway Canal Road Intersection PM with +3 vehicles site traffic

Four Way intersection with Peak Hour Tidal Flow
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Princes Highway											
1	L	74	0.0	0.753	21.9	LOS B	35.4	252.9	0.74	0.97	38.5
2	T	865	2.6	0.753	14.5	LOS A	35.4	252.9	0.74	0.69	40.6
3	R	897	4.8	0.927	72.2	LOS F	30.7	224.1	1.00	1.03	20.2
Approach		1836	3.6	0.927	43.0	LOS D	35.4	252.9	0.87	0.87	27.1
East: Canal Road											
4	L	1217	4.0	0.596	25.8	LOS B	22.1	160.0	0.71	0.83	35.2
5	T	507	0.0	0.937	59.7	LOS E	30.6	214.3	0.96	1.01	21.3
6	R	89	1.2	0.937	75.6	LOS F	30.6	214.3	1.00	1.14	20.1
Approach		1814	2.7	0.937	37.7	LOS C	30.6	214.3	0.79	0.90	29.0
North: Princes Highway											
7	L	67	0.0	0.937	70.0	LOS E	41.5	295.4	1.00	1.13	21.2
8	T	1719	2.2	0.937	62.0	LOS E	41.5	295.4	1.00	1.13	21.4
Approach		1786	2.1	0.937	62.3	LOS E	41.5	295.4	1.00	1.13	21.4
All Vehicles		5436	2.8	0.937	47.6	LOS D	41.5	295.4	0.89	0.97	25.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	22	37.6	LOS D	0.1	0.1	0.81	0.81
P5	Across N approach	20	43.5	LOS E	0.1	0.1	0.87	0.87
P7	Across W approach	5	29.2	LOS C	0.0	0.0	0.71	0.71
All Pedestrians		47	39.2	LOS D			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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