Widemere Recycling Facility

Environmental Impact Statement
Appendices A - F

Prepared for Boral Recycling Pty Ltd | 29 May 2015

Planning + Environment + Acoustics

Appendix A

Agency requirements

Development Assessment Systems & Approvals
Industry, Key Sites & Social Projects
Contact: David Mooney
Phone: (02) 9228 2040
Fax: (02) 9228 6566
Email: david.mooney@planning.nsw.gov.au

Mrs Kate Jackson
Boral Recycling Pty Ltd
Lot 107 Clunies Ross Street
PROSPECT NSW 2148

Ref: SSD 6525

Dear Mrs Jackson

State Significant Development – Environmental Assessment Requirements
Boral Recycling Facility, Wetherill Park (SSD 6525)

I have attached a copy of the Secretary's environmental assessment requirements (EARs) for the preparation of an Environmental Impact Statement (EIS) for the proposed increase of processing capacity at Boral's recycling facility at Wetherill Park.

These requirements are based on the information you have provided to date and have been prepared in consultation with the relevant government agencies and Fairfield City Council. The agency and Council comments, which you should address appropriately when preparing the EIS, are also attached (see **Attachment 2**). Please note that the department may alter these EARs at any time, and that you must consult further with the department if you do not lodge a development application and EIS for the development within two years of the date of issue of the EARs.

The proposed development may require a separate approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). If an EPBC Act approval is required, you should advise the department. The Commonwealth approval process may be integrated into the NSW approval process and in which case supplementary EARs may need to be issued.

The department will review the EIS for the proposed development before placing it on public exhibition. If the department considers that the EIS does not adequately address the EARs, you may be required to submit an amended EIS.

I wish to emphasise the importance of effective and genuine community consultation and the need for a proactive approach to community concerns. A comprehensive, detailed and genuine community consultation process must be undertaken during preparation of the EIS. This process must ensure that the community is informed of the proposal and is actively engaged with the issues of concern to it. Sufficient and accurate information must be provided to the community so that it has a good understanding of the proposal and the potential impacts.

I would appreciate it if you would contact the department at least two weeks before you intend to submit the DA and EIS for the proposed development to determine the appropriate application fee and to make suitable arrangements for the review and subsequent public exhibition of the EIS.

If you have any enquiries about these requirements, please contact David Mooney on the details above.

Yours sincerely

17/6/14

Daniel Keary
Director
Industry, Key Sites & Social Projects
as the Secretary's nominee

Secretary's Environmental Assessment Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

State Significant Development

Application Number	SSD 6525
Development	Proposed increase to maximum recycling rate to 1 million tonnes per year
Location	Lot 107 Clunies Ross Street, Prospect
Applicant	Boral Recycling Pty Ltd
Date of Issue	17 June 2014
General Requirements	The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In addition, the EIS must include a: • detailed description of the development, including: – need for the proposed development; – justification for the proposed development; – likely staging of the development; – likely interactions between the development and existing, approved and proposed operations in the vicinity of the site; and – plans of any proposed works. • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: – a description of the existing environment, <u>using sufficient baseline data</u>; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and – a description of the measures that would be implemented to avoid, minimise, mitigate and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage significant risks to the environment; and • consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS. The EIS must also be accompanied by a report from a qualified quantity surveyor providing: • a detailed calculation of the capital investment value (CIV) of the proposal as defined in clause 3 of the *Environmental Planning and Assessment Regulation 2000*, including details of all components of the CIV; and • a close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and certification that the information provided is accurate at the date of preparation.
Key Issues	The EIS must address the following specific matters: • **strategic context** – including: – detailed justification for the proposal and suitability of the site; and – demonstration that the proposal is generally consistent with all relevant planning strategies including the relevant *NSW Waste Avoidance and Resource Recovery Strategy*, environmental planning instruments, development control plans (DCPs), and justification for any inconsistencies.

	• **waste management** – including: - identification and classification of waste streams that would be transported to and from, stored, handled, processed and disposed of at the facility; - description of proposed waste transport, storage, handling, processing; and disposal; and - description of potential impacts and impact mitigation associated with transporting, storing, handling, processing and disposing of waste. • **soils and water** - including: - description of the water demands and a breakdown of water supplies including any water licensing requirements; - a detailed water balance; - description of the measures to minimise water use; - description of the construction erosion and sediment controls; - a description of the surface and stormwater management system, including on site detention, and measures to treat or reuse water; - an assessment of potential surface and groundwater impacts associated with the development, including impacts to flooding, Prospect Creek, groundwater dependent ecosystems, and potentially affected groundwater users; - details of impact mitigation, management and monitoring measures; and - an assessment of any potential existing soil contamination. • **wastewater** – including: - a detailed description of the wastewater treatment process for the development including details of the volume of wastewater generated, treated, reused/recycled, or stored on site; and - details of the key pollutant concentrations of the wastewater before and after treatment with reference to relevant water quality guidelines. • **air quality and odour** - including: - description of all potential air emission and odour sources; - a comprehensive air quality assessment of all potential air quality and odour impacts from the development, including details of air quality and odour impacts on private properties, in accordance with relevant Environment Protection Authority guidelines; and - details of mitigation, management and monitoring measures for preventing and/or minimising both point and fugitive emissions. • **noise and vibration** – including: - description of all potential noise and vibration sources such as construction, operational and traffic noise; - a comprehensive noise and vibration impact assessment including cumulative impact assessment in accordance with relevant Environment Protection Authority guidelines; and - details of noise mitigation, management and monitoring measures. • **traffic and transport** – including: - details of all traffic and transport predictions for the development during construction and operation, including a description of haul routes; - details on access to the site from the road network including intersection location, design and sight distance; - an assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project; - plans of any road upgrades, rail and other infrastructure works or new roads required for the development; and - detailed plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards. • **hazards and risk** – including a risk screening and if necessary a Preliminary Hazard Analysis (PHA) in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis and Multi-Level Risk Assessment. • **flora and fauna** – including an assessment of the potential impacts to threatened species, populations and communities, and their habitat(s), and if required describe how the principles of "avoid, mitigate, offset" have been

	used to minimise the impacts of the proposal on biodiversity. • **heritage and Aboriginal cultural heritage;** • **socio-economic** – including an analysis of the economic and social impacts of the development, demonstrating that it would have a new benefit for the community, and paying particular attention to the potential effects on waste minimisation and resource recovery in the region. • **visual impacts** – including: - an assessment of impacts (using photomontages) to views from public vantage points; and - a description of visual impact mitigation measures such as landscaping. • **greenhouse gas** – including: – a quantitative assessment of the potential Scope 1 and 2 greenhouse gas emissions of the development, and a qualitative assessment of the potential impacts of these emissions on the environment; and – a detailed description of the measures that would be implemented on site to ensure that the development is energy efficient. • **cumulative impacts** – particularly in relation to air, noise and traffic associated with other nearby industrial or commercial operations.
Plans and Documents	The EIS must include all plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*. These documents should be included as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups or affected landowners. In particular you must consult with: • Environmental Protection Authority; • Department of Primary Industries; • Fairfield City Council; and • local community and other stakeholders. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge an EIS for the development within 2 years of the issue date of these EARs, you must consult with the Secretary in relation to the requirements for lodgement.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.

ATTACHMENT 1
Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au,
http://www.bookshop.nsw.gov.au,
http://www.publications.gov.au

Policies, Guidelines & Plans

Aspect	Policy /Methodology
Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)
	Action for Air (DECC)
Odour	
	Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW (DEC)
	Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC)
Waste	
	Waste Avoidance and Resource Recovery Strategy 2007 (DECC)
	Waste Classification Guidelines (DECC)
	Environmental Guidelines: Assessment Classification and Management of Non-Liquid and Liquid Waste (NSW EPA)
	Environmental guidelines: Composting and Related Organics Processing Facilities (DEC)
	Environmental guidelines: Use and Disposal of Biosolid Products (NSW EPA)
	Composts, soil conditioners and mulches (Standards Australia, AS 4454)
Soil and Water	
Soil	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC)
	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC)
	Draft Guidelines for the Assessment & Management if Groundwater Contamination (DECC)
	State Environmental Planning Policy No. 55 – Remediation of Land
	Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land (DOP)
Surface Water	National Water Quality Management Strategy: Water quality management - an outline of the policies (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Policies and principles - a reference document (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)

	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	State Water Management Outcomes Plan
	NSW Government Water Quality and River Flow Environmental Objectives (DECC)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment
	Managing Urban Stormwater: Soils & Construction (Landcom)
	Managing Urban Stormwater: Treatment Techniques (DECC)
	Managing Urban Stormwater: Source Control (DECC)
	Technical Guidelines: Bunding & Spill Management (DECC)
Groundwater	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC)
	NSW State Groundwater Quality Protection Policy (DLWC)
	NSW State Groundwater Quantity Management Policy (DLWC) Draft
	Guidelines for the Assessment and Management of Groundwater Contamination (DECC)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Noise	
	NSW Industrial Noise Policy (EPA, 2000) and Industrial Noise Policy Application Notes
	NSW Road Noise Policy (EPA, 2011)
	Environmental Noise Control Manual (DECC)
	Interim Construction Noise Guideline (DEDCC, 2009)
	Assessing Vibration: a Technical Guide (DEC, 2006)
	Interim Guidelines: Assessment of Noise from Rail Infrastructure Projects
	Rail Infrastructure Noise Guideline draft for Consultation
	Other Rail Noise: http://www.environment.nsw.gov.au/noise/railnoise.htm
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines (DUAP)
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
Biodiversity	
	Principles for the use of Biodiversity Offsets in NSW (DECC 2008);
	OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State Significant Development (SSD) and State Significant Infrastructure (SSI) projects
	State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44)
	Draft Guidelines for Threatened Species Assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (DEC)
	Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)
	The NSW State Groundwater Dependent Ecosystem Policy (DLWC)
Visual	
	Control of Obtrusive Effects of Outdoor Lighting (Standards Australia, AS 4282)
	State Environmental Planning Policy No 64 - Advertising and Signage

Greenhouse Gas	
	AGO Factors and Methods Workbook (AGO)
	Guidelines for Energy Savings Action Plans (DEUS, 2005)
Heritage	
Aboriginal	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC)
Non- Aboriginal	NSW Heritage Manual (NSW Heritage Office & DUAP)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)

ATTACHMENT 2

Agency EIS Requirements

David Mooney

From: Andrew Helman <andrew.helman@trade.nsw.gov.au>
Sent: Thursday, 22 May 2014 11:32 AM
To: David Mooney
Subject: Request for EARs (SSD 6252) Boral Recycling Facility - Mineral Resources

David,

Thank you for the opportunity to comment on SSD 6252. As the proposal does not impact on access to identified mineral resources, NSW Trade & Investment - Mineral Resources Branch has no Environmental Assessment Requirements to issue.

Regards,

Andrew Helman | Geoscientist - Minerals and Land Use Assessment
NSW Trade & Investment | Division of Resources and Energy
516 High Street | Maitland NSW 2320 | PO Box 344 | Hunter Region Mail Centre NSW 2310
T: 02 49 31 6572 | E: andrew.helman@trade.nsw.gov.au
W: www.trade.nsw.gov.au | www.resourcesandenergy.nsw.gov.au

David Mooney

From: JEGATHESAN Jana <Jana.JEGATHESAN@rms.nsw.gov.au>
Sent: Monday, 2 June 2014 9:21 AM
To: David Mooney
Subject: RE: Request for Environmental Assessment Requirements (SSD 6252) - Boral Widemere, Fairfield Council area

Hi David,

Roads and Maritime has reviewed the above subject application and raises no object to the proposal.

Regards,

Jana

From: David Mooney [mailto:David.Mooney@planning.nsw.gov.au]
Sent: Tuesday, 20 May 2014 2:11 PM
To: mail@fairfieldcity.nsw.gov.au; Development Sydney; landuse.enquiries@spi.nsw.gov.au; referrals; planning.matters@environment.nsw.gov.au; waste.operations@environment.nsw.gov.au
Subject: Request for Environmental Assessment Requirements (SSD 6252) - Boral Widemere, Fairfield Council area

Hello all,

The Department has received a request for the Secretary's environmental assessment requirements (EARs) from Boral for a proposal to increase the annual capacity of its waste management facility at Widemere Road, Wetherill Park. The proposal is State Significant Development under State Environmental Planning Policy (State and Regional Development) 2011 because it proposes to handle more than 100,000 tonnes per year of waste.

I have attached a copy of the application and Boral's Preliminary Environmental Assessment for the proposal for you perusal. The Department now requests any comments or advice you may have, which may be included in the EARs for the preparation of an Environmental Impact Statement.

Please provide by return email any comments are advice you may have by **Tuesday, 3 June 2014**.

Please feel welcome to 'phone or email if you have any questions.

Regards,

David Mooney | Senior Planner
Industry, Key Sites & Social Projects | Department of Planning and Environment
23-33 Bridge Street SYDNEY 2000 | GPO Box 39 SYDNEY 2001
t: 02 9228 2040 | e: david.mooney@planning.nsw.gov.au

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David Mooney

From: Marnie Stewart <Marnie.Stewart@environment.nsw.gov.au>
Sent: Wednesday, 28 May 2014 4:38 PM
To: David Mooney
Subject: SSD 6252 Boral Widemere - Request for EARs

Hi David

Please be advised that OEH will not be providing any comments in regard to SSD 6252 - Request for Secretary's EARs for the Boral Widemere project.

Regards,

Marnie Stewart
Senior Regional Operations Officer
Regional Operations
Office of Environment and Heritage
NSW Department of Premier and Cabinet
T: 02 9995 6868
F: 02 9995 6900
W: www.environment.nsw.gov.au
Please note my work days are Tues, Wed and Thurs

The Department of Planning and Environment
SYDNEY NSW 2001

Attention: David Mooney

Notice Number	1522325
File Number	EF14/10073
Date	02-Jun-2014

RE: Proposed increase in processing - Request for key issues and assessment requirements - State Significant Development 6252 - Boral Recycling facility Widemere, Wetherill Park (SSD - 6252)

I refer to your request for the Director-General's Requirements including the preliminary environmental impact statement ("the Proposal") prepared by EMGA Mitchell McLennan ("EMM") on behalf of Boral Recycling Pty Ltd ("the Proponent") dated 8 May 2014, received by the Environment Protection Authority ("EPA") on 20 May 2014. The Proposal is in respect to the facility located at 38 Widemere Road, Wetherill Park NSW 2164.

The EPA has considered the details of the Proposal as provided by the Department of Planning and Environment ("DoPE") and has identified the information it requires to assess the project (see **Attachment A**). The Proponent should ensure that the Environmental Assessment ("EA") is sufficiently comprehensive to enable the EPA to determine the extent of the impact(s) of the Proposal.

The key issues requiring assessment for this project are summarised below:

1. Air quality (including dust, odour, other air emissions assessment modelling and management);
2. Noise Impacts (including noise assessment modeling and mitigation);
3. Waste acceptance, storage, processing, reuse, management and disposal;
4. Spoil and contamination, and;
5. Surface waste and waste water management, (including surface water controls and impact on waterways and water supply.

In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in **Attachment B** and any relevant industry codes of practice and best practice management guidelines.

Please note that this response does not cover biodiversity or aboriginal cultural heritage issues which are the responsibly of the Office of Environment and Heritage.

The Proponent should be made aware that nay commitments made in the EA may be formalised as approved conditions and may also be placed as formal licence conditions.

The proponent should be made aware that, consistent with previsions under part 9.4 of the *Protection of the Environment Operations Act 1997* ("the Act") the EPA may require the provision of financial assurance and or assurances. The amount and form of the assurance(s) would be determined by the EPA and require as a condition of an Environment Protection Licence ("EPL").

In addition, as a require of an EPL, the EPA will require the Proponent to prepare, test and implement a Pollution Incident Response Management Plan and or Plans in accordance with Section 153A of the Act.

The EPA requests that an electronic copy of the EA be submitted for assessment. This document should be sent to waste.operations@epa.nsw.gov.au

If you have any questions about this matter please contact Mr Damien Smith on (02) 9995 6289

Yours sincerely

Celeste Forestal

Acting Unit Head

Waste & Resources - Waste Management

(by Delegation)

ATTACHMENT A: EA REQUIREMENTS FOR

BORAL RECYCLING PTY LTD

How to use these requirements

The EPA suggests that the EA follow this structure:

A. Executive summary

B. The proposal

C. The location

D. Identification and prioritisation of issues

E. The environmental issues

F. List of approvals and licences

G. Compilation of mitigation measures

H. Justification for the proposal

A Executive summary

The executive summary should include a brief discussion of the extent to which the proposal achieves identified environmental outcomes.

B The proposal

1. Objectives of the proposal

- The objectives of the proposal should be clearly stated and refer to:
  a) the size and type of the operation, the nature of the processes and the products, by-products and wastes produced
  b) a life cycle approach to the production, use or disposal of products
  c) the anticipated level of performance in meeting required environmental standards and cleaner production principles
  d) the staging and timing of the proposal and any plans for future expansion
  e) the proposal's relationship to any other industry or facility.

2. Description of the proposal

General

- Outline the production process including:
  a) the environmental "mass balance" for the process – quantify in-flow and out-flow of materials, any points of discharge to the environment and their respective destinations (sewer, stormwater, atmosphere, recycling, landfill etc)
  b) any life-cycle strategies for the products.
- Outline cleaner production actions, including:
  a) measures to minimise waste (typically through addressing source reduction)
  b) proposals for use or recycling of by-products
  c) proposed disposal methods for solid and liquid waste
  d) air management systems including all potential sources of air emissions, proposals to re-use or treat emissions, emission levels relative to relevant standards in regulations, discharge points
  e) water management system including all potential sources of water pollution, proposals for re-use, treatment etc, emission levels of any wastewater discharged, discharge points, summary of options explored to avoid a discharge, reduce its frequency or reduce its impacts, and rationale for selection of option to discharge.
  f) soil contamination treatment and prevention systems.
- Outline construction works including:
  a) actions to address any existing soil contamination
  b) any earthworks or site clearing; re-use and disposal of cleared material (including use of spoil on-site)
  c) construction timetable and staging; hours of construction; proposed construction methods

d) environment protection measures, including noise mitigation measures, dust control measures and erosion and sediment control measures.

Air

- Provide a quantitative assessment of the dust emissions from the current onsite activities. Identify the current dust emission sources and mitigation measures (including site maps with the area of effect of these measures) and provide a quantitative assessment of the effectiveness of these controls.
- Identify the proposed changes to be made to dust emissions sources and dust emission controls under this proposal. Detail the effectiveness of any mitigation measures to address any increased impacts of the proposal.
- Identify all sources of air emissions from the development.

  Note: emissions can be classed as either:

  - *point (eg emissions from stack or vent) or*
  - *fugitive (from wind erosion, leakages or spillages, associated with loading or unloading, conveyors, storage facilities, plant and yard operation, vehicle movements (dust from road, exhausts, loss from load), land clearing and construction works).*
- Provide details of the project that are essential for predicting and assessing air impacts including:

  a) the quantities and physio-chemical parameters (eg concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored

  b) an outline of procedures for handling, transport, production and storage

  c) the management of solid, liquid and gaseous waste streams with potential for significant air impacts.

Noise and vibration

- Identify all noise sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials.
- Specify the times of operation for all phases of the development and for all noise producing activities.
- Specify the activities that will be undertaken during the proposed times of operation.
- For projects with a significant potential traffic noise impact provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to a scale sufficient to delineate individual residential blocks.

Water

- Provide details of the project that are essential for predicting and assessing impacts to waters:

  a) including the quantity and physio-chemical properties of all potential water pollutants and the risks they pose to the environment and human health, including the risks they pose to Water Quality

Objectives in the ambient waters (as defined on www.environment.nsw.gov.au/ieo, using technical criteria derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC 2000)

b) the management of discharges with potential for water impacts

c) drainage works and associated infrastructure; land-forming and excavations; working capacity of structures; and water resource requirements of the proposal.

- Outline site layout, demonstrating efforts to avoid proximity to water resources (especially for activities with significant potential impacts eg effluent ponds) and showing potential areas of modification of contours, drainage etc.
- Outline how total water cycle considerations are to be addressed showing total water balances for the development (with the objective of minimising demands and impacts on water resources). Include water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

Waste and chemicals

- Provide details of the quantity and type of both liquid waste and non-liquid waste generated, handled, processed or disposed of at the premises. Waste must be classified according to the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (NSW EPA, 1999).
- Provide details of liquid waste and non-liquid waste management at the facility, including:
    a) the transportation, assessment and handling of waste arriving at or generated at the site
    b) any stockpiling of wastes or recovered materials at the site
    c) any waste processing related to the facility, including reuse, recycling, reprocessing (including composting) or treatment both on- and off-site
    d) the method for disposing of all wastes or recovered materials at the facility
    e) the emissions arising from the handling, storage, processing and reprocessing of waste at the facility
    f) the proposed controls for managing the environmental impacts of these activities.
- Provide details of spoil disposal with particular attention to:
    a) the quantity of spoil material likely to be generated
    b) proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil
    c) the need to maximise reuse of spoil material in the construction industry
    d) identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material
    e) designation of transportation routes for transport of spoil.
- Provide details of procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of at the site, in addition to the requirements for liquid and non-liquid wastes.
- Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.
- Reference should be made to the guidelines: *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (NSW EPA, 1999).

ESD

- Demonstrate that the planning process and any subsequent development incorporates objectives and mechanisms for achieving ESD, including an assessment of a range of options available for use of the resource, including the benefits of each option to future generations:
    a) proper valuation and pricing of environmental resources
    b) identification of who will bear the environmental costs of the proposal.

3. Rehabilitation

- Outline considerations of site maintenance, and proposed plans for the final condition of the site (ensuring its suitability for future uses).

4. Consideration of alternatives and justification for the proposal

- Consider the environmental consequences of adopting alternatives, including alternative:
  a) sites and site layouts
  b) access modes and routes
  c) materials handling and production processes
  d) waste and water management
  e) impact mitigation measures
  f) energy sources
- Selection of the preferred option should be justified in terms of:
  a) ability to satisfy the objectives of the proposal
  b) relative environmental and other costs of each alternative
  c) acceptability of environmental impacts and contribution to identified environmental objectives
  d) acceptability of any environmental risks or uncertainties
  e) reliability of proposed environmental impact mitigation measures
  f) efficient use (including maximising re-use) of land, raw materials, energy and other resources.

C The location

1. General

- Provide an overview of the affected environment to place the proposal in its local and regional environmental context including:
  a) meteorological data (eg rainfall, temperature and evaporation, wind speed and direction)
  b) topography (landform element, slope type, gradient and length)
  c) surrounding land uses (potential synergies and conflicts)
  d) geomorphology (rates of landform change and current erosion and deposition processes)
  e) soil types and properties (including erodibility; engineering and structural properties; dispersibility; permeability; presence of acid sulfate soils and potential acid sulfate soils)
  f) ecological information (water system habitat, vegetation, fauna)
  g) availability of services and the accessibility of the site for passenger and freight transport.

2. Air

- Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.
- Describe surrounding buildings that may effect plume dispersion.
- Provide and analyse site representative data on following meteorological parameters:
  a) temperature and humidity
  b) rainfall, evaporation and cloud cover
  c) wind speed and direction
  d) atmospheric stability class
  e) mixing height (the height that emissions will be ultimately mixed in the atmosphere)
  f) katabatic air drainage
  g) air re-circulation.

3. Noise and vibration

- Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals. Typically the location of any noise sensitive locations in relation to the site should be included on a map of the locality.
- Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.

4. Water

- Describe the catchment including proximity of the development to any waterways and provide an assessment of their sensitivity/significance from a public health, ecological and/or economic perspective. The Water Quality and River Flow Objectives on the website: www.environment.nsw.gov.au/ieo should be used to identify the agreed environmental values and human uses for any affected waterways. This will help with the description of the local and regional area.

5. Soil Contamination Issues

- Provide details of site history – if earthworks are proposed, this needs to be considered with regard to possible soil contamination, for example if the site was previously a landfill site or if irrigation of effluent has occurred.

D Identification and prioritisation of issues / scoping of impact assessment

- Provide an overview of the methods used to identify and prioritise issues. The methods should take into account:
  a) relevant NSW government guidelines
  b) industry guidelines
  c) EAs for similar projects
  d) relevant research and reference material
  e) relevant preliminary studies or reports for the proposal
  f) consultation with stakeholders.
- Provide a summary of the outcomes of the process including:
  a) all issues identified including local, regional and global impacts (eg increased/ decreased greenhouse emissions)
  b) key issues which will require a full analysis (including comprehensive baseline assessment)
  c) issues not needing full analysis though they may be addressed in the mitigation strategy
  d) justification for the level of analysis proposed (the capacity of the proposal to give rise to high concentrations of pollution compared with the ambient environment or environmental outcomes is an important factor in setting the level of assessment).

E The environmental issues

1. General

- The potential impacts identified in the scoping study need to be assessed to determine their significance, particularly in terms of achieving environmental outcomes, and minimising environmental pollution.
- Identify gaps in information and data relevant to significant impacts of the proposal and any actions proposed to fill those information gaps so as to enable development of appropriate management and mitigation measures. This is in accordance with ESD requirements.

  Note: The level of detail should match the level of importance of the issue in decision making which is dependent on the environmental risk.

Describe baseline conditions

- Provide a description of existing environmental conditions for any potential impacts.

Assess impacts

- For any potential impacts relevant for the assessment of the proposal provide a detailed analysis of the impacts of the proposal on the environment including the cumulative impact of the proposal on the receiving environment especially where there are sensitive receivers.
- Describe the methodology used and assumptions made in undertaking this analysis (including any modelling or monitoring undertaken) and indicate the level of confidence in the predicted outcomes and the resilience of the environment to cope with the predicted impacts.
- The analysis should also make linkages between different areas of assessment where necessary to enable a full assessment of environmental impacts eg assessment of impacts on air quality will often need to draw on the analysis of traffic, health, social, soil and/or ecological systems impacts; etc.
- The assessment needs to consider impacts at all phases of the project cycle including: exploration (if relevant or significant), construction, routine operation, start-up operations, upset operations and decommissioning if relevant.
- The level of assessment should be commensurate with the risk to the environment.

Describe management and mitigation measures

- Describe any mitigation measures and management options proposed to prevent, control, abate or mitigate identified environmental impacts associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- Proponents are expected to implement a ‘reasonable level of performance’ to minimise environmental impacts. The proponent must indicate how the proposal meets reasonable levels of performance. For example, reference technology based criteria if available, or identify good practice for this type of activity or development. A ‘reasonable level of performance’ involves adopting and implementing technology and management practices to achieve certain pollutant emissions levels in economically

viable operations. Technology-based criteria evolve gradually over time as technologies and practices change.

- Use environmental impacts as key criteria in selecting between alternative sites, designs and technologies, and to avoid options having the highest environmental impacts.
- Outline any proposed approach (such as an Environmental Management Plan) that will demonstrate how commitments made in the EA will be implemented. Areas that should be described include:

  a) operational procedures to manage environmental impacts
  b) monitoring procedures
  c) training programs
  d) community consultation
  e) complaint mechanisms including site contacts
  f) strategies to use monitoring information to improve performance
  g) strategies to achieve acceptable environmental impacts and to respond in event of exceedences.

1. Air

Describe baseline conditions

- Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data. This description should include an assessment of dust particulate matter.

Assess impacts

- Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source and discharge point.
- Estimate the resulting ground level concentrations of all pollutants. Where necessary (eg potentially significant impacts and complex terrain effects), use an appropriate dispersion model to estimate ambient pollutant concentrations. Discuss choice of model and parameters with the EPA.
- Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.
- Describe the contribution that the development will make to regional and global pollution, particularly in sensitive locations.
- For potentially odorous emissions provide the emission rates in terms of odour units (determined by techniques compatible with EPA procedures). Use sampling and analysis techniques for individual or complex odours and for point or diffuse sources, as appropriate.
- Glass sourced from waste collection can contain a significant portion of putrescible residues. The EPA has taken regulatory action at other licenced premises where the activity of handling and processing glass has created offsite offensive odour impacts.

a) The EPA recommends that the modelling of odour impacts include emissions from the receival, storage and handling of glass sourced from waste collection processes or from the intermediary Material Recycling Facilities.

Note: With dust and odour, it may be possible to use data from existing similar activities to generate emission rates.

- Reference should be made to *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001)*; Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA, 2001)*; Assessment and Management of Odour from Stationary Sources in NSW* (EPA, 2001)*; Technical Notes: Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW (EPA, 2001)*.

Describe management and mitigation measures

- Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.

2. Noise and vibration

Describe baseline conditions

- Determine the existing background (LA90) and ambient (LAeq) noise levels in accordance with the *NSW Industrial Noise Policy*.
- Determine the existing road traffic noise levels in accordance with the *NSW Environmental Criteria for Road Traffic Noise*, where road traffic noise impacts may occur.
- The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including:
  a) details of equipment used for the measurements
  b) a brief description of where the equipment was positioned
  c) a statement justifying the choice of monitoring site, including the procedure used to choose the site, having regards to the definition of 'noise sensitive locations(s)' and 'most affected locations(s)' described in Section 3.1.2 of the *NSW Industrial Noise Policy*
  d) details of the exact location of the monitoring site and a description of land uses in surrounding areas
  e) a description of the dominant and background noise sources at the site
  f) day, evening and night assessment background levels for each day of the monitoring period
  g) the final Rating Background Level (RBL) value
  h) graphs of the measured noise levels for each day should be provided

i) a record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and a statement indicating the need for any re-monitoring under Step 1 in Section B1.3 of the *NSW Industrial Noise Policy*

j) determination of LAeq noise levels from existing industry.

Assess impacts

- Determine the project specific noise levels for the site. For each identified potentially affected receiver, this should include:

  a) determination of the intrusive criterion for each identified potentially affected receiver

  b) selection and justification of the appropriate amenity category for each identified potentially affected receiver

  c) determination of the amenity criterion for each receiver

  d) determination of the appropriate sleep disturbance limit.

- Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible affects on sleep. Where LA1(1min) noise levels from the site are less than 15 dB above the background LA90 noise level, sleep disturbance impacts are unlikely. Where this is not the case, further analysis is required. Additional guidance is provided in Appendix B of the *NSW Environmental Criteria for Road Traffic Noise*.

- Determine expected noise level and noise character (eg tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during:

  a) site establishment

  b) construction

  c) operational phases

  d) transport including traffic noise generated by the proposal

  e) other services.

  Note: The noise impact assessment report should include noise source data for each source in 1/1 or 1/3 octave band frequencies including methods for references used to determine noise source levels. Noise source levels and characteristics can be sourced from direct measurement of similar activities or from literature (if full references are provided).

- Determine the noise levels likely to be received at the most sensitive locations (these may vary for different activities at each phase of the development). Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.

- The noise impact assessment report should include:

  a) a plan showing the assumed location of each noise source for each prediction scenario

  b) a list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site

  c) any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc

d) methods used to predict noise impacts including identification of any noise models used. Where modelling approaches other than the use of the ENM or SoundPlan computer models are adopted, the approach should be appropriately justified and validated

e) an assessment of appropriate weather conditions for the noise predictions including reference to any weather data used to justify the assumed conditions

f) the predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario under any identified significant adverse weather conditions as well as calm conditions where appropriate

g) for developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived

h) an assessment of the need to include modification factors as detailed in Section 4 of the *NSW Industrial Noise Policy*.

- Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional mitigation measures.
- The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation.
- Where relevant noise/vibration criteria cannot be met after application of all feasible and cost effective mitigation measures the residual level of noise impact needs to be quantified by identifying:

  a) locations where the noise level exceeds the criteria and extent of exceedence

  b) numbers of people (or areas) affected

  c) times when criteria will be exceeded

  d) likely impact on activities (speech, sleep, relaxation, listening, etc)

  e) change on ambient conditions

  f) the result of any community consultation or negotiated agreement.

- For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EA.
- Where blasting is intended an assessment in accordance with the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990) should be undertaken. The following details of the blast design should be included in the noise assessment:

  a) bench height, burden spacing, spacing burden ratio

  b) blast hole diameter, inclination and spacing

  c) type of explosive, maximum instantaneous charge, initiation, blast block size, blast frequency.

Describe management and mitigation measures

- Determine the most appropriate noise mitigation measures and expected noise reduction including both noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.

- For traffic noise impacts, provide a description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedures for calculation of noise levels including ameliorative measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include:

  a) use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage

  b) control of traffic (eg: limiting times of access or speed limitations)

  c) resurfacing of the road using a quiet surface

  d) use of (additional) noise barriers or bunds

  e) treatment of the façade to reduce internal noise levels buildings where the night-time criteria is a major concern

  f) more stringent limits for noise emission from vehicles (i.e. using specially designed ‘quite’ trucks and/or trucks to use air bag suspension

  driver education

  g) appropriate truck routes

  h) limit usage of exhaust breaks

  i) use of premium muffles on trucks

  j) reducing speed limits for trucks

  ongoing community liaison and monitoring of complaints

  k) phasing in the increased road use.

4. Water

Describe baseline conditions

- Describe existing surface and groundwater quality – an assessment needs to be undertaken for any water resource likely to be affected by the proposal and for all conditions (e.g. a wet weather sampling program is needed if runoff events may cause impacts).

  Note: Methods of sampling and analysis need to conform with an accepted standard (e.g. Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA 2004) *or be approved and analyses undertaken by accredited laboratories).*

- Provide site drainage details and surface runoff yield.
- State the ambient Water Quality and River Flow Objectives for the receiving waters. These refer to the community's agreed environmental values and human uses endorsed by the Government as goals for the ambient waters. These environmental values are published on the website: www.environment.nsw.gov.au/ieo. The EA should state the environmental values listed for the catchment and waterway type relevant to your proposal. NB: A consolidated and approved list of environmental values are not available for groundwater resources. Where groundwater may be affected the EA should identify appropriate groundwater environmental values and justify the choice.
- State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC 2000 *Guidelines for Fresh and Marine Water Quality* (http://www.deh.gov.au/water/quality/nwqms/volume1.html)(Note that, as at 2004, the NSW Water Quality Objectives booklets and website contain technical criteria derived from the 1992 version of the ANZECC Guidelines. The Water Quality Objectives remain as Government Policy, reflecting the community's environmental values and long-term goals, but the technical criteria are replaced by the more recent ANZECC 2000 Guidelines). NB: While specific guidelines for groundwater are not available, the ANCECC 2000 Guidelines endorse the application of the trigger values and decision trees as a tool to assess risk to environmental values in groundwater.
- State any locally specific objectives, criteria or targets, which have been endorsed by the government e.g. the Healthy Rivers Commission Inquiries (www.hrc.nsw.gov.au) or the NSW Salinity Strategy (DLWC, 2000) (www.dlwc.nsw.gov.au/care/salinity/#Strategy).
- Where site specific studies are proposed to revise the trigger values supporting the ambient Water Quality and River Flow Objectives, and the results are to be used for regulatory purposes (e.g. to assess whether a licensed discharge impacts on water quality objectives), then prior agreement from the EPA on the approach and study design must be obtained.
- Describe the state of the receiving waters and relate this to the relevant Water Quality and River Flow Objectives (i.e. are Water Quality and River Flow Objectives being achieved?). Proponents are generally only expected to source available data and information. However, proponents of large or high risk developments may be required to collect some ambient water quality / river flow / groundwater data to enable a suitable level of impact assessment. Issues to include in the description of the receiving waters could include:

  a) lake or estuary flushing characteristics

  b) specific human uses (e.g. exact location of drinking water offtake)

  c) sensitive ecosystems or species conservation values

  d) a description of the condition of the local catchment e.g. erosion levels, soils, vegetation cover, etc

e) an outline of baseline groundwater information, including, but not restricted to, depth to watertable, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment

f) historic river flow data where available for the catchment.

Assess impacts

- No proposal should breach clause 120 of the *Protection of the Environment Operations Act* 1997 (i.e. pollution of waters is prohibited unless undertaken in accordance with relevant regulations).
- Identify and estimate the quantity of all pollutants that may be introduced into the water cycle by source and discharge point including residual discharges after mitigation measures are implemented.
- Include a rationale, along with relevant calculations, supporting the prediction of the discharges.
- Describe the effects and significance of any pollutant loads on the receiving environment. This should include impacts of residual discharges through modelling, monitoring or both, depending on the scale of the proposal. Determine changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, wetland hydrologic regimes and groundwater).
- Describe water quality impacts resulting from changes to hydrologic flow regimes (such as nutrient enrichment or turbidity resulting from changes in frequency and magnitude of stream flow).
- Identify any potential impacts on quality or quantity of groundwater describing their source.
- Identify potential impacts associated with geomorphological activities with potential to increase surface water and sediment runoff or to reduce surface runoff and sediment transport. Also consider possible impacts such as bed lowering, bank lowering, instream siltation, floodplain erosion and floodplain siltation.
- Identify impacts associated with the disturbance of acid sulfate soils and potential acid sulfate soils.
- Containment of spills and leaks shall be in accordance with the technical guidelines section 'Bunding and Spill Management' of the *Authorised Officers Manual* (EPA, 1995) (http://www.environment.nsw.gov.au/mao/bundingspill.htm) and the most recent versions of the Australian Standards referred to in the Guidelines. Containment should be designed for no-discharge.
- The significance of the impacts listed above should be predicted. When doing this it is important to predict the ambient water quality and river flow outcomes associated with the proposal and to demonstrate whether these are acceptable in terms of achieving protection of the Water Quality and River Flow Objectives. In particular the following questions should be answered:

  a) will the proposal protect Water Quality and River Flow Objectives where they are currently achieved in the ambient waters; and

  b) will the proposal contribute towards the achievement of Water Quality and River Flow Objectives over time, where they are not currently achieved in the ambient waters.
- Consult with the EPA as soon as possible if a mixing zone is proposed (a mixing zone could exist where effluent is discharged into a receiving water body, where the quality of the water being discharged does not immediately meet water quality objectives. The mixing zone could result in dilution, assimilation and decay of the effluent to allow water quality objectives to be met further downstream, at the edge of the mixing zone). The EPA will advise the proponent under what conditions a mixing zone will and will not be acceptable, as well as the information and modelling requirements for assessment.

Note: The assessment of water quality impacts needs to be undertaken in a total catchment management context to provide a wide perspective on development impacts, in particular cumulative impacts.

- Where a licensed discharge is proposed, provide the rationale as to why it cannot be avoided through application of a reasonable level of performance, using available technology, management practice and industry guidelines.
- Where a licensed discharge is proposed, provide the rationale as to why it represents the best environmental outcome and what measures can be taken to reduce its environmental impact.
- Reference should be made to *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), *Guidelines for Fresh and Marine Water Quality* ANZECC 2000), *Environmental Guidelines: Use of effluent by Irrigation* (EPA, 2004).

Describe management and mitigation measures

- Outline stormwater management to control pollutants at the source and contain them within the site. Also describe measures for maintaining and monitoring any stormwater controls.
- Outline erosion and sediment control measures directed at minimising disturbance of land, minimising water flow through the site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.
- Describe waste water treatment measures that are appropriate to the type and volume of waste water and are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the site; reusing/recycling waste water; and treating any unavoidable discharge from the site to meet specified water quality requirements.
- Outline pollution control measures relating to storage of materials, possibility of accidental spills (eg preparation of contingency plans), appropriate disposal methods, and generation of leachate.
- Describe hydrological impact mitigation measures including:
  a) site selection (avoiding sites prone to flooding and waterlogging, actively eroding or affected by deposition)
  b) minimising runoff
  c) minimising reductions or modifications to flow regimes
  d) avoiding modifications to groundwater.
- Describe groundwater impact mitigation measures including:
  a) site selection
  b) retention of native vegetation and revegetation
  c) artificial recharge
  d) providing surface storages with impervious linings
  e) monitoring program.
- Describe geomorphological impact mitigation measures including:
  a) site selection

b) erosion and sediment controls

c) minimising instream works

d) treating existing accelerated erosion and deposition

e) monitoring program.

- Any proposed monitoring should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (EPA 2004).

5. Soils and contamination

Describe baseline conditions

- Provide any details (in addition to those provided in the location description - Section C) that are needed to describe the existing situation in terms of soil types and properties and soil contamination.

Assess impacts

- Identify any likely impacts resulting from the construction or operation of the proposal, including the likelihood of:

  a) disturbing any existing contaminated soil

  b) contamination of soil by operation of the activity

  c) subsidence or instability

  d) soil erosion

  e) disturbing acid sulfate or potential acid sulfate soils.

- Reference should be made to *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 1997)*; Contaminated Sites – Guidelines on Significant Risk of Harm and Duty to Report* (EPA, 1999).

Describe management and mitigation measures

- Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:

  a) erosion and sediment control measures

  b) proposals for site remediation – see *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998)

  c) proposals for the management of these soils – see *Assessing and Managing Acid Sulfate Soils,* Environment Protection Authority, 1995 (note that this is the only methodology accepted by the EPA).

6. Waste and chemicals

Describe baseline conditions

- Describe any existing waste or chemicals operations related to the proposal.

Waste Classification

- Describe, clarify and classify the additional waste types in accordance with the *Waste Classification Guidelines* (2009).
  - a) Clarify the source and nature of glass waste received and the characteristics of the concrete stirrer waste.

Assess impacts

- Assess the adequacy of proposed measures to minimise natural resource consumption and minimise impacts from the handling, transporting, storage, processing and reprocessing of waste and/or chemicals.
- Reference should be made to *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (EPA, 1999).

Describe management and mitigation measures

- Outline measures to minimise the consumption of natural resources.
- Outline measures to avoid the generation of waste and promote the re-use and recycling and reprocessing of any waste.
- Outline measures to support any approved regional or industry waste plans.

7. Cumulative impacts

- Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions to which this proposal will contribute.
- Assess the impact of the proposal against the long term air, noise and water quality objectives for the area or region.
- Identify infrastructure requirements flowing from the proposal (eg water and sewerage services, transport infrastructure upgrades).
- Assess likely impacts from such additional infrastructure and measures reasonably available to the proponent to contain such requirements or mitigate their impacts (eg travel demand management strategies).

F. List of approvals and licences

- Identify all approvals and licences required under environment protection legislation including details of all scheduled activities, types of ancillary activities and types of discharges (to air, land, water).

G. Compilation of mitigation measures

- Outline how the proposal and its environmental protection measures would be implemented and managed in an integrated manner so as to demonstrate that the proposal is capable of complying with statutory obligations under EPA licences or approvals (eg outline of an environmental management plan).
- The mitigation strategy should include the environmental management and cleaner production principles which would be followed when planning, designing, establishing and operating the proposal. It should include two sections, one setting out the program for managing the proposal and the other outlining the monitoring program with a feedback loop to the management program.

H. Justification for the Proposal

- Reasons should be included which justify undertaking the proposal in the manner proposed, having regard to the potential environmental impacts.

NSW GOVERNMENT | Department of Primary Industries

OUT14/15903

Mr David Mooney
Industry, Key Sites and Social Projects
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

10 JUN 2014

David.Mooney@planning.nsw.gov.au

Dear Mr Mooney,

Widemere Recycling Facility [SSD_6252]
Request for input into Secretary's Environment Assessment Requirements

I refer to your email dated 20 May 2014 to the Department of Primary Industries in respect to the above matter.

Comment by NSW Office of Water

The NSW Office of Water (Office of Water) has reviewed the Supporting documentation accompanying the request for Secretary's Environmental Assessment Requirements (SEARs) and provides the following comments below, and further detail in **Attachment A**.

It is recommended that the EIS be required to include:

- Details of water proposed to be taken (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any water licensing requirements (including those for ongoing water take following completion of the project).
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Proposed surface and groundwater monitoring activities and methodologies.
- Full technical details and data of all surface and groundwater modelling.
- A detailed and consolidated site water balance.

- Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.
- Consideration of relevant policies and guidelines.
- A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).

For further information please contact Janne Grose, Planning and Assessment Coordinator (Penrith office) on 4729 8262 or at janne.grose@water.nsw.gov.au.

Fisheries NSW

Fisheries NSW is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, Fisheries NSW ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (namely the aquatic habitat protection and threatened species provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Fish Habitat Conservation and Management (2013).*

Prospect Creek has been mapped as being key fish habitat. The Department recommends that the project is designed to:

- minimise impacts to the riparian zone of Prospect Creek,
- minimise potential erosion and sedimentation impacts to the river during and following construction, and
- maintain or improve any existing stormwater related impacts to Prospect Creek.

Information requirements that may be of assistance in the preparation of an environmental assessment for this proposal are listed in **Attachment B**.

For further information please contact Carla Ganassin, Fisheries Conservation Manager, (Wollongong Office) on 4254 5527 or at carla.ganassin@dpi.nsw.gov.au.

Comment by Crown Lands

The proponent must identify any Crown land affected by the proposal. Prior to preparation of the EIS it is recommended that the proponent undertake a Crown Land Status search available through Crown Lands.

For further information please contact Rebecca Johnson, Co-ordinator Client Services, (Newcastle Office) on 4920 5040 or at rebecca.johnson@lands.nsw.gov.au.

Agriculture NSW advise no issues.

Yours sincerely

Kristian Holz
Director Policy, Legislation and Innovation

Attachment A

Widemere Recycling Facility [SSD_6252]
Request for Input into Secretary's Environmental Assessment Requirements
Comment by the NSW Office of Water

For further information visit the NSW Office of Water website, www.water.nsw.gov.au

The EIS should take into account the objects and regulatory requirements of the *Water Act 1912* (WA 1912) and *Water Management Act 2000* (*WMA 2000*), and associated regulations and instruments, as applicable.

Key Relevant Legislative Instruments

This section provides a basic summary to aid proponents in the development of an Environmental Impact Statement (EIS), and should not be considered a complete list or comprehensive summary of relevant legislative instruments that may apply to the regulation of water resources for a project.

Water Management Act 2000 (WMA 2000)
Key points:

- Volumetric licensing in areas covered by water sharing plans,
- Works within 40m of waterfront land,
- SSD & SSI projects are exempt from requiring water supply work approvals and controlled activity approvals as a result of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*,
- No exemptions for volumetric licensing apply as a result of the *EP&A Act*,
- Basic landholder rights, including harvestable rights dams,
- Aquifer activity approval and flood management work approval provisions have not yet commenced and are regulated by the *Water Act 1912,*
- Maximum penalties of $2.2 million plus $264,000 for each day an offence continues apply under the *WMA 2000.*

Water Act 1912 (WA 1912)
Key points:

- Volumetric licensing in areas where no water sharing plan applies,
- Monitoring bores,
- Aquifer interference activities that are not regulated as a water supply work under the *WMA 2000*,
- Flood management works,
- No exemptions apply to licences or permits under the *WA 1912* as a result of the *EP&A Act*,
- Regulation of water bore driller licensing.

Water Management (General) Regulation 2011
Key points:

- Provides various exemptions for volumetric licensing and activity approvals
- Provides further detail on requirements for dealings and applications.

Water Sharing Plans – these are considered regulations under the *WMA 2000*

Access Licence Dealing Principles Order 2004

Harvestable Rights Orders

Water Sharing Plans

The proposal is located within the area covered by the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources* and the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources.* The EIS is required to:

- Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.
- Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.
- Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:
    - Sufficient market depth to acquire the necessary entitlements for each water source.
    - Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP.
    - Daily and long-term access rules.
    - Account management and carryover provisions.
- Provide a detailed and consolidated site water balance.
- Further detail on licensing requirements is provided below.

Relevant Policies and Guidelines

The EIS should take into account the following policies (as applicable):

- NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012),
- NSW Aquifer Interference Policy (NOW, 2012),
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012),
- Australian Groundwater Modelling Guidelines (NWC, 2012),
- NSW State Rivers and Estuary Policy (1993),
- NSW State Groundwater Policy Framework Document (1997),
- NSW State Groundwater Quality Protection Policy (1998),
- NSW State Groundwater Dependent Ecosystems Policy (2002),
- NSW Water Extraction Monitoring Policy (2007).

Office of Water policies can be accessed at the following links:
http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/default.aspx
http://www.water.nsw.gov.au/Water-licensing/Approvals/Controlled-activities/default.aspx

An assessment framework for the NSW Aquifer Interference Policy can be found online at: http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference.

Licensing Considerations

The EIS is required to provide:

- Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site – such as evaporative loss from open voids or inflows).

- Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.
- Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc).
- Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).
- Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.
- Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages.
- Details on the location, purpose, size and capacity of any new proposed dams/storages.
- Applicability of any exemptions under the *Water Management (General) Regulation 2011* to the project.

Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.

The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

For more information on Harvestable Right dams visit:
http://www.water.nsw.gov.au/Water-licensing/Basic-water-rights/Harvesting-runoff/Harvesting-runoff

Dam Safety

Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.

See www.damsafety.nsw.gov.au for further information.

Groundwater Assessment

To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including:

- The predicted highest groundwater table at the site.
- Works likely to intercept, connect with or infiltrate the groundwater sources.
- Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes (Office of Water "GW" registration numbers and licence/approval numbers should be supplied).

- A description of the flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).
- Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.
- The predicted impacts of any final landform on the groundwater regime.
- The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.
- An assessment of the quality of the groundwater for the local groundwater catchment.
- An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).
- Measures proposed to protect groundwater quality, both in the short and long term.
- Measures for preventing groundwater pollution so that remediation is not required.
- Protective measures for any groundwater dependent ecosystems (GDEs).
- Proposed methods of the disposal of waste water and approval from the relevant authority.
- The results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Any proposed monitoring programs, including water levels and quality data.
- Reporting procedures for any monitoring program including mechanism for transfer of information.
- An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

Groundwater Dependent Ecosystems

The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and:

- Identify any potential impacts on GDEs as a result of the proposal including:
    - the effect of the proposal on the recharge to groundwater systems;
    - the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and
    - the effect on the function of GDEs (habitat, groundwater levels, connectivity).
- Provide safeguard measures for any GDEs.

Watercourse and Riparian Land

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:

- Scaled plans showing the location of:
  - watercourses and top of bank;
  - riparian corridor widths to be established along the creeks;
  - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);
  - the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and
  - proposed location of any asset protection zones.
- Photographs of the watercourses.
- A detailed description of all potential impacts on the watercourses/riparian land.
- A description of the design features and measures to be incorporated to mitigate potential impacts.
- Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.

Project specific notes
The southern boundary of the site is in close proximity to Prospect Creek and its riparian corridor. The PEA indicates the project includes realigning the southern internal haul road. It notes the road alignment will remove some degraded groundcover but native vegetation surrounding the site will not be impacted (page 27). It is unclear if the proposed road realignment will encroach into the riparian corridor width that needs to be provided along Prospect Creek. It is recommended the EIS clarifies this.

In addition to above details to be included on the watercourse and riparian land scaled plan, it is recommended the plan also show the location of the existing internal road alignment compared to the proposed realignment and the location of the additional stockpile area of recycled materials.

End Attachment A

Attachment B

Widemere Recycling Facility [SSD_6252]
Request for Input into Secretary's Environmental Assessment Requirements
Comment by Fisheries NSW

Note: Fisheries NSW recommends that development proposals comply with the *Policy and Guidelines for Fish Habitat Conservation and Management (2013)* (referred to hereafter as P&GLs). A list of general information requirements for developments and standard precautions and mitigation measures are outlined in Section 3.1 of this document. See http://www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation.

1: General Requirements

- site address and contact details.
- property description (e.g. Lot and DP numbers).
- a clear description of the proposal including details of construction methods and materials.
- map(s) of the development area and adjacent areas.
- clear photographs of the site.
- a clear description of the physical and hydrological features of the development area (which may extend upstream and downstream of the development site in the case of flowing rivers or tidal waterways).
- a clear description of aquatic environments including:
  - threatened and protected species, populations, ecological communities, pest species or presence of 'critical habitat' under the FM Act or EPBC Act,
  - a riparian vegetation survey map of the area which shows the location and/or coverage of riparian vegetation,
- details of the nature, timing, magnitude and duration of the proposed disturbance to the aquatic environment.
- assessments of predicted impacts upon any threatened species (fish and marine vegetation) (i.e. completion of a 7 part test and/or species impact statement(s)) and other aquatic flora and fauna.
- details of any mitigation measures to limit environmental impacts.
- details of the general regional context, any protected areas, other developments in the area, and/or cumulative impacts.
- a copy of the land owner's consent where relevant.
- notification of any other matters relevant to the particular proposal and of interest to NSW DPI.

2. Aquatic habitat assessment

The aim of the aquatic assessment should be to define the presence of 'key fish habitat' within the study site, adjacent areas (upstream and downstream), and the broader regional area. There may be a range of potential fish habitats that could be impacted by a particular activity. Some points to consider include:

- is it mapped as key fish habitat? (see www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats#KFH for maps of key fish habitat per Local Government Area),
- flow regime of the watercourse (e.g. is it an intermittent or permanently flowing stream? What is the range of water velocity of the flow? What are the maximum and minimum or percentile flows (in megalitres/day) for the watercourse?),
- description of the water quality (e.g. discolouration, sedimentation, turbidity, pH, dissolved oxygen, nutrients),
- types of surrounding land use (e.g. agricultural, urban, aquaculture),
- condition of riparian vegetation (i.e. present or absent. Are the species native or exotic? Is the density of vegetation thick or sparse?),

3. Assessment of likely impacts

- indicate the location, nature and extent of fish habitat removal or modification (both direct and indirect) which may result from the proposed action;
- discuss the potential impact of the modification or removal of habitat (potential direct and indirect sources of impact are stated in the letter with this attachment).

Note: In defining the proposal area, discussion must be provided in regard to possible indirect effects of the proposal on species/habitats in the area surrounding the subject site: for example, through altered hydrological regimes, soil erosion or pollution.

4. Ameliorative measures

The environmental assessment should consider and provide detail on how the proposal has been or may be modified and managed to minimise impacts and conserve aquatic habitat on the subject site and in the study area.

End Attachment B

David Mooney

From: Andrew Mooney <AMooney@fairfieldcity.nsw.gov.au>
Sent: Tuesday, 3 June 2014 4:43 PM
To: David Mooney
Cc: Karl Berzins
Subject: RE: Boral's waste management facility at Widemere Road, Wetherill Park.

Hi David

In terms of *Soil and Water* Issues, specific information will need to be submitted demonstrating that there will be no net increase in stormwater run-off from the site or increase in flood levels along Prospect Creek as a result of the development.

This was a critical issue under the original redevelopment of the Greystanes Southern Employment Lands (SEL) and a determinant factor in the design of stormwater detention basins included in the SEL. Council officers would be happy to meet with the proponent to provide further background and advice regarding the above.

Regards

Andrew Mooney
Coordinator Strategic Planning | City Development
Fairfield City Council

PO Box 21, Fairfield NSW 1860
P (02) 9725 0214 | F (02) 9725 4249

From: Karl Berzins
Sent: Tuesday, 3 June 2014 4:26 PM
To: 'david.mooney@planning.nsw.gov.au'; Andrew Mooney
Subject: Boral's waste management facility at Widemere Road, Wetherill Park.

Hi David,

Please find attached Council's response to your request re EAR contents for the above project.

Please contact me if you have any questions

Karl Berzins
Consultant Planner
Fairfield City Council

PO Box 21, Fairfield NSW 1860
P (02) 9725 0846

FairfieldCity
Celebrating diversity

Issues to be considered in regard to the preparation of an environmental assessment for a proposal to increase the annual capacity of Boral's waste management facility at Widemere Road, Wetherill Park.

Fairfield City Council's officers have examined Boral's Preliminary Environmental Assessment for the Widemere Recycling Facility, dated 8 May 2014, and prepared by EMM Consulting Pty. Ltd.

The following comments are made to assist the Department in its preparation of environmental assessment requirements (EARs) for the project.

a) General Requirements for the Environmental Assessment.

The Environmental Assessment (EA) must include:

1. An executive summary;

2. A detailed description of past, existing and approved operations on the site including a copy of all relevant statutory approvals;

3. A detailed description of the project including:
    - The need for the project, having particular regard to Clause 123 of State Environmental Planning Policy (Infrastructure)2007,
    - The alternatives to the proposal including a detailed justification for the proposal,
    - Plans of existing development on the site including existing stockpile locations and heights and plans showing proposed works including any new buildings and/or roads,
    - Plans and elevations of proposed operational stockpiles on the site
    - A proposed rehabilitation strategy for the site.
    - Changes to operational characteristics of the site.

4. A risk assessment of the potential environmental impacts of the project, identifying key areas for further assessment.

5. A detailed assessment of the key issues identified above including data showing baseline conditions, an assessment of the potential environmental impacts including cumulative impacts and a description of the measures to be undertaken to mitigate these impacts.

6. A statement of commitments , outlining the proposed environmental management and mitigation measures.

7. A conclusion justifying the development in terms of the objects of the EP&A Act (1979) and the environmental, economic and social impacts of the project as a whole.

b) Key Issues

Traffic and Transport- including:

- Accurate predictions of traffic volumes
- Assessment of these volumes on capacity, efficiency and safety of the local road network

- Details of any proposed road upgrade works
- Details of proposed access and parking arrangements on the site.

Waste – including:

- The measures that would be implemented to comply with NSW Waste Avoidance Strategy 2007 and the EPA's guidelines for Solid Waste Landfills
- Details of the quantities and classification of waste to be received, processed, recycled, stockpiled and land filled
- Details on the location of location and size of stockpiles of unprocessed and processed/recycled waste to be stored on the site.

Soil and Water – including

- Detailed modelling of the potential surface and groundwater impacts of the project paying particular attention to Prospect Creek and its associated riparian corridor.
- A site water balance for the project including strategies to minimize water use.
- Details of erosion and sedimentation controls during construction and operation of the development

Rehabilitation – including

- Details of rehabilitation of the site that is not directly used for water management purposes.

Visual – including

- An analysis of the visual impact of the proposal using photomontages to demonstrate the impact on any sensitive receivers
- Details of measures to minimize visual impacts including any landscaping initiatives.

The Department is also requested to consider imposing a sunset clause on the development.

attached a copy of the application and Boral's Preliminary Environmental Assessment for the proposal for you perusal. The Department now requests any comments or advice you may have, which may be included in the EARs for the preparation of an Environmental Impact Statement.

Appendix B

Traffic assessment

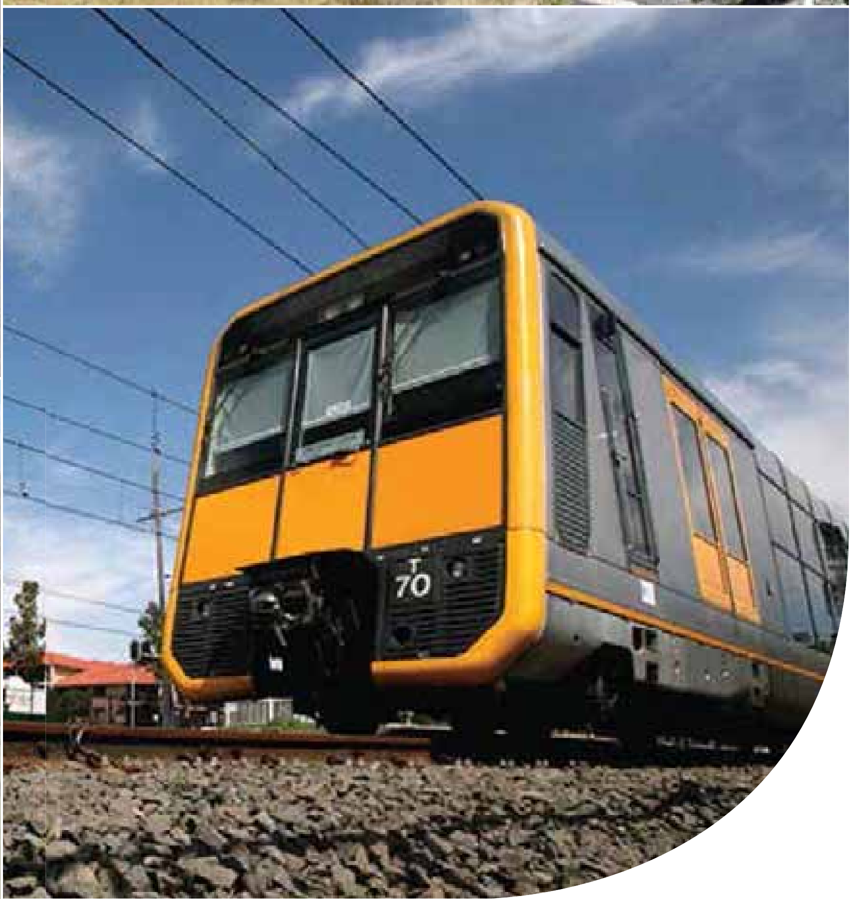
Traffic Impact Assessment

Widemere Recycling Facility

Prepared for Boral Recycling Pty Limited | 26 May 2015







Traffic Impact Assessment

Widemere Recycling Facility

Prepared for Boral Recycling Pty Limited | 26 May 2015

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Traffic Impact Assessment

Final

Report J13127RP1 | Prepared for Boral Recycling Pty Limited | 26 May 2015

Prepared by	**Tim Brooker**	Approved by	**Brett Mclennan**
Position	Senior Transport Planner	Position	Project Director
Signature		Signature	
Date	26 May 2015	Date	26 May 2015

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.

Document Control

Version	Date	Prepared by	Reviewed by
V1	4 September 2014	Tim Brooker	Jarred Kramer Kate Cox
V2	16 December 2014	Tim Brooker	Kate Cox
Final	26 May 2015	Tim Brooker	Mina Aynsley

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1 Introduction

1.1 Overview

Boral Recycling Pty Limited (Boral) operates the Widemere Recycling Facility, at Wetherill Park in the Fairfield Local Government Area (LGA). The site location is shown in Figure 1.1. The facility accepts construction and demolition waste where it separates, crushes and blends it with quarry material to form construction materials.

Boral is seeking development consent to modify operations at the facility, including increasing the maximum processing rate from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the proposal). The proposal also includes a minor internal road realignment, import of additional waste materials that are not currently listed on the facility's Environment Protection Licence (EPL) and minor changes to the operating hours of the facility.

This traffic impact assessment has been prepared to assess traffic and transport impacts from the proposal. The proposal is being assessed as State Significant Development (SSD) under Part 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Accordingly, this traffic impact assessment has been prepared to support an environmental impact statement and development application (DA) for the proposal.

1.2 Scope of this report

In this report, the existing and future peak hour intersection traffic operations at the facility access have been analysed using the SIDRA intersection analysis program. The adequacy of the internal facility truck circulation, queuing areas and employee and visitor car parking has also been assessed including the realignment on an internal haul road.

This assessment addresses the NSW Department of Planning and Environment's (DP&E) environmental assessment requirements that identify the following issues for a traffic impact assessment:

- details of all traffic and transport predictions for the development during construction and operations, including a description of haul routes;
- details on access to the facility from the road network including intersection location, design and sight distance;
- an assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project;
- plans of any road upgrades, rail and other infrastructure works or new roads required for the development; and
- detailed plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards.

This traffic impact assessment has also been carried out in accordance with the requirements of the *Roads and Traffic Authority Guide to Traffic Generating Developments,* (RTA 2002) and the requirements of the Australian Standards (AS 2890) for facility access and car parking for cars and heavy vehicles.

T:\Jobs\2013\J13127 - Boral Widemere\GIS\02_Maps\T018_RoadNetwork_20140910_01.mxd 10/09/2014

Facility locations and surrounding road network

Widemere Recycling Facility

Traffic Impact Assessment

Figure 1.1

2 Existing traffic conditions

2.1 Current operations

Development consent (DA 21-1-2002-i) was granted for the facility in 2002 by the Minister for Planning under the EP&A Act. The original development consent was for the construction and operation of the facility, including processing of up to 600,000 tpa of construction and demolition (C&D) material. The development consent was subsequently modified in 2005 (MOD-126-8-2005-i) to increase the processing capacity of the facility to 750,000 tpa, increase hours of operation and modify processing operations to include a blending plant.

Approved operations at the facility include the receipt of permitted waste which is sorted, processed and blended on-site to produce a range of recycled aggregate and road base products. The facility has approval to process 750,000 tpa of material, comprising no more than 600,000 tonnes of permitted waste with the balance being made up of blending material (that is, material not more than 25 mm in diameter, including quarry fines).

The facility occupies an area of approximately 9.8 hectares (ha), and comprises the following general areas (see Figure 2.1):

- receivals area which includes a weighbridge, spot checking platform, and administration buildings;
- incoming materials stockpile area where incoming vehicles unload waste material;
- processing plant;
- processed materials stockpiles including imported quarry product; and
- water management area (including retention basins).

2.2 Location and access

To the north of the facility is the former Prospect Quarry which is now used for commercial and light industrial purposes. To the south is Wetherill Park which is one of Sydney's largest industrial precincts.

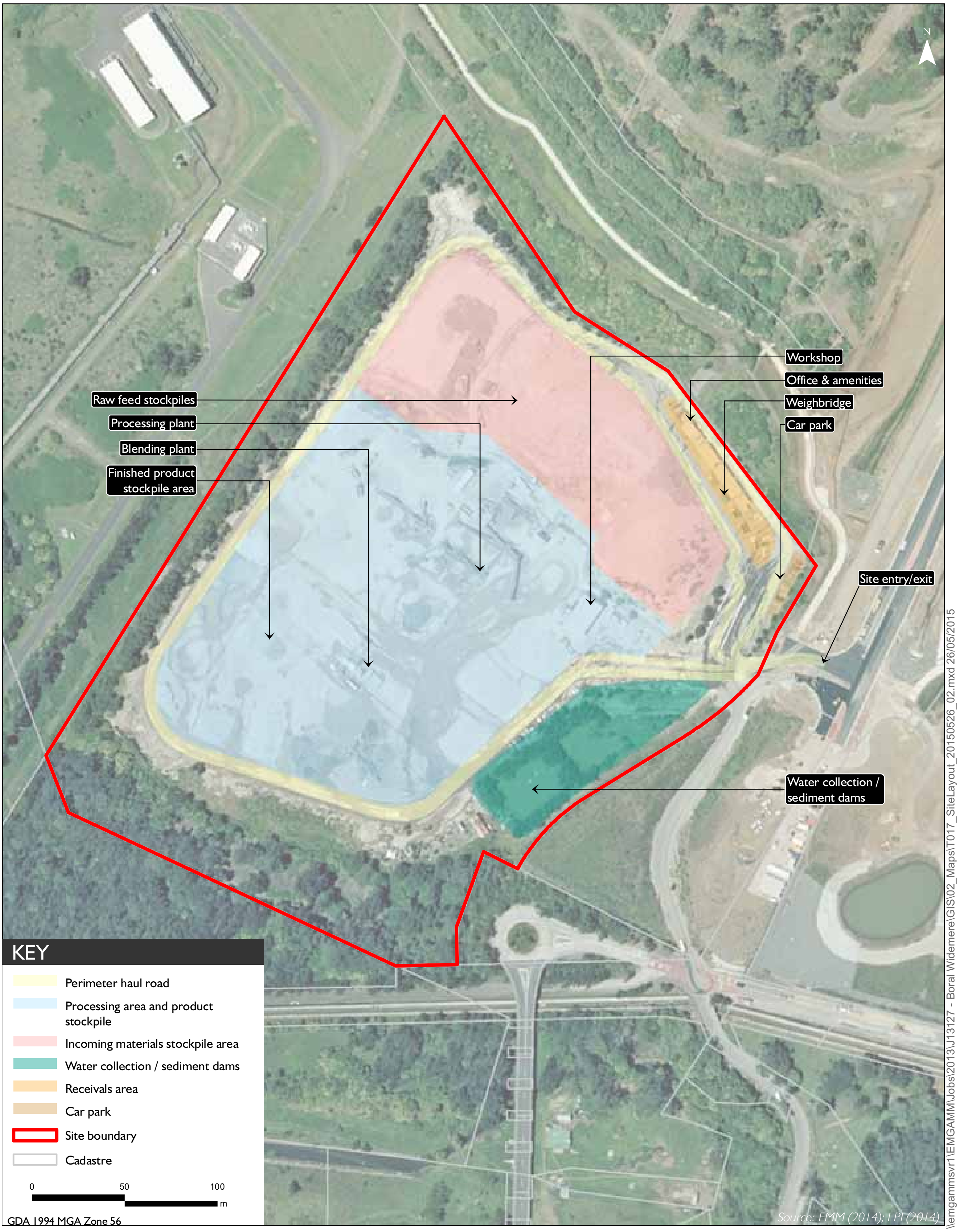
The facility access is a private road which intersects with Widemere Road (note that immediately north of the intersection, Widemere Road becomes Reconciliation Road). The access road and Widemere Road intersection is signalised. A dedicated right turn traffic lane is provided on Reconciliation Road for vehicles turning right into the access road. There are two exit lanes on the access road for vehicles turning either left (on to Reconciliation Road) or right (on to Widemere Road) when leaving the facility.

Reconciliation Road is a newly constructed road linking the industrial areas within the Fairfield and Holroyd LGAs. Traffic travels to/from the north of the facility along Reconciliation Road to the M4 Motorway, Prospect Highway and Great Western Highway routes, and south via Widemere Road, Hassall Street and Gipps Road to the Horsley Drive and Cumberland Highway routes.

The facility currently employs up to 30 full-time staff. The general shift times are between 5.30 am and 7.00 pm. Shifts outside of these hours are only considered as required, when material is required to be delivered during the night time period.

There is an additional nearby traffic signal controlled intersection on Reconciliation Road, where the Liverpool to Parramatta bus transitway route crosses the road. This intersection is located approximately 120 m south of the facility access intersection, which has sufficient separation distance to minimise any potential traffic queuing interactions between the two intersections.

Details of the internal facility traffic circulation to and from the incoming material receival area and the sales stockpile are shown on the current facility traffic management plan in Figure 2.2.

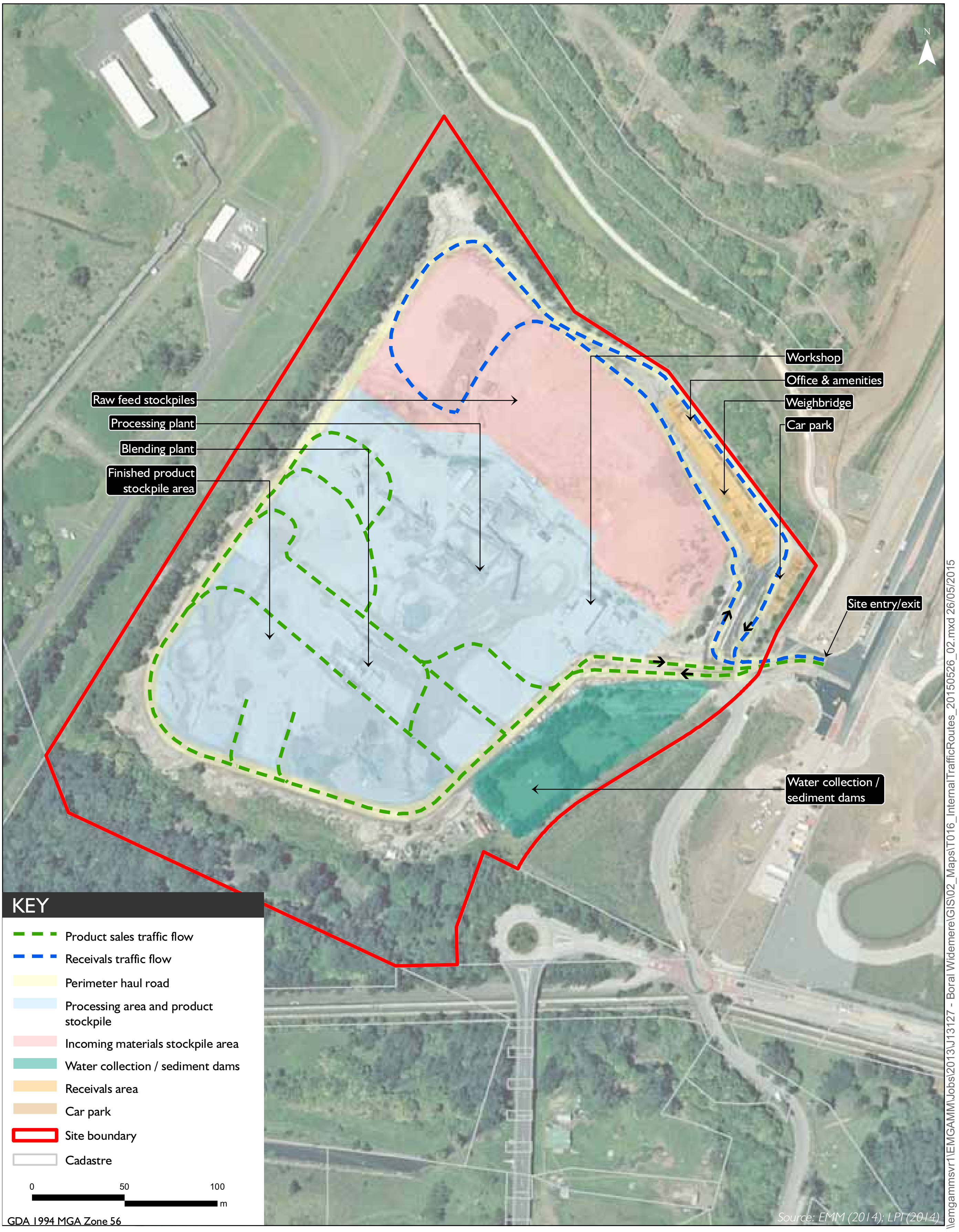


Facility layout

Widemere Recycling Facility

Traffic Impact Assessment

Figure 2.1



Facility traffic management plan
Widemere Recycling Facility
Traffic Impact Assessment
Figure 2.2

2.3 Local road network

2.3.1 Reconciliation Road

Reconciliation Road is a sealed two-way road generally constructed to arterial or sub arterial road standards with two traffic lanes in each direction and a combination of roundabouts or traffic signals at the major intersections. The route links industrial and commercial sites in the Fairfield and Holroyd LGAs. The speed limit adjacent to the facility is 60 km/h.

The existing facility access intersection approaches from the west, north and south are shown in Photographs 2.1, 2.2 and 2.3. The continuations of the main access routes to and from the north (via Reconciliation Road) and the south (via Hassall Street) are shown in Photographs 2.4 and 2.5.

The intersection sight lines to the north on Reconciliation Road are good (over 500 m visibility) as the road is straight in this direction. South of the access intersection on Widemere Road, the road dips and curves around to the south-west and the intersection sight lines in this direction are lower (giving approximately 100 m visibility) towards the bus transitway intersection, which is not directly visible from the this intersection.

These intersection sight distances are nevertheless acceptable as the intersection is controlled by traffic signals and the route has a 60 km/h traffic speed limit.

Photograph 2.1 Site access approach to the intersection with Widemere Road/Reconciliation Road

Photograph 2.2 Reconciliation Road at the access intersection looking north

Photograph 2.3 Reconciliation Road at the access intersection looking south

Photograph 2.4 **Local road access route to the north via Reconciliation Road (Holroyd LGA)**

Photograph 2.5 **Local road access route from the south via Hassall Street (Fairfield LGA)**

2.3.2 Widemere Road and Hassall Street

To the south of the facility within the Fairfield LGA, Reconciliation Road connects with Widemere Road and Hassall Street. Hassall Street is typically a 13 metre wide industrial road which is marked with one travel lane and one parking lane in each direction and also has a 60 km/hr speed limit, as is shown in Photograph 2.5. The route passes through intersections at Widemere Road/Davis Road and Widemere Road/Hassall Street. These roads and intersections are located within an established industrial area (Wetherill Park) and have significant truck traffic usage.

2.3.3 Frontage road traffic

Hourly traffic volumes for Reconciliation Road/Widemere Road at the facility access intersection were determined by intersection traffic surveys undertaken on the morning and afternoon of Thursday 13 March 2014 (6.00 am to 9.00 am and 3.00 pm to 6.00 pm). The full survey results are in Appendix A.

The traffic surveys identified the peak hour periods for all traffic using Reconciliation Road/Widemere Road, including traffic from the recycling facility as 7.30 am to 8.30 am and 4.00 pm to 5.00 pm.

During these two peak hours, approximately 730 and 805 vehicles per hour (two-way) travelled along Reconciliation Road north of the intersection. Heavy vehicles constituted 16% of the recorded morning peak hour and 7% of the recorded afternoon peak hour traffic flows using Reconciliation Road north of the intersection.

The recorded peak hourly flows correspond to approximately 8,500 vehicle movements daily using Reconciliation Road north of the intersection and a marginally lower total (approximately 8,350 vehicle movements daily) using Widemere Road to the south. A summary of the actual recorded peak hourly northbound and southbound traffic volumes using Reconciliation Road is provided in Table 2.1.

Table 2.1 Peak hourly traffic volumes using Reconciliation Road to the north

Time period	Direction	All vehicles	Cars	Trucks	Proportion
Morning peak hour	Northbound	281	214	67	24%
	Southbound	447	397	50	11%
	Combined	728	611	117	16%
Afternoon peak hour	Northbound	561	531	30	5%
	Southbound	242	216	26	12%
	Combined	803	747	56	7%

2.4 Traffic generation from current operations

The facility operates on approximately 295 days each year, including Saturdays. The hours of operation are Monday to Friday 6 am to 10 pm and Saturday 6 am to 4 pm. The facility currently receives material and dispatches product Monday to Friday 6 am to midnight and Saturday 6 am to 4 pm. No activities are undertaken on Sundays or public holidays.

A summary of the facility's morning and afternoon hourly traffic volumes for both cars and trucks on the survey day, which was a typical weekday in March 2014, is shown in Table 2.2.

Table 2.2 Surveyed facility access traffic volumes on Thursday 13 March 2014

Time Period	Left Turn In		Right Turn In		Left Turn Out		Right Turn Out		All traffic	
Facility Operation	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
One hour (6.00–7.00 am)	2	9	1	23	0	20	1	7	4	59
One hour (7.00–8.00 am)	2	13	1	13	2	23	2	10	7	59
One hour (8.00–9.00 am)	5	12	5	29	4	19	1	12	15	72
One hour (7.30–8.30 am) Intersection am peak hour	**2**	**12**	**1**	**17**	**0**	**17**	**2**	**9**	**5**	**55**
One hour (3.00–4.00 pm)	1	6	5	14	6	15	5	8	17	43
One hour (4.00–5.00 pm) Intersection pm peak hour	**1**	**1**	**1**	**7**	**2**	**10**	**1**	**0**	**5**	**18**
One hour (5.00–6.00 pm)	1	0	1	0	11	0	5	3	18	3

On the traffic survey day, a total of 127 trucks visited the facility during a six hour period, of which approximately 70% travelled to and from the north via Reconciliation Road and 30% travelled to and from the south.

On average, for the eight months from July 2013 to February 2014 (inclusive), approximately 234 trucks in total visited the facility each day (468 vehicle movements), either transporting C&D materials to the facility for recycling or picking up recycled products.

There is no back loading of the trucks transporting either materials for recycling or processed products from the facility, as all trucks which bring materials to the facility generally depart empty and all trucks which transport product from the facility generally arrive empty prior to collecting their load.

At most times of the day, as shown by the data in Table 2.2, the facility traffic movements are predominantly trucks with only minimal car traffic. There is also some facility visitor car traffic during daytime periods. The total daily car traffic is approximately 50 cars each weekday (100 car movements), which are generated by either the workforce or visitors to the facility.

The morning peak periods for the facility truck traffic can coincide with the morning peak hour for traffic using Reconciliation Road, as is shown by the data in Table 2.2. However, during the afternoons the facility truck traffic is normally lower and is generally minimal after 4.00 pm, which is when the afternoon peak hour traffic conditions on Reconciliation Road occur.

From the traffic surveys results in Table 2.2, it is calculated that approximately 12% of the facility daily truck movements (55 out of 468) normally occur during the morning traffic peak hour on Reconciliation Road which is 7.30 am to 8.30 am and approximately 4% (18 out of 468) normally occur during the afternoon traffic peak hour which is 4.00 pm to 5.00 pm.

2.5 Intersections and turning traffic

The NSW Roads and Maritime Services (RMS) intersection level of service standards are summarised in Table 2.3. Intersection traffic operations are defined in terms of both level of service (LoS) standards and their corresponding average vehicle delay (AVD) in seconds (s).

Table 2.3 Intersection Level of Service standards

LoS	Average delay (seconds per vehicle)	Traffic signals, roundabout	Priority intersection ('Stop' and 'Give Way')
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: Guide to Traffic Generating Developments, RTA 2002.

The existing surveyed facility access traffic volumes have been analysed using the intersection modelling software SIDRA for the morning and afternoon peak hour traffic periods. The intersection modelling results also include the intersection degree of saturation (DOS) which is a measure of the traffic flow volume for each intersection approach, in comparison to the capacity of the intersection to accommodate this traffic .

The SIDRA intersection traffic modelling results and the modelled intersection layout, including the current lengths of the intersection turn lanes on each approach, are included as Appendix B and are summarised in Table 2.4.

Table 2.4 Results of the existing facility access SIDRA intersection analysis

Intersection Peak Hour	Existing situation – Average Day Facility Traffic			
	LoS	DOS	AVD* (seconds)	Maximum traffic queue length (m)
Intersection am peak hour (7.30–8.30 am)	A	0.177	8.0	19.6
Intersection pm peak hour (4.00–5.00 pm)	A	0.313	9.2	36.6

*Notes: * The average vehicle delay for traffic signals is the average for all traffic movements at the intersection.*

The SIDRA intersection traffic modelling of the existing facility traffic which is shown in Table 2.4, indicates that the intersection has low peak hour traffic delays (LoS A) indicating good traffic operations and a high level of spare traffic capacity (low DOS) during both the morning and afternoon peak hours.

2.6 Internal facility layout and traffic circulation

The key locations for the internal facility traffic circulation are illustrated by the facility layout plan in Figure 2.1 and Photographs 2.6 to 2.13.

Incoming construction and demolition (C&D) waste material trucks are all weighed at the main site entry weighbridge (Photographs 2.6) and exit via the wheelwash at the southern exit. Incoming trucks collecting the blended and recycled materials enter via the finished product stockpile area and then exit via the main perimeter haul road, stopping at the wheelwash and weighbridge located near the main site entry in the north of the site. The loaded trucks are covered to prevent any loss of material or dust from these vehicles during transit (Photograph 2.7).

During the EMM site inspection which occurred during a busy mid-morning period on a weekday, the maximum number of vehicles which was observed queuing on the main site entry road at the incoming material weighbridge was four trucks. These were comfortably accommodated on the main section of the site entry road which passes through the car park area. There is currently adequate space available for queuing trucks entering the site so that there is no queuing further back towards the facility access intersection on Reconciliation Road.

Once the incoming trucks have passed through the facility entry weighbridge, they queue again before unloading at the raw feed material stockpile area (Photographs 2.8 and 2.9) where there is also a checkpoint for empty trucks departing the area to ensure no loose material remains on the tyres, bodies or trailers of trucks.

Trucks moving around the facility perimeter 'haul road' are shown in Photographs 2.10 to 2.12 which show there is adequate road width available at the main corners along this roadway to permit safe truck circulation in both directions. Also a facility water truck (Photograph 2.13) is used for dust control purposes at the facility in addition to the wheel wash facilities for empty trucks departing from the facility (Photographs 2.7).

Photograph 2.6 Trucks queuing at the main site entry C&D materials weighbridge

Photograph 2.7 Southern entry gate with wheel wash exit lane for departing empty trucks

Photograph 2.8 Trucks queuing within the facility at the incoming C&D materials area

Photograph 2.9 Empty trucks departing the inspection checkpoint at the C&D materials area

Photograph 2.10 Truck turning at the north western corner of the facility haul road

Photograph 2.11 Truck on the western section of the perimeter haul road heading north

Photograph 2.12 Truck on the southern section of the perimeter haul road heading east

Photograph 2.13 Site water truck used for dust suppression purposes

2.7 Safety and traffic management

The facility traffic is managed in accordance with the traffic management plan (Figure 2.2) and additional traffic directional signage (green Boral traffic signage) which is displayed at numerous locations throughout the facility (Photographs 2.14 and 2.15).

The facility speed limit, 30 km/hr, is clearly sign posted at the main entry gate driveway (Photograph 2.14) and at other locations along the facility perimeter road. All trucks are visually inspected before departing from the C&D material dumping area (Photograph 2.9) to remove any loose material which may be attached to the truck tyres or other parts of the vehicle before vehicles leave the facility.

2.8 Car parking

The existing staff and visitor car parking areas at the facility are located adjacent to the weighbridge, workshop and administration office. Photographs 2.7, 2.9 and 2.21 show the facility staff and visitor parking areas which are between the facility weighbridges and offices and the main entry gate.

The total capacity of the facility car parking areas is thirty seven cars currently. The car parking areas are sealed asphalt and are adequate for the maximum numbers of facility employees (30) and visitors normally present at the facility. At the time of EMM's facility inspection, a total of twenty three cars were observed parked respectively in the facility car parking areas. There were a total of fourteen vacant car parking spaces remaining within the site car parking areas at this time.

Photograph 2.14 Main facility car park and speed limit sign adjacent to the facility entry roadway

Photograph 2.15 Boral traffic direction signage at main site entry

2.9 Public transport

Bus services in the locality operate along the Liverpool to Parramatta bus transitway south of the site. A section of the bus transitway route (Photograph 2.16) passes within 120 m south of the facility. The transitway bus services enable persons to travel to and from work at the facility by public transport.

Photograph 2.16 Liverpool to Parramatta bus transitway route near the facility

2.10 Pedestrian and cyclist access

There are footpaths and a cycleway route along Reconciliation Road/Widemere Road past the site. The cycleway route has been recently constructed and links the facility with other nearby land uses and the adjoining recreation reserves.

3 The Proposal

3.1 Future operations

Under current operations, the approved production rate of the facility is 750,000 tpa. The proposal involves increasing the production capacity of the facility to 1,000,000 tpa, as described in Section 1.1.

The proposal is estimated to increase truck traffic at the facility by approximately 30%, on average (ie a typical day), compared to current operations. The future materials received and products sold will continue to be transported to and from the facility via Reconciliation Road in the same north (70%) and south (30%) traffic distribution ratio which was observed from the access intersection traffic count (Table 2.2) on Thursday 13 March 2014.

Incoming C&D materials and quarry products for blending will be transported to the facility in trucks of various sizes with an average 28 tonnes capacity. Similarly, the average capacity of the trucks departing from the facility supplying recycled and blended aggregate products is also estimated as 28 tonnes.

The workforce will increase by approximately three persons as a result of the proposal compared to current operations. The car traffic will therefore increase by up to three vehicles each weekday, each vehicle entering once and departing once from the facility each day.

3.2 Internal road layout and traffic changes

The proposal involves minor changes to the site layout and traffic management, including realignment of the southern internal haul road. The realignment would provide greater flexibility for vehicle movements and improve internal traffic management at the facility during peak delivery/transport times. It would also facilitate a minor increase in the size of the finished product stockpile area, and improve the efficiency of the site water management system by improving catchment boundaries and water movement on site.

The haul road realignment would be contained fully within the site boundary.

No changes to the general layout of plant and equipment are proposed. This will continue to be consistent with approved operations.

The current vacant car parking capacity at the facility, which was observed to be seven car spaces during a typical weekday mid morning period, should permit some additional employees to be based at the facility without requiring additional car parking capacity.

Traffic impacts at the access intersection are assessed in this report for the short term future traffic situation using the year 2014 surveyed morning and afternoon peak hour traffic volumes with assumed 30% traffic growth from the facility on a typical daily basis, in accordance with the new proposed facility production levels. Potential future maximum day operating traffic conditions at the access intersection have also been assessed, in Chapter 4, based on predicted maximum daily site traffic activity, which may be up to 85% higher than typical daily operations.

The external traffic impacts as a result of the proposal have also been assessed during these peak hour periods for Reconciliation Road and Widemere Road to the north and the south of the facility.

3.3 Construction traffic

Construction traffic access routes in the local area will primarily be via Reconciliation Road to and from the north and via Widemere Road and Hassall Street, to and from the south. These roads are identified on Figure 1.1.

The total construction period under the proposal (realignment of internal haul road) will be five days. The construction traffic movements within the site will primarily be travelling to and from the works area for the proposed haul road realignment which is in the southern (product stockpile and sales) area of the facility (Figure 2.2). This construction traffic will generally enter and depart from the facility via the southern gates, which are shown in Photograph 2.7.

The temporary workforce for the construction of the site road works/realignment will be no more than four people (one supervisor and three operators). A maximum of five people will be required when the new asphalt is laid, which will be undertaken on a single day.

The majority of materials required to construct the road works will be supplied from the facility. No truck movements will generally be required on external roads (eg Reconciliation Road). The only product sourced externally will be asphalt from Boral's Enfield plant for road surfacing over one day. A maximum of five truckloads per day (of asphalt material) will be brought to the site on the day when the new asphalt is laid.

The facility construction traffic movements will be a maximum of up to 10 construction workforce car traffic movements per day and up to 10 daily truck traffic movements. These construction workforce traffic movements will typically occur during early morning (6.00 am to 7.00 am) and mid afternoon (3.00 pm to 4.00 pm) traffic periods which will not generally coincide with the current morning and afternoon traffic peak periods on Reconciliation Road (7.30 am to 8.30 am and 4.00 pm to 5.00 pm). Detailed impact assessment for the construction traffic is not warranted as the predicted additional traffic volumes will be significantly less than the corresponding additional traffic volumes during future project operations.

Construction waste materials that remain following the completion of construction activities will not leave the site. This material will be used to produce recycled roadbase material within the site, and thus there will be no residual truck traffic impact as a result of a need to remove construction waste following the road realignment works.

The construction workforce car parking demand (generally for up to four employees) could be accommodated within existing car parking at the facility.

4 Traffic impact assessment

4.1 Traffic generation and distribution

The proposal involves an increase in the production capacity of the facility to approximately 1,000,000 tpa.

There will be some variability in the traffic movements generated by the facility from day to day, which has been assumed to be equivalent to the current variability between the site average and the maximum daily truck traffic movements. A +85% maximum daily traffic factor was determined between the average daily and the maximum daily site truck traffic movements over the recent eight month period from July 2013 to February 2014 (inclusive).

For the proposed operations, assuming 295 days of annual operation, on a typical day the average number of trucks visiting the facility will increase by approximately 30% from 234 to 306. This traffic impact has been based on the following average and maximum daily truck volumes which are shown in Table 4.1. It has been assumed that trucks will have an average capacity of 28 tonnes for both incoming and outgoing deliveries.

Table 4.1 Future average daily and maximum daily truck traffic volumes

	Current operations			Proposed operations			
Truck movements	**Imported waste**	**Exported product**	**Total**	**Imported waste**	**Exported product**	**Total**	**Increase**
Average trucks/day	124	110	234	182	124	306	**72 trucks/day**
Average movements/day	248	220	468	364	248	612	**144 truck movements/day**
Maximum trucks/day	234	198	432	337	229	566	**134 trucks/day**
Maximum movements/day	468	396	864	673	459	1,132	**268 truck movements/day**

As summarised in Table 4.1, on an average day there will be approximately 306 trucks per day arriving at, and departing from the facility, which will correspond to 612 daily truck movements.

On busy days, the facility could generate greater truck traffic volumes, estimated at up to 85% greater than the average. This corresponds to 566 daily truck loads (1,132 daily movements) under proposed operations.

4.2 External traffic impact at intersections

The hourly distribution of the truck traffic movements from current operations, which was reported in Table 2.2, shows approximately 12% of the total daily truck movements normally occur during the morning traffic peak hour on Reconciliation Road (7.30 am to 8.30 am) and 4% occur during the afternoon traffic peak hour (4.00 pm to 5.00 pm).

These proportions indicate that on an average day, during the morning and afternoon peak traffic periods, there will be 37 and 12 trucks per hour, respectively, travelling into the facility and an equivalent number of trucks also travelling outbound from the facility. On maximum days, the corresponding morning and afternoon peak traffic truck traffic movements could be up to 68 (morning peak) and 23 (afternoon peak) trucks per hour travelling both into and outbound from the facility.

Daily and peak period car traffic movements will only change marginally from the current operations (related to the increase in the daily number of facility employees from 30 to 33 persons). There is potential for one additional car traffic movement travelling inbound to the facility each day during the morning peak traffic period (7.30 am to 8.30 am) and two additional car traffic movements travelling outbound from the facility during the afternoon peak traffic period (4.00 pm to 5.00 pm) as a result of the proposal.

The SIDRA 5.1 intersection analysis program has been used to analyse the effect of the additional facility generated car and truck traffic at the access intersection for the year 2014 traffic conditions. The future forecasted facility peak hour car and truck traffic movements using the access road at the intersection are summarised in Table 4.2 in comparison to the recently surveyed current traffic volumes.

Table 4.2 Predicted future facility traffic movements at the facility access intersection

Time period	Left turn in		Right turn in		Left turn out		Right turn out	
	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
Morning Peak Traffic Period								
Current traffic am peak hour (7.30–8.30 am)	2	12	1	17	0	17	2	9
Future – average day traffic am peak hour (7.30–8.30 am)	3	16	1	23	0	23	2	12
Future – maximum day traffic am peak hour (7.30–8.30 am)	3	30	1	42	0	42	2	22
Afternoon Peak Traffic Periods								
Current traffic pm peak hour (4.00–5.00 pm)	1	1	1	7	2	10	1	0
Future – average day traffic pm peak hour (4.00–5.00 pm)	1	1	1	9	3	13	2	1
Future – maximum day traffic pm peak hour (4.00–5.00 pm)	1	2	1	17	3	25	2	2

Under average daily productions conditions, the future peak hour traffic generation from the facility at other local intersections to the north and south of the site access will be:

- on routes to the north, twelve additional hourly traffic movements (all trucks) during the am peak hour and six additional hourly traffic movements (one car and five trucks) during the pm peak period; and
- on routes to the south, eight additional hourly traffic movements (one car and seven trucks) during the am peak hour and two additional hourly traffic movements (two car and one truck) during the pm peak period.

The additional site generated hourly car or truck traffic movements during the construction period would be minimal and would be much lower than additional traffic during future site operations. Detailed SIDRA intersection analysis of the site construction traffic volumes is not required.

The additional peak hourly site production traffic movements will be greatest at the access intersection where all the access movements will be combined, but will be quickly dispersed via a number of other intersections on the local access routes to the north and south resulting in minimal potential locality traffic impacts at other intersections. As such, SIDRA intersection analysis has been completed for this intersection only.

A summary of the future SIDRA intersection analysis results for average and maximum daily production compared to the existing traffic situation during the morning and afternoon peak traffic periods is provided in Table 4.3. The detailed SIDRA intersection analysis results are included in Appendix B.

Table 4.3 SIDRA intersection analysis results - facility access intersection 2014

Year Scenario	Time period	Degree of Saturation	Average vehicle delay (seconds)	Level of Service	Maximum queue length (m)
Current operations (year 2014)	(7.30–8.30 am)	0.177	8.0	A	19.6
	(4.00–5.00 pm)	0.313	9.2	A	36.6
Proposed operations (year 2014 – average day)	(7.30–8.30 am)	0.194	8.9	A	21.6
	(4.00–5.00 pm)	0.313	9.4	A	36.6
Proposed operations (year 2014 – maximum day)	(7.30–8.30 am)	0.311	13.1	A	30.4
	(4.00–5.00 pm)	0.314	10.1	A	36.8

At the facility access intersection, the future intersection degree of saturation and traffic delays will increase marginally for the two peak traffic periods analysed as detailed in Table 4.3. However, there will be no changes in the intersection levels of service which will remain at level of service A for both average days and maximum days under proposed operations.

The maximum traffic queue lengths on the site access (minor road) approach to the intersection will generally increase from 20 m (currently operations) to 30 m under the proposal in the morning traffic peak hour, but there will be no change generally to the afternoon peak hour intersection queue lengths. This is because the hourly volumes of the site truck traffic are much lower later in the afternoon.

4.3 External traffic impacts on the road network

As summarised in Section 3.1 and Section 4.1, the average truck traffic generated by the facility under proposed operations will increase by approximately 72 daily truck loads (144 daily truck movements) associated with the increase in production at the facility.

However on a maximum day, truck traffic could increase by up to 134 daily truck loads (268 daily truck movements) in comparison to a busy day for current operations.

Car (light vehicle) traffic will increase only marginally on both an average and maximum production day by up to six car traffic movements (three return employee car trips) travelling either inbound to or outbound from the facility at appropriate times of the day.

The year 2014 daily traffic volumes for Reconciliation Road north and Widemere Road south of the access intersection have been estimated from the hourly intersection counts as 8,500 and 8,350 daily traffic movements, as summarised in Section 2.3.3. The additional truck traffic movements will predominantly be travelling to and from the north (70%) with the remaining 30% travelling to and from the south. However, the additional car traffic movements to and from the facility have been assumed to be travelling to and from the south (70%) with only 30% approximately travelling to and from the north.

The corresponding daily traffic increases for Reconciliation Road traffic from the proposal under both the average and maximum conditions are shown in Table 4.4.

Table 4.4 Future daily traffic movements on Reconciliation Road

Road Section	Existing base daily traffic movements	Additional facility generated daily traffic movements (average day)		Percentage daily traffic proportion for the facility traffic	Additional facility generated daily traffic movements (maximum day)		Percentage daily traffic proportion for the facility traffic
	All traffic	Cars	Trucks	All traffic			
Reconciliation Road, north of the facility access intersection	8,500	2	100	1.2%	2	188	2.2%
Widemere Road, south of the facility access intersection	8,350	4	44	0.6%	4	80	1.0%

The proportional daily traffic increases will be highest to the north of the facility travelling towards the M4 Motorway and Great Western Highway. This corresponds to a +1.2% increase on an average day and +2.2% on a maximum operating day. The proportional increases in the daily traffic using Widemere Road and Hassall Street to the south of the facility will be lower, corresponding to a maximum +0.6% traffic increase on either of these roads on an average production day and a +1.0% traffic increase on a maximum operating day.

The typical road width and condition to the north and south of the facility are shown in Photographs 2.2 to 2.5. These roads are industrial area type roads which have been adequately constructed to carry significant volumes of heavy vehicle traffic and are unlikely to be adversely affected by additional traffic volumes (Table 4.4) generated by the proposal.

4.4 Car parking

The existing staff and visitor car parking areas at the facility, as discussed in Section 2.8 and shown in Photograph 2.14, are more than adequate for the current employees and visitors numbers at the facility. Employee numbers will only change marginally under the proposal; the predicted demand from three additional employee should be accommodated by the current level of car parking capacity.

No additional facility car parking capacity will be required for the proposed workforce. However during construction, some additional construction workforce car parking demand (for up to four employee vehicles over five construction days) should be accommodated in the existing car parking area.

4.5 Safety and traffic management

The external road network traffic safety for the facility traffic is considered to be very good. This is because access to the site is via Reconciliation Road, which is a newly constructed road, is constructed to a high design standard in comparison to the current usage and the speed limit (60 km/hr) and the intersections are well designed with adequate sight distance for visibility.

Potential internal site traffic safety issues have been previously identified and addressed by the facility operating procedures and traffic management plan, as summarised in Section 2.2 and Section 2.7. There will be no change to current operational levels of traffic safety within the facility resulting from the proposal.

The internal facility traffic circulation and road widths have been reviewed and all generally comply with the AS 2890 Part 2 recommended minimum road widths of 6.5 m for two way traffic movement by large trucks, with additional widening provided at corners to accommodate the increased vehicle path width requirements for these vehicles when cornering.

4.6 Public transport, pedestrian and cycling access

Access to the facility is available by paved paths for cyclists and pedestrians and for public transport access via the bus transitway, as shown on Photograph 2.16. However, demand levels for travel by either walking or cycling to and from the facility are likely to be minimal due to the distances from nearest residential areas in the locality.

5 Summary and conclusions

The facility has been operating since 2002, employing approximately 30 staff. It is estimated that current operations at the facility generate approximately 234 daily trucks (468 truck movements) and approximately 50 daily car trips (100 car movements) to and from the site.

Reconciliation Road is a newly constructed road which links commercial and industrial areas within the Holroyd and Fairfield LGAs. The existing daily traffic volumes using the route have been estimated from a peak hour intersection traffic survey as approximately 8,500 vehicles north of the facility access intersection and 8,350 vehicles south of the intersection. The route carries high proportions of heavy vehicle traffic currently which were surveyed as 16% of total traffic during the morning peak hour and 7% of total traffic during the afternoon peak hour. For this assessment, it was assumed (based on traffic surveys undertaken) that truck movements are distributed approximately 70% to and from the north via Reconciliation Road and 30% to and from the south via Widemere Road and Hassall Street.

This traffic impact assessment has assessed the traffic impacts of the proposed increased production (from 750,000 to 1,000,000 tpa) at the facility, which would increase traffic generation compared to current operations. Daily truck movements are predicted to increase to 306 truck loads (612 truck movements) on average, and were estimated to increase to up to 566 truck loads (1,132 truck movements) on a maximum operating day.

The proposed site construction traffic access routes are via Reconciliation Road to and from the north and via Widemere Road and Hassall Street, to and from the south. These roads are industrial area roads which carry significant heavy vehicle traffic currently. The additional site generated hourly car or truck traffic movements during the construction period would be minimal and temporary (a maximum of 10 additional car and 10 additional truck movements daily over a five day period). As these movements are much lower than the proposed additional traffic during future site operations, detailed impact analysis of the site construction traffic volumes is not required.

On average, daily traffic on the local road network (Reconciliation Road to the north and Widemere Road and Hassall Street to the south) is predicted to increase by up to +1.2% under the proposal. The additional truck traffic movements should be accommodated with minimal impacts to either the traffic capacity or the road pavement condition on these roads which are industrial area roads that have been adequately constructed to carry significant volumes of heavy vehicle traffic. The proposal will not therefore have an adverse impact on the local road network.

The proposal will not have a significant impact on intersection performance. The future peak hour operating performance of the facility access intersection with Widemere Road will continue to be very good, remaining at level of service A, under both daily average and predicted maximum operations.

The facility generated peak hourly traffic increases will be quickly distributed onto a range of local access routes to the north and the south, resulting in generally minimal peak hourly traffic increases and no potential traffic impacts at other intersections along these routes.

Employee and visitor numbers will change only marginally and no additional car parking capacity will be required.

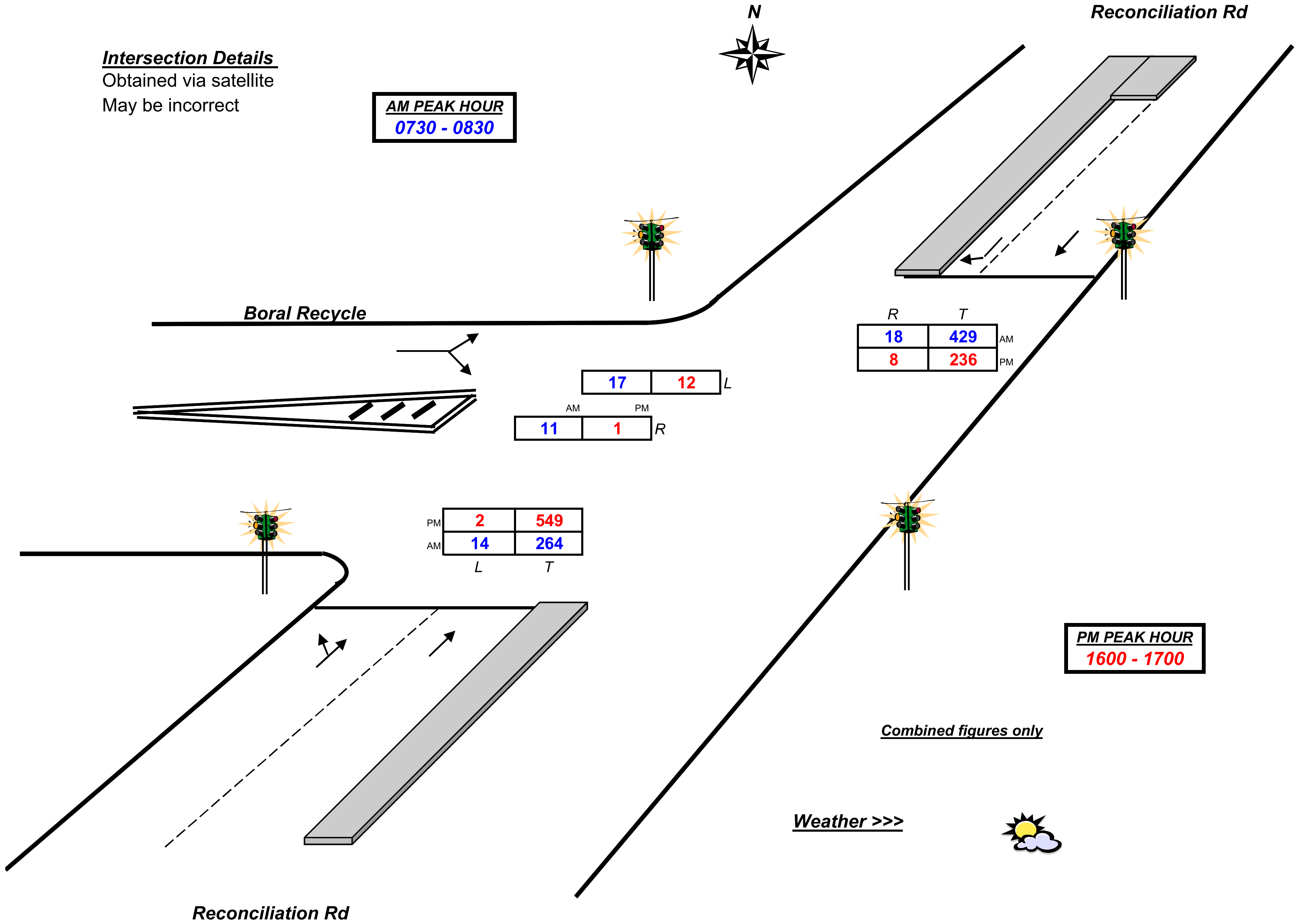
Appendix A

Year 2013/14 intersection traffic volumes

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMGA
Job No/Name : 5040 Wetherill Park Boral Quarry Access
Day/Date : Thursday 13th March 2014

Intersection Details
Obtained via satellite
May be incorrect



R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5040 Wetherill Park Boral Access
Day/Date : Thursday 13th March 2014

PEDS

Time Per	NORTH Reconciliatio	WEST Boral Recycle	SOUTH Reconciliatio	TOT
0600 - 0615				0
0615 - 0630				0
0630 - 0645		NOT		0
0645 - 0700		REQUIRED		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
Per End	**0**	**0**	**0**	**0**

PEDS

Peak Per	NORTH Reconciliatio	WEST Boral Recycle	SOUTH Reconciliatio	TOT
0600 - 0700	0	0	0	0
0615 - 0715	0	0	0	0
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**

Lights

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	47	0	0	0	0	28	75
0615 - 0630	62	0	0	0	0	24	86
0630 - 0645	92	1	0	0	0	49	142
0645 - 0700	115	0	0	1	2	40	158
0700 - 0715	79	0	1	0	0	39	119
0715 - 0730	111	1	1	1	1	37	152
0730 - 0745	100	0	0	1	0	55	156
0745 - 0800	99	0	0	0	1	66	166
0800 - 0815	85	1	0	1	0	48	135
0815 - 0830	112	0	0	0	1	45	158
0830 - 0845	65	2	0	0	1	45	113
0845 - 0900	84	2	4	0	3	44	137
Per End	**1051**	**7**	**6**	**4**	**9**	**520**	**1597**

Heavies

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	7	7	3	0	1	4	22
0615 - 0630	7	4	5	3	2	8	29
0630 - 0645	5	5	5	3	4	9	31
0645 - 0700	4	7	7	1	2	7	28
0700 - 0715	4	4	8	3	4	8	31
0715 - 0730	12	4	2	1	2	7	28
0730 - 0745	9	2	8	3	2	11	35
0745 - 0800	13	3	5	3	5	19	48
0800 - 0815	5	2	3	2	1	6	19
0815 - 0830	6	10	1	1	4	14	36
0830 - 0845	11	8	7	2	5	13	46
0845 - 0900	8	9	8	7	2	8	42
Per End	**10**	**65**	**62**	**29**	**34**	**114**	**314**

Combined

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	54	7	3	0	1	32	97
0615 - 0630	69	4	5	3	2	32	115
0630 - 0645	97	6	5	3	4	58	173
0645 - 0700	119	7	7	2	4	47	186
0700 - 0715	83	4	9	3	4	47	150
0715 - 0730	123	5	3	2	3	44	180
0730 - 0745	109	2	8	4	2	66	191
0745 - 0800	112	3	5	3	6	85	214
0800 - 0815	90	3	3	3	1	54	154
0815 - 0830	118	10	1	1	5	59	194
0830 - 0845	76	10	7	2	6	58	159
0845 - 0900	92	11	12	7	5	52	179
Per End	**1142**	**72**	**68**	**33**	**43**	**634**	**1911**

Lights

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	316	1	0	1	2	141	461
0615 - 0715	348	1	1	1	2	152	505
0630 - 0730	397	2	2	2	3	165	571
0645 - 0745	405	1	2	3	3	171	585
0700 - 0800	389	1	2	2	2	197	593
0715 - 0815	395	2	1	3	2	206	609
0730 - 0830	396	1	0	2	2	214	615
0745 - 0845	361	3	0	1	3	204	572
0800 - 0900	346	5	4	1	5	182	543
PEAK HR	**396**	**1**	**0**	**2**	**2**	**214**	**615**

Heavies

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	23	23	20	7	9	28	110
0615 - 0715	20	20	25	10	12	32	119
0630 - 0730	25	20	22	8	12	31	118
0645 - 0745	29	17	25	8	10	33	122
0700 - 0800	38	13	23	10	13	45	142
0715 - 0815	39	11	18	9	10	43	130
0730 - 0830	33	17	17	9	12	50	138
0745 - 0845	35	23	16	8	15	52	149
0800 - 0900	30	29	19	12	12	41	143
PEAK HR	**33**	**17**	**17**	**9**	**12**	**50**	**138**

Combined

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral Recycle		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	339	24	20	8	11	169	571
0615 - 0715	368	21	26	11	14	184	624
0630 - 0730	422	22	24	10	15	196	689
0645 - 0745	434	18	27	11	13	204	707
0700 - 0800	427	14	25	12	15	242	735
0715 - 0815	434	13	19	12	12	249	739
0730 - 0830	429	18	17	11	14	264	753
0745 - 0845	396	26	16	9	18	256	721
0800 - 0900	376	34	23	13	17	223	686
PEAK HR	**429**	**18**	**17**	**11**	**14**	**264**	**753**

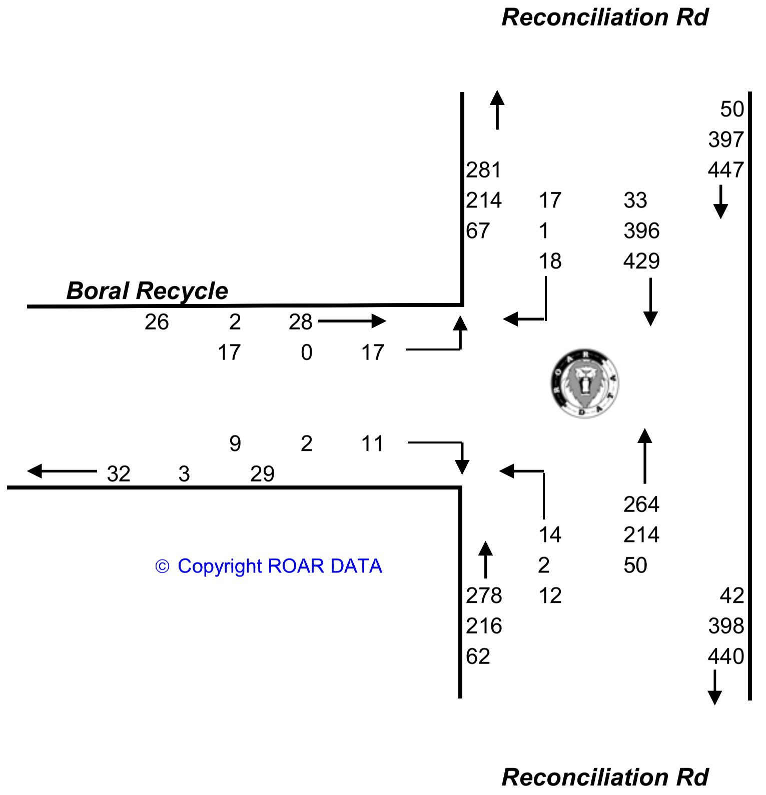
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

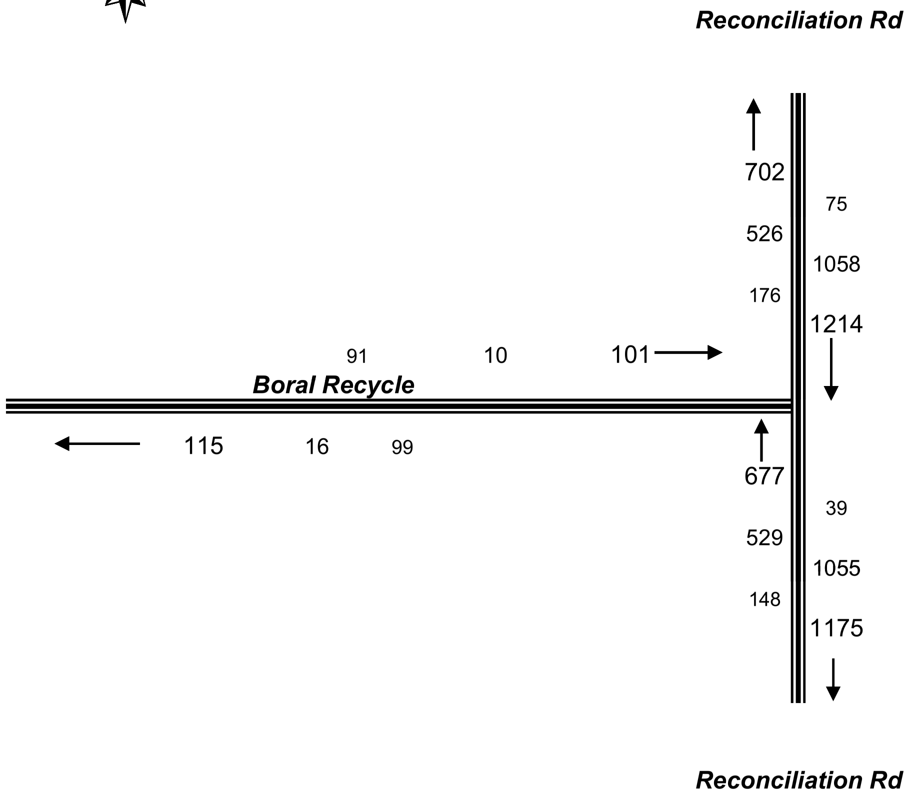
Client : EMGA
Job No/Name : 5040 Wetherill Park Boral Access
Day/Date : Thursday 13th March 2014

TOTAL VOLUMES FOR COUNT PERIOD

AM PEAK
0730 - 0830

N





R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5040 Wetherill Park Boral Access
Day/Date : Thursday 13th March 2014

PEDS

	NORTH	WEST	SOUTH	
Time Per	Reconciliatio	Boral	Reconciliatio	TOT
1500 - 1515				0
1515 - 1530				0
1530 - 1545		NOT		0
1545 - 1600		REQUIRED		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
Per End	0	0	0	0

PEDS

	NORTH	WEST	SOUTH	
Peak Per	Reconciliatio	Boral	Reconciliatio	TOT
1500 - 1600	0	0	0	0
1515 - 1615	0	0	0	0
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
PEAK HR	0	0	0	0

Lights

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	54	2	1	0	1	106	164
1515 - 1530	58	2	2	1	0	68	131
1530 - 1545	44	0	1	1	0	115	161
1545 - 1600	49	1	2	3	0	86	141
1600 - 1615	68	1	1	1	1	158	230
1615 - 1630	50	0	1	0	0	94	145
1630 - 1645	57	0	0	0	0	158	215
1645 - 1700	40	0	0	0	0	119	159
1700 - 1715	66	0	1	0	0	134	201
1715 - 1730	57	0	0	0	0	129	186
1730 - 1745	46	1	2	0	0	95	144
1745 - 1800	35	0	8	5	1	78	127
Per End	624	7	19	11	3	1340	2004

Heavies

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	7	3	7	1	2	6	26
1515 - 1530	6	7	5	4	2	6	30
1530 - 1545	11	1	2	1	1	12	28
1545 - 1600	7	3	1	2	1	7	21
1600 - 1615	9	4	5	0	1	5	24
1615 - 1630	4	1	2	0	0	3	10
1630 - 1645	2	0	2	0	0	7	11
1645 - 1700	6	2	1	0	0	5	14
1700 - 1715	2	0	0	1	0	2	5
1715 - 1730	8	0	0	0	0	4	12
1730 - 1745	5	0	0	2	0	2	9
1745 - 1800	6	0	0	0	0	2	8
Per End	73	21	25	11	7	61	198

Combined

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	61	5	8	1	3	112	190
1515 - 1530	64	9	7	5	2	74	161
1530 - 1545	55	1	3	2	1	127	189
1545 - 1600	56	4	3	5	1	93	162
1600 - 1615	77	5	6	1	2	163	254
1615 - 1630	54	1	3	0	0	97	155
1630 - 1645	59	0	2	0	0	165	226
1645 - 1700	46	2	1	0	0	124	173
1700 - 1715	68	0	1	1	0	136	206
1715 - 1730	65	0	0	0	0	133	198
1730 - 1745	51	1	2	2	0	97	153
1745 - 1800	41	0	8	5	1	80	135
Per End	697	28	44	22	10	1401	2202

Lights

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	205	5	6	5	1	375	597
1515 - 1615	219	4	6	6	1	427	663
1530 - 1630	211	2	5	5	1	453	677
1545 - 1645	224	2	4	4	1	496	731
1600 - 1700	215	1	2	1	1	529	749
1615 - 1715	213	0	2	0	0	505	720
1630 - 1730	220	0	1	0	0	540	761
1645 - 1745	209	1	3	0	0	477	690
1700 - 1800	204	1	11	5	1	436	658
PEAK HR	215	1	2	1	1	529	749

Heavies

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	31	14	15	8	6	31	105
1515 - 1615	33	15	13	7	5	30	103
1530 - 1630	31	9	10	3	3	27	83
1545 - 1645	22	8	10	2	2	22	66
1600 - 1700	21	7	10	0	1	20	59
1615 - 1715	14	3	5	1	0	17	40
1630 - 1730	18	2	3	1	0	18	42
1645 - 1745	21	2	1	3	0	13	40
1700 - 1800	21	0	0	3	0	10	34
PEAK HR	21	7	10	0	1	20	59

Combined

	NORTH		WEST		SOUTH		
	Reconciliatio		Boral		Reconciliatio		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	236	19	21	13	7	406	702
1515 - 1615	252	19	19	13	6	457	766
1530 - 1630	242	11	15	8	4	480	760
1545 - 1645	246	10	14	6	3	518	797
1600 - 1700	236	8	12	1	2	549	808
1615 - 1715	227	3	7	1	0	522	760
1630 - 1730	238	2	4	1	0	558	803
1645 - 1745	230	3	4	3	0	490	730
1700 - 1800	225	1	11	8	1	446	692
PEAK HR	236	8	12	1	2	549	808

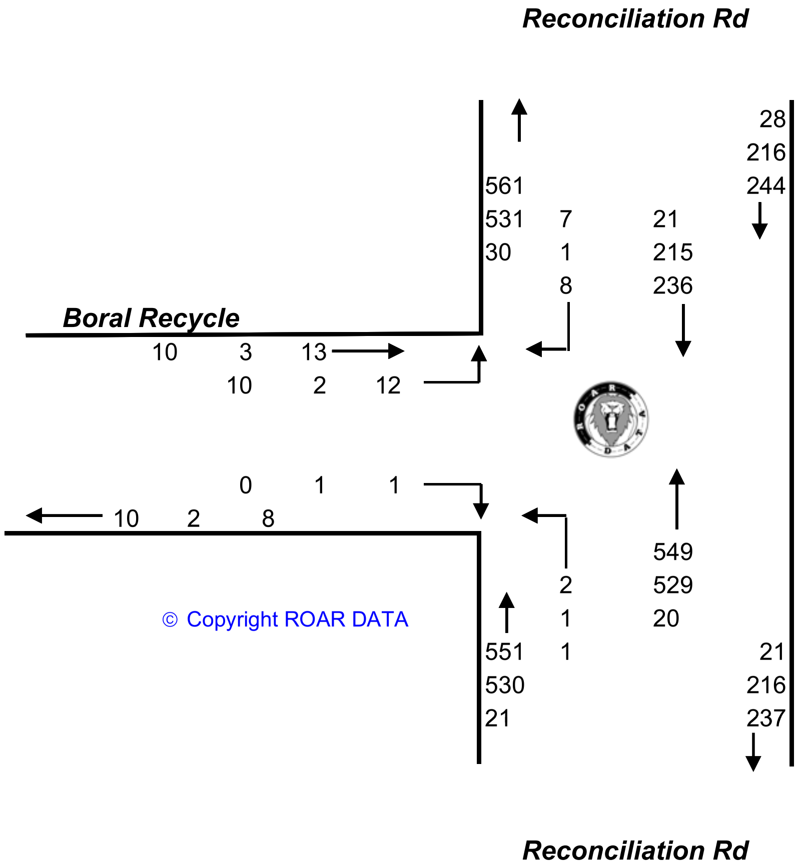
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

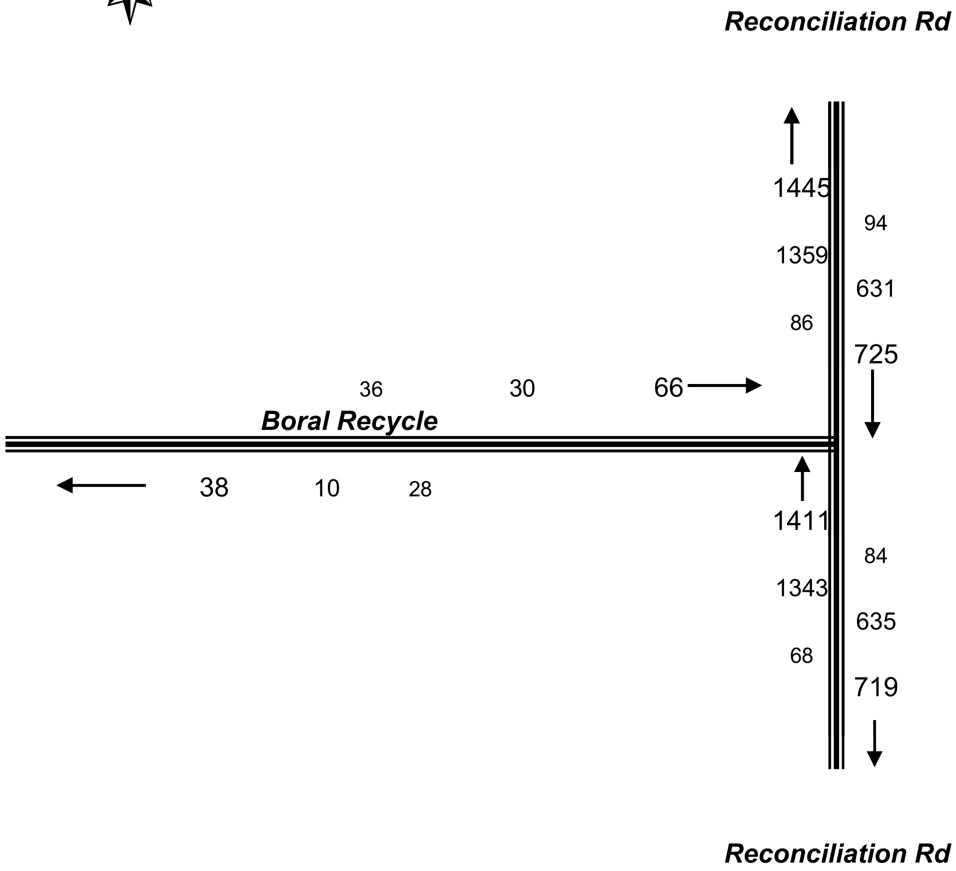
Client : EMGA
Job No/Name : 5040 Wetherill Park Boral Access
Day/Date : Thursday 13th March 2014

PM PEAK
1600 - 1700

TOTAL VOLUMES FOR COUNT PERIOD

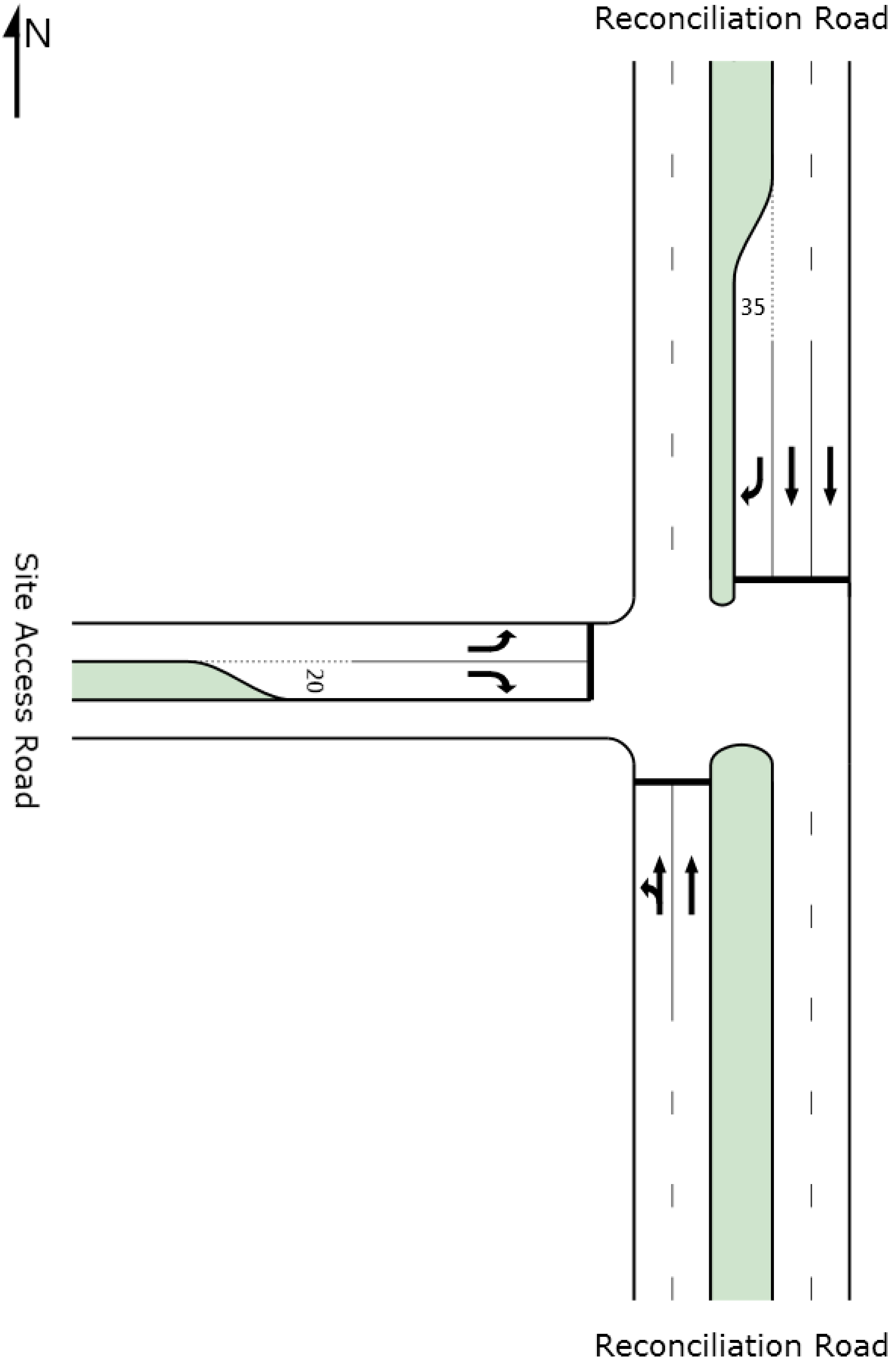
N





Appendix B

SIDRA intersection analysis


N
Reconciliation Road
35
Site Access Road
20
Reconciliation Road

MOVEMENT SUMMARY

Site: Site Access Intersection AM Peak

Reconciliation Road Intersection
Signals - Fixed Time Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	15	85.7	0.177	21.0	LOS B	2.2	19.0	0.57	1.01	41.4
2	T	278	18.9	0.177	9.6	LOS A	2.4	19.6	0.58	0.48	45.3
Approach		293	22.3	0.177	10.1	LOS A	2.4	19.6	0.58	0.51	45.1
North: Reconciliation Road											
8	T	452	7.7	0.174	3.3	LOS A	2.2	16.7	0.36	0.31	53.3
9	R	19	94.4	0.171	42.2	LOS C	0.6	7.1	0.95	0.71	29.4
Approach		471	11.2	0.174	4.9	LOS A	2.2	16.7	0.39	0.32	51.6
West: Site Access Road											
10	L	18	100.0	0.055	28.5	LOS C	0.4	5.0	0.74	0.71	35.4
12	R	14	84.6	0.159	40.5	LOS C	0.4	4.9	0.94	0.69	29.5
Approach		32	93.3	0.159	33.7	LOS C	0.4	5.0	0.82	0.70	32.8
All Vehicles		795	18.5	0.177	8.0	LOS A	2.4	19.6	0.47	0.41	47.9

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 SUMMARY

Site: Site Access Intersection AM Peak With Production Increase - Average Day

Reconciliation Road Intersection
Signals - Fixed Time   Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	20	84.2	0.194	22.3	LOS B	2.5	21.3	0.61	0.99	40.4
2	T	278	18.9	0.194	10.9	LOS A	2.7	21.6	0.62	0.52	44.0
Approach		298	23.3	0.194	11.6	LOS A	2.7	21.6	0.62	0.55	43.7
North: Reconciliation Road											
8	T	452	7.7	0.174	3.3	LOS A	2.2	16.7	0.36	0.31	53.3
9	R	25	95.8	0.172	39.8	LOS C	0.7	9.1	0.92	0.72	30.5
Approach		477	12.4	0.174	5.2	LOS A	2.2	16.7	0.39	0.33	51.3
West: Site Access Road											
10	L	24	100.0	0.067	27.0	LOS B	0.5	6.5	0.71	0.72	36.2
12	R	15	85.7	0.172	40.6	LOS C	0.4	5.3	0.94	0.70	29.5
Approach		39	94.6	0.172	32.2	LOS C	0.5	6.5	0.80	0.71	33.6
All Vehicles		814	20.3	0.194	8.9	LOS A	2.7	21.6	0.49	0.43	47.0

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.

Processed: Tuesday, 17 June 2014 2:19:19 PM
SIDRA INTERSECTION 5.1.13.2093

Project: C:\Program Files (x86)\SIDRA SOLUTIONS\SIDRA RESULTS\Boral Widemere\Reconciliation Road Intersection.sip
8001331, EMG, SINGLE

MOVEMENT SUMMARY

Site: Site Access Intersection AM Peak With Production Increase - Maximum Day

Reconciliation Road Intersection
Signals - Fixed Time   Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	37	91.4	0.306	28.8	LOS C	3.1	28.4	0.79	0.93	36.3
2	T	278	18.9	0.306	17.5	LOS B	3.7	30.4	0.79	0.67	38.3
Approach		315	27.4	0.306	18.8	LOS B	3.7	30.4	0.79	0.70	38.0
North: Reconciliation Road											
8	T	452	7.7	0.187	4.5	LOS A	2.6	19.6	0.42	0.36	51.5
9	R	49	97.9	0.311	33.9	LOS C	1.2	15.9	0.84	0.75	33.3
Approach		501	16.6	0.311	7.4	LOS A	2.6	19.6	0.46	0.39	48.9
West: Site Access Road											
10	L	48	100.0	0.092	21.1	LOS B	0.8	10.2	0.57	0.73	39.7
12	R	27	92.3	0.308	37.5	LOS C	0.8	9.5	0.90	0.72	30.9
Approach		76	97.2	0.308	27.0	LOS B	0.8	10.2	0.69	0.73	36.3
All Vehicles		892	27.3	0.311	13.1	LOS A	3.7	30.4	0.60	0.53	43.2

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.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Site Access Intersection PM Peak

Reconciliation Road Intersection
Signals - Fixed Time   Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	2	50.0	0.313	21.7	LOS B	5.0	36.5	0.63	1.00	40.5
2	T	578	3.6	0.313	10.8	LOS A	5.1	36.6	0.63	0.54	44.1
Approach		580	3.8	0.313	10.9	LOS A	5.1	36.6	0.63	0.54	44.1
North: Reconciliation Road											
8	T	248	8.9	0.096	3.1	LOS A	1.2	8.7	0.34	0.28	53.7
9	R	8	87.5	0.074	41.1	LOS C	0.2	3.0	0.93	0.68	29.7
Approach		257	11.5	0.096	4.3	LOS A	1.2	8.7	0.36	0.29	52.3
West: Site Access Road											
10	L	13	83.3	0.036	27.7	LOS B	0.3	3.2	0.73	0.70	35.7
12	R	1	0.0	0.007	35.1	LOS C	0.0	0.2	0.92	0.59	30.5
Approach		14	76.9	0.036	28.3	LOS B	0.3	3.2	0.75	0.69	35.3
All Vehicles		851	7.3	0.313	9.2	LOS A	5.1	36.6	0.55	0.47	46.1

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.

MOVEMENT SUMMARY

Site: Site Access Intersection PM Peak With Production Increase - Average Day

Reconciliation Road Intersection
Signals - Fixed Time   Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	2	50.0	0.313	21.7	LOS B	5.0	36.5	0.63	1.00	40.5
2	T	578	3.6	0.313	10.8	LOS A	5.1	36.6	0.63	0.54	44.1
Approach		580	3.8	0.313	10.9	LOS A	5.1	36.6	0.63	0.54	44.1
North: Reconciliation Road											
8	T	248	8.9	0.096	3.1	LOS A	1.2	8.7	0.34	0.28	53.7
9	R	11	90.0	0.093	41.4	LOS C	0.3	3.8	0.94	0.69	29.7
Approach		259	12.2	0.096	4.6	LOS A	1.2	8.7	0.36	0.29	52.0
West: Site Access Road											
10	L	17	81.3	0.048	27.7	LOS B	0.4	4.3	0.74	0.71	35.7
12	R	3	33.3	0.026	37.1	LOS C	0.1	0.8	0.92	0.63	30.1
Approach		20	73.7	0.048	29.2	LOS C	0.4	4.3	0.77	0.70	34.7
All Vehicles		859	8.0	0.313	9.4	LOS A	5.1	36.6	0.55	0.47	45.9

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 SUMMARY

Site: Site Access Intersection PM Peak With Production Increase - Maximum Day

Reconciliation Road Intersection
Signals - Fixed Time   Cycle Time = 60 seconds (User-Given Cycle Time)

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: Reconciliation Road											
1	L	3	66.7	0.314	22.2	LOS B	5.0	36.6	0.63	1.02	40.5
2	T	578	3.6	0.314	10.8	LOS A	5.1	36.8	0.63	0.54	44.1
Approach		581	4.0	0.314	10.9	LOS A	5.1	36.8	0.63	0.54	44.1
North: Reconciliation Road											
8	T	248	8.9	0.096	3.1	LOS A	1.2	8.7	0.34	0.28	53.7
9	R	20	94.7	0.181	42.3	LOS C	0.6	7.6	0.95	0.71	29.4
Approach		268	15.3	0.181	6.0	LOS A	1.2	8.7	0.38	0.31	50.6
West: Site Access Road											
10	L	31	89.7	0.090	28.4	LOS B	0.7	8.3	0.75	0.73	35.5
12	R	4	50.0	0.039	38.1	LOS C	0.1	1.2	0.92	0.65	30.0
Approach		35	84.8	0.090	29.5	LOS C	0.7	8.3	0.77	0.72	34.7
All Vehicles		884	10.6	0.314	10.1	LOS A	5.1	36.8	0.56	0.48	45.4

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.

Processed: Tuesday, 17 June 2014 2:25:54 PM
SIDRA INTERSECTION 5.1.13.2093

Project: C:\Program Files (x86)\SIDRA SOLUTIONS\SIDRA RESULTS\Boral Widemere\Reconciliation Road Intersection.sip
8001331, EMG, SINGLE

EMM

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Appendix C

Air quality and greenhouse gas assessment

Widemere Recycling Facility - Air Quality Impact Assessment

Prepared for:
EMGA Mitchell McLennan

Prepared by:
ENVIRON Australia Pty Ltd

Date:
29 May 2015

Project Number:
AS121701

ENVIRON

Prepared by:				**Authorised by:**			
Name:	Scott Fishwick			Name:	Brian Bell		
Title:	Manager – Air Quality			Title:	Principal – Air Quality		
Phone:	(02) 9954 8100			Phone:	(08) 9225 5199		
Email:	sfishwick@environcorp.com			Email:	bbell@environcorp.com		
Signature:		Date:	29.05.2015	Signature:		Date:	29.05.2015

This document is issued in confidence to EMGA Mitchell McLennan and Boral Recycling Pty Limited for the purposes of the assessment of air quality impacts associated with the Widemere Recycling Facility. It should not be used for any other purpose.

VERSION CONTROL RECORD

Document File Name	**Date Issued**	**Version**	**Author**	**Reviewer**
AS121701_Widemere_AQIA_final_161214	16 December 2014	Final	Scott Fishwick	Brian Bell
AS121701_Widemere_AQIA_final_R1_280415	28 April 2015	Revision 1	Scott Fishwick	Brian Bell
AS121701_Widemere_AQIA_final_R2_070515	7 May 2015	Revision 2	Scott Fishwick	Brian Bell
AS121701_Widemere_AQIA_final_R3_290515	29 May 2015	Revision 3	Scott Fishwick	Brian Bell

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Executive Summary

ENVIRON Australia Pty Ltd (ENVIRON) was commissioned by EMGA Mitchell McLennan (EMM) on behalf of Boral Recycling Pty Limited (Boral) to undertake an Air Quality Impact Assessment for the proposed production increase at the Widemere Recycling Facility (the facility). Boral propose to increase annual processing and production of recycled materials from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the proposal).

The proposal is being assessed as State Significant Development (SSD) under Part 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Accordingly, this Air Quality Impact Assessment has been prepared to support an environmental impact statement and development application (DA) for the proposal.

Emissions of particulate matter were estimated for both existing (approved) operations, and operations at the facility under the proposal (proposed operations). Atmospheric dispersion modelling predictions of air pollution emissions was undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted for the existing and proposed operational scenarios highlight the following:

- The increase in processing and product dispatch that would occur as a result of the proposal is predicted to result in an increase in the ambient particulate concentrations in the surrounding environment relative to existing operations, although the predicted concentrations are low;
- Facility increment-only (excluding ambient background) particulate concentrations and deposition levels from both existing and proposed operations are low relative to applicable assessment criterion at surrounding receptors;
- Taking background ambient air quality concentrations into account, compliance with short-term criterion for PM_{10} and $PM_{2.5}$ is heavily influenced by elevated background concentrations caused by natural events such as bushfires. Excluding these events, exceedance of short-term criterion is considered unlikely; and
- Taking background ambient air quality concentrations into account, including elevated natural events, annual average TSP, PM_{10} and $PM_{2.5}$ concentrations are predicted to comply with applicable assessment criterion at all surrounding receptors for both current and proposed operations at the facility.

The potential for adverse impact upon the surrounding environment due to air emissions from the proposal is low. Criteria exceedances are only likely during periods of elevated background ambient air quality due to significant natural events such as bushfires. On the basis of the modelling conducted within this assessment, it is considered unlikely that emissions from the proposed increased production rates at the facility would negatively impact upon the surrounding area.

To evaluate the proposal's greenhouse gas (GHG) emissions and determine the facility's contribution to NSW and Australian annual GHG emissions, emissions were estimated based on information provided by Boral and relevant GHG emission factors.

GHG emissions were calculated for:

- Direct emissions produced from sources within the boundary of the facility and as a result of activities at the facility (Scope 1 emissions); and
- Indirect emissions generated in the wider economy as a consequence of the Proposal activities, but which are physically produced by the activities of another organisation indirectly (Scope 2 emissions).

Key findings are as follows:

- Total facility GHG emissions (from direct and indirect sources) from the proposal were estimated to be 2.3kt and 3.1kt of Carbon Dioxide Equivalent per year (CO_2–e/yr) for current and future proposed operations with the increase being roughly proportional to the proposed increase in production; and
- Emissions generated by the proposal represent between 0.0014% and 0.0019% of annual NSW GHG emissions and 0.0004% to 0.0006% of annual Australian GHG emissions (relative to year 2011-2012).

1 Introduction

ENVIRON was commissioned by EMM on behalf of Boral to undertake an Air Quality Impact Assessment for the Widemere Recycling Facility (the facility).

The facility accepts construction and demolition waste where it separates, crushes and blends it with quarry material to form construction materials. Boral is seeking to modify operations at the facility, including increasing the maximum processing rate from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the proposal). The proposal also includes a minor internal road realignment, import of additional waste materials that are not currently listed on the facility's Environment Protection Licence (EPL) and minor changes to the operating hours of the facility.

The facility is located off Widemere Road, Wetherill Park, approximately 28 km west of the Sydney central business district in the Fairfield local government area (LGA) and occupies seven hectares (ha) of a 10 ha site (the facility). The regional setting of the facility is illustrated in **Figure 1**, while the existing layout of the facility is presented in **Figure 2**.

This Air Quality Impact Assessment has principally been guided by the NSW Environment Protection Authority (NSW EPA, then Department of Environment and Conservation (DEC)) document *The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* ("the Approved Methods for Modelling", DEC 2005).

The proposal is being assessed as State Significant Development (SSD) under Part 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Accordingly, this Air Quality Impact Assessment has been prepared to support an environmental impact statement and development application (DA) for the proposal.

1.1 Secretary's Environmental Assessment Requirements

A summary of the NSW Department of Planning and Environment Secretary's Environmental Assessment Requirements (SEAR's) relevant to this report are presented in **Table 1**. The relevant sections of the report where the SEAR's are addressed is also presented in **Table 1**.

Table 1: Summary of SEAR's for the Proposal

SEAR	Section Addressed
Air Quality	
Description of all potential air emission and odour sources	**Section 7 and Appendix B**
A comprehensive air quality assessment of all potential air quality and odour impacts from the development, including details of air quality and odour impacts on private properties, in accordance with relevant Environment Protection Authority guidelines	**Section 7, Section 8 and Section 9**
Details of mitigation, management and monitoring measures for preventing and/or minimising both point and fugitive emissions	**Section 7**
Cumulative impacts – particularly in relation to air, noise and traffic associated with other nearby industrial or commercial operations	**Section 7, Section 8 and Section 9**
Greenhouse Gas	
A quantitative assessment of the potential Scope 1 and 2 greenhouse gas emissions of the development, and a qualitative assessment of the potential impacts of these emissions on the environment	**Section 10**
A detailed description of the measures that would be implemented on site to ensure that the development is energy efficient	

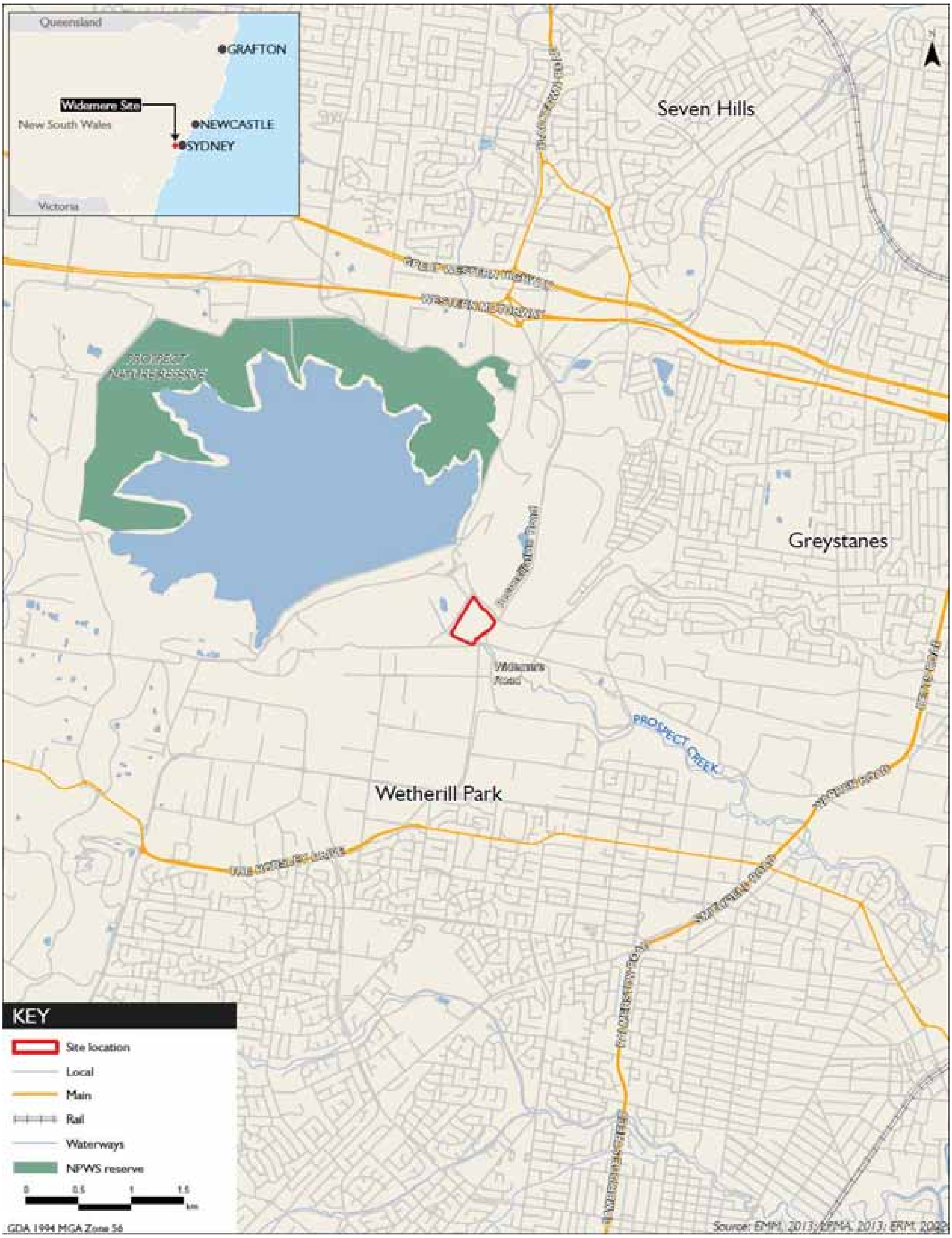

Figure 1: Regional Setting of the facility

Source: EMM, 2014

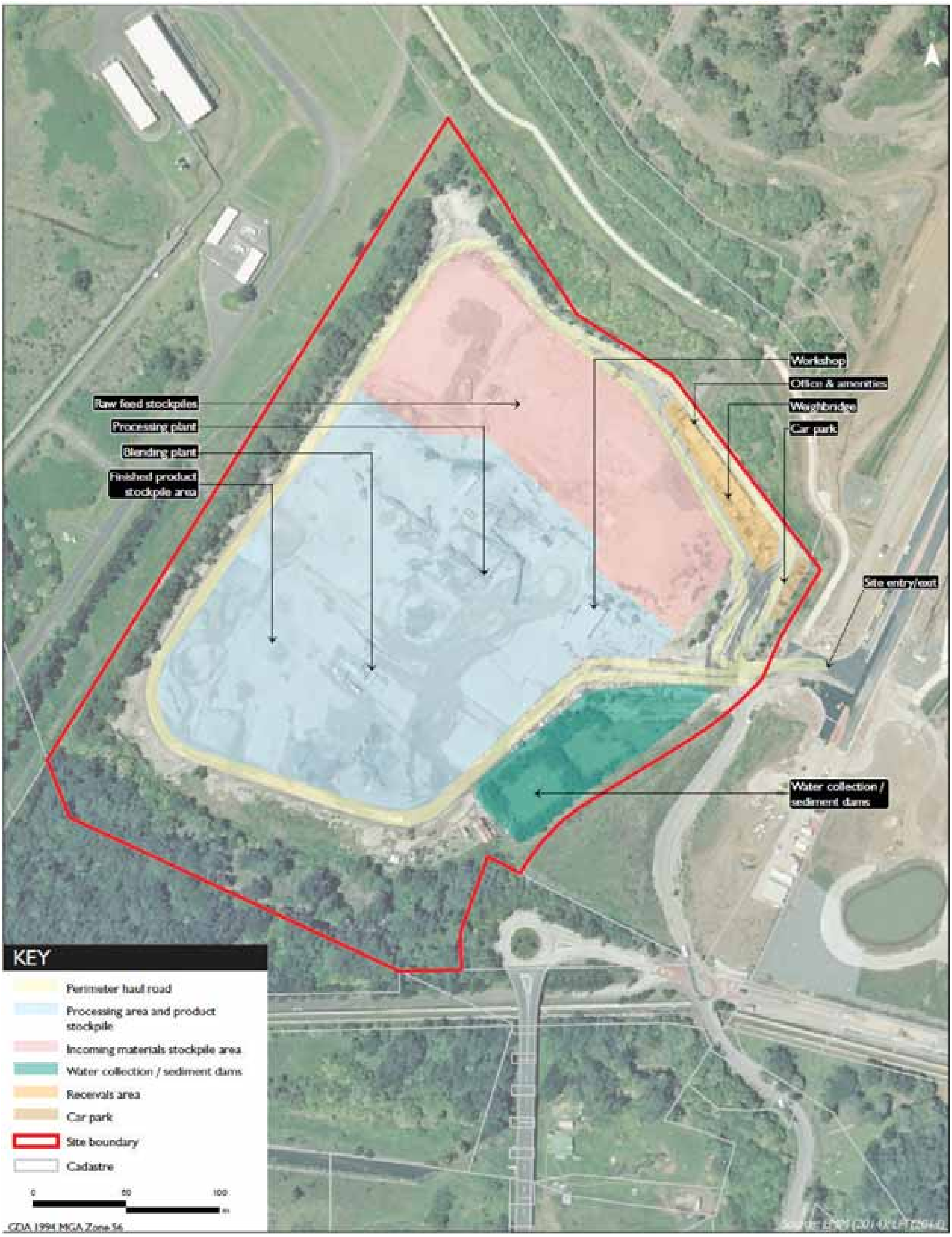

Figure 2: Existing Site Layout

Source: EMM, 2014

2 Overview of Project

Approved operations at the facility include the receipt of permitted waste which is sorted, processed, and blended on site to produce a range of recycled aggregate and road base products. The proposal involves continuation of operations approved under the current development consent (as modified), with the following modifications:

- increase in the maximum processing capacity from the existing limit of 750,000 tonnes per annum (tpa) to 1,000,000 tpa;
- addition of new waste streams to the permitted wastes received by the facility;
- a minor change to the site layout, realigning the southern internal road (see **Figure 2**); and
- change the operating hours of the facility to allow maintenance activities to be undertaken on no more than 12 Sundays and public holidays per year.

The realignment of the southern internal road would allow the stockpiling of additional recycled materials associated with the additional processing rate and improve the overall layout of the site.

The modifications to approved operations under the proposal are required in order to respond to changes in market demands for engineered road base products, optimise the use of the site, and consolidate waste from other Boral operations to improve broader resource recovery outcomes for the business.

Permitted wastes under current operations would continue to be received by the facility. Approval is also sought to receive the following additional wastes:

- excavated natural material (ENM);
- tiles and masonry (including materials direct from manufacturer, such as seconds material);
- quarry products (greater than 20 mm); and
- wet concrete batching plant stirrer waste.

All new waste products received at the site as part of the proposal will be processed into four new products which will remain consistent with existing aggregates and road base products.

Concrete batching plant stirrer waste would be sourced mainly from Boral's concrete batching plants within the Sydney region. The wet concrete stirrer waste would be stockpiled in the same location as the concrete washout received under approved operations, and allowed to dry prior to processing. The existing concrete washout stockpile area has a solid concrete base which provides a non-permeable barrier to contain the wet concrete stirrer waste. The stirrer waste would solidify quickly, and would be crushed at the facility in the incoming materials stockpile area.

Quarry products (greater than 20 mm) would be used as an alternative blending material, which would provide greater flexibility for product blending.

Details of the existing and proposed modified operations at the facility are presented in **Table 2**.

Table 2: Proposed Changes from Current Operations		
	Current Operations	**Proposed Change**
Hours of operation	Processing activities 6 am-10 pm, Monday to Friday. 6 am-4 pm, Saturday. Receival of waste material and dispatch of product 6 am-midnight, Monday to Friday. 6 am-4 pm, Saturday. No operations on Sundays or public holidays.	Processing and dispatch activities 6 am-midnight, Monday to Saturday. 6 am-6 pm one Sunday per month, on average. Maintenance activities 6 am-6 pm on Sunday and public holidays.
Volume of material to be processed as a finished product	750,000 tpa	1,000,000 tpa
Number of employees	30	33
Stockpile height	20 m	No change
Materials to be received	– Building & demolition waste, as defined in Schedule 1 of the POEO Act – Asphalt waste – Virgin excavated natural material – Plasterboard and ceramics - Cured concrete waste (washout) or in solid form from a concrete batching plant – Natural quarry product – processed – Soil (meets CT1 thresholds for General Solid Waste in Table 1 of the waste classification guidelines) – Garden waste, as defined in Schedule 1 of the POEO Act – General or specific exempted waste (meets all conditions of a resource recovery exemption under clause 51A of the POEO (Waste) regulation) – Any waste that is below licensing thresholds in Schedule 1 of the POEO Act	Additional material to be received: – ENM; – tiles and masonry (including materials direct from the manufacturer) – quarry products (greater than 20 mm) – wet concrete batching plant stirrer waste

3 Project Setting

3.1 Existing Land Use and Topography

The facility is located off Widemere Road, Wetherill Park within the Fairfield local government area (LGA), close to its boundary with Holroyd LGA. It is located between the employment lands developed in Boral's Greystanes Estate and the Wetherill Park industrial area, one of Sydney's largest industrial precincts

To the north of the facility is the former Prospect Quarry which is now used for commercial/light industrial purposes. Prospect Reservoir and its associated buffer area are to the west of the facility. To the east is a large stormwater detention basin. Residential land uses are approximately 1 km to the east.

The topography surrounding the facility varies with notably increasing elevation towards the northeast and northwest (Prospect Reservoir wall), while the land to the south is generally flat.

Figure 3 illustrates the topography of the area surrounding the facility.

3.2 Nearest Residences

The facility is located in the vicinity of a number of industrial operations, recreational and residential areas. A mixture of residential, industrial and recreational receptors, representative of the surrounding region, have been selected as assessment locations for this report. Relevant details of these receptors are listed within **Table 3**.

Figure 4 illustrates the location of these sensitive receptor locations relative to the facility.

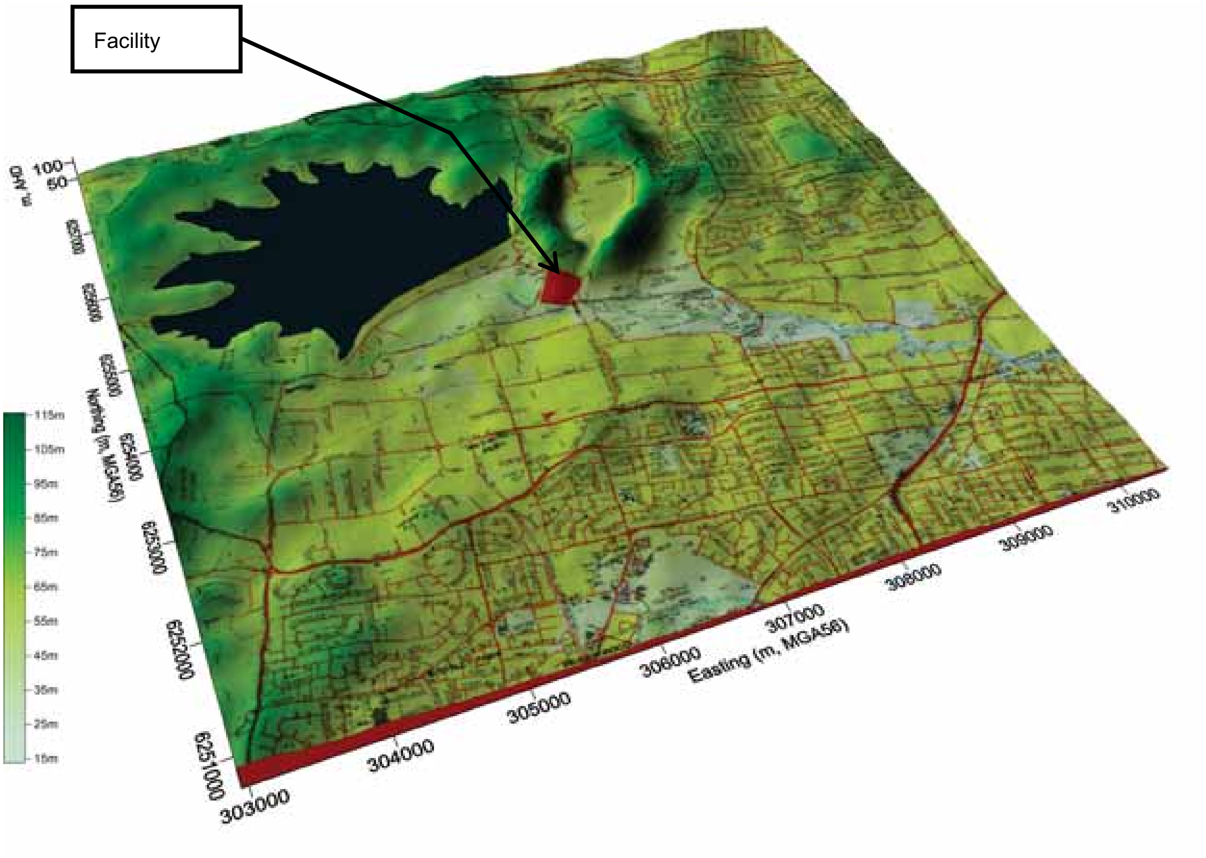

Figure 3: Topography surrounding the facility

Note: Vertical Exaggeration of 4 applied

Table 3: Selected Surrounding Sensitive Receptor Locations

ID	Name	Location (m, MGA56)		Distance (km) / Direction from facility Boundary	Elevation (m, AHD)
		Easting	Northing		
R1	71 Munro St Greystanes	307937	6254537	1.0 / E	43
R2	Hyland Road Park	307646	6254230	0.8 / ESE	36
R3	Hyland Road Youth Centre	307473	6254388	0.6 / E	46
R4	146 Daruga Ave - Nelsons Ridge (residential)	307989	6255221	1.3 / ENE	89
R5	Transgrid substation (Infrastructure)	307425	6254234	0.6 / ESE	35
R6	Industrial area Greystanes	307977	6254145	1.1 / ESE	37
R7	Gipps Road sporting complex	307859	6253830	1.2 / ESE	32
R8	Industrial area - Davis Road	306531	6254174	0.2 / SSW	34
R9	Southern Employment Lands (Industrial / commercial)	307248	6254859	0.5 / NE	64
R10	Future high-density residential development	307616	6254662	0.8 / E	69
R11	Lower Prospect Canal Reserve	306448	6254927	0.3 / NW	41

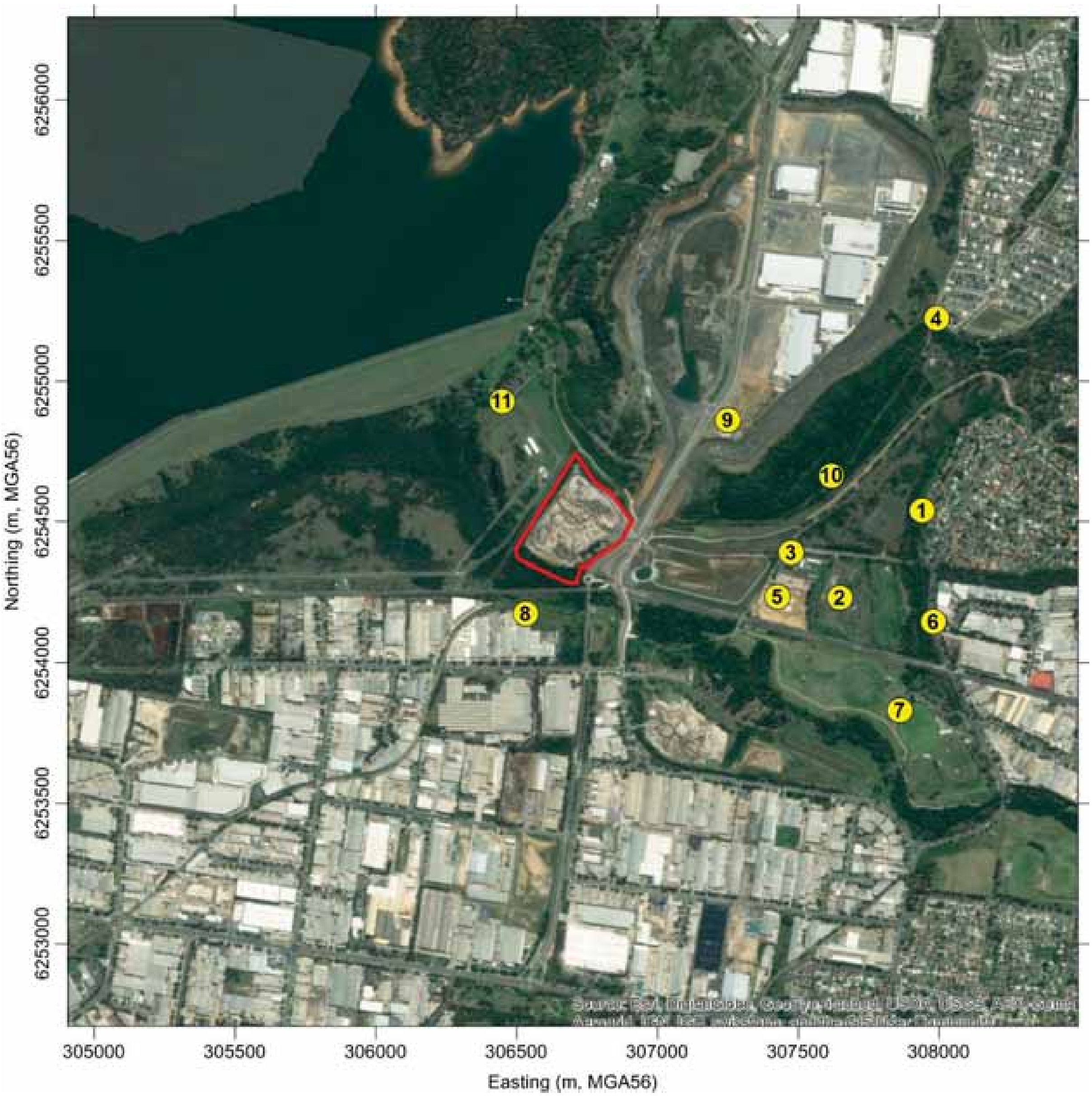

Figure 4: Surrounding Sensitive Receptor Locations

4 Air Quality Criteria

To be in compliance, operations must demonstrate that cumulative air pollutant concentrations, taking into account incremental concentrations due to the operation's emissions and existing background concentrations, comply with the ambient air quality limits.

For this assessment, focus has been given to the primary particulate matter pollutants, namely Total Suspended Particulate (TSP) matter, particulate matter with an equivalent aerodynamic diameter of 10 microns (PM_{10}) and particulate matter with an equivalent aerodynamic diameter of 2.5 microns ($PM_{2.5}$). Dust deposition, as a result of the TSP emissions, is also assessed.

Relevant ambient air quality criteria applicable to the proposal are presented in this section. For proposed developments within NSW, ground level assessment criteria specified by the NSW EPA within the Approved Methods for Modelling are applicable. These assessment criteria are designed to maintain an ambient air quality that allows for adequate protection of human health and well-being.

4.1 Goals Applicable to Airborne Particulate Matter

Ambient air quality limits for particulates are typically given for various particle size fractions, including TSP, PM_{10} and $PM_{2.5}$. Although TSP is defined as all particulates with an aerodynamic diameter of less than 50-100 µm, an effective upper limit of 30 µm aerodynamic diameter is frequently assigned. PM_{10} and $PM_{2.5}$ are of concern due to potential health impacts (Pope and Dockery, 2006; WHO, 2007).

Air quality limits issued by the Federal and NSW government for particulates are given in **Table 4**.

Table 4: Impact Assessment Goals for Airborne Particulates

Pollutant	Averaging Period	Concentration (µg/m³)[5]	Reference
TSP	Annual	90	NSW EPA[(1)]
PM_{10}	24 hours	50	NSW EPA[(1)]
	24 hours	50[(3)]	NEPM[(2)]
	Annual	30	NSW EPA[(1)]
$PM_{2.5}$	24 hours	25	NEPM[(4)]
	Annual	8	NEPM[(4)]

Note 1: NSW EPA Approved Methods for Modelling (DEC 2005)

Note 2: NEPC, 2003, National Environment Protection (Ambient Air Quality) Measure, as amended

Note 3: Provision made for up to five exceedances of the limit per year

Note 4: Advisory reporting goal issued by the NEPC (NEPC, 2003)

Note 5: Concentrations referenced to standard temperature and pressure (STP - 0°C, 1ATM)

The NSW 24-hour PM_{10} assessment goal of 50 µg/m^3 is numerically identical to the equivalent National Environment Protection Measure (NEPM) reporting standard except that the NEPM reporting standard allows for five exceedances per year. The NEPM goals were developed by the National Environmental Protection Council (NEPC) in 1998, with compliance to be achieved by 2008. All State jurisdictions commenced formal reporting against the NEPM standards in 2002. It is noted, however, that the NSW EPA requires assessment of predicted 24-hour average PM_{10} against the maximum predicted concentration.

The NSW EPA has not published any ambient air quality criteria for $PM_{2.5}$. Reference may, however, be made to the $PM_{2.5}$ advisory reporting goals issued by the NEPC (NEPC, 2003), as referenced in **Table 4**.

The air quality impact assessment criteria for airborne particulate concentrations are applicable at sensitive receptors, defined by the Approved Methods for Modelling as the nearest existing, or likely future, off-site dwellings or school, hospital, office or public recreational area. In assessing against these criteria, the total air pollutant concentration (incremental plus background concentration) must be reported as the 100th percentile (i.e. maximum) concentration in units consistent with the impact assessment criteria. These must then be compared with the relevant impact assessment criteria.

4.2 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 5** 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 5: DECC Goals for Allowable 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, DEC 2005

4.3 Air Quality Criteria Applied in the Study

The air quality impact assessment criteria applicable to the assessment of the proposal are summarised in **Table 6**.

Table 6: Adopted Impact Assessment Criteria

Pollutant	Averaging Period	Criterion
TSP	Annual	90 $\mu g/m^3$
PM_{10}	24 hours	50 $\mu g/m^3$
	Annual	30 $\mu g/m^3$
$PM_{2.5}$	24 hours	25 $\mu g/m^3$
	Annual	8 $\mu g/m^3$
Dust Deposition	Annual	2 g/m^2/month – Increment 4 g/m^2/month – Cumulative

Note: Concentrations referenced to STP.

5 Climate and Meteorology

Meteorological mechanisms affect the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere.

The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the boundary layer (the general term for the layer of the atmosphere adjacent to the earth’s surface) and other factors such as wind speed and direction.

Thermal turbulence is driven by incoming solar radiation during daylight hours. Mechanical turbulence is associated with wind speed, in combination with the surface roughness of the surrounding area. The stability of the atmosphere increases with a decrease in thermal and mechanical turbulence.

Air pollutant dispersion consists of vertical and horizontal components of motion. Vertical motion is defined by the stability of the atmosphere (e.g. a stable atmosphere has low vertical dispersion potential) and the depth of the surface-mixing layer, typically the vertical distance between the earth’s surface and a temperature inversion during the day.

The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field (i.e. wind speed and direction). The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume ‘stretching’. The wind direction, and the variability in wind direction, determines the general path that the pollutants will follow.

Airborne particulate concentration levels therefore fluctuate in response to changes in atmospheric stability, mixing depth and winds (Oke, 2003; Sturman and Tapper, 2006; Seinfeld and Pandis, 2006).

In order to characterise the dispersion meteorology of the region surrounding the facility, long-term climate records, time-resolved meteorological monitoring data and meteorological modelling for the region was drawn upon, as documented in the following sections.

5.1 Climate records and meteorological data

The NSW EPA specifies in Section 4.1 of the Approved Methods for Modelling that meteorological data representative of a site should 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).

Meteorological monitoring is not conducted at the facility. In the absence of suitable site-specific meteorological monitoring data, a combination of meteorological modelling and local area monitoring datasets were drawn upon. The following data sets were used in the meteorological analysis:

- 1-hour average meteorological data from the NSW Office of Environment and Heritage (OEH) ambient air quality monitoring station at Prospect, located approximately 4 km north of the facility (years 2011 to 2013 acquired);

- 1-hour average cloud cover data from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) location at Bankstown Airport (Station Number 066137), located approximately 11.7 km southeast of the facility (years 2009 to 2013 accessed); and
- long-term climate statistics (1968 to 2014) obtained from the BoM Bankstown Airport station. It is noted that this station represents the longest and most comprehensive climate record in the local area. Temperature and rainfall records were accessed from this station to demonstrate the suitability of the meteorological dataset adopted.

In addition to the above meteorological observation datasets, the CSIRO meteorological model TAPM was used to generate parameters not routinely measured by these stations, specifically the vertical temperature profile. TAPM was configured and run in accordance with 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); and
- Inclusion of high resolution (90 m) regional topography (improvement over default 250 m resolution data).

The TAPM vertical temperature profile for every hour was adjusted by first substituting the predicted 10 m above ground temperature with hourly recorded temperature at 10 m (in this assessment, sourced from the NSW OEH Prospect station). The difference between the TAPM predicted temperature and the measured 10 m temperature was applied to the entire predicted vertical temperature profile. This modified vertical profile was used in combination with the ambient air temperature throughout the day to calculate convective mixing heights between sunrise and sunset.

5.2 Prevailing annual wind regime

5.2.1 Inter-annual variability

Meteorological data from the OEH Prospect monitoring station were analysed for the period between 2011 and 2013. To determine the variability between the years of data reviewed, the frequency of recorded wind speed and direction was calculated for each year and presented in **Figure 5** and **Figure 6** respectively. Annual wind roses generated from hourly wind speed and direction for the three analysed years are presented in **Figure 7**.

It can be seen from these figures that the wind direction and speed statistics recorded by the NSW OEH Prospect station are very similar across the three years analysed. All years exhibit dominant flow from the southwest and northwest, with hourly wind speeds less than 5 m/s between 96% and 98% of the year.

From the above analysis, it is considered that there is limited inter-annual variability in wind speed and direction experienced in the region of the facility. The 2013 NSW OEH Prospect dataset was adopted within this assessment as it represents the most recent complete annual dataset available at the time of this report.

5.2.2 Annual wind regime –OEH Prospect

The wind roses of recorded wind speed and direction data from the NSW OEH Prospect station 2013, along with 2011 and 2012, is presented in **Figure 7**. The annual recorded wind pattern is dominated by southwesterly and northwesterly airflow. The highest wind speeds recorded at the location are most frequently experienced from the west to north quadrant. The average recorded wind speed for 2013 was 2.0 m/s, with a frequency of calm conditions (wind speeds less than 0.5 m/s) occurring in the order of 13% of the time.

5.3 Seasonal and diurnal wind regime

Seasonal and diurnal (dividing the day into four periods) wind roses for 2013 OEH Prospect station dataset are presented within **Appendix A**.

Seasonal variation is evident in the data recorded at the NSW OEH Prospect station. The dominant southwest and northwest components evident in the annual wind direction profile are most defined during the autumn, winter and spring months, while summer experiences a higher proportion of flow from the northeast to southeast. Wind speed is typically highest during spring, while the incidence of calms is highest during the autumn months.

Diurnal variation in the recorded wind regime is also notable at the NSW OEH Prospect site. Wind speeds are greatest during the daylight periods, peaking during the period between noon and 6pm. The occurrence of easterly flow is evident almost exclusively in the afternoon hours, with the remainder of the day experiencing flow from the western half of the directional spectrum. Wind speeds are notably lower between the evening and early morning hours, with the southwesterly component the dominant wind direction. Northwesterly flow is greatest in the 6am to noon period.

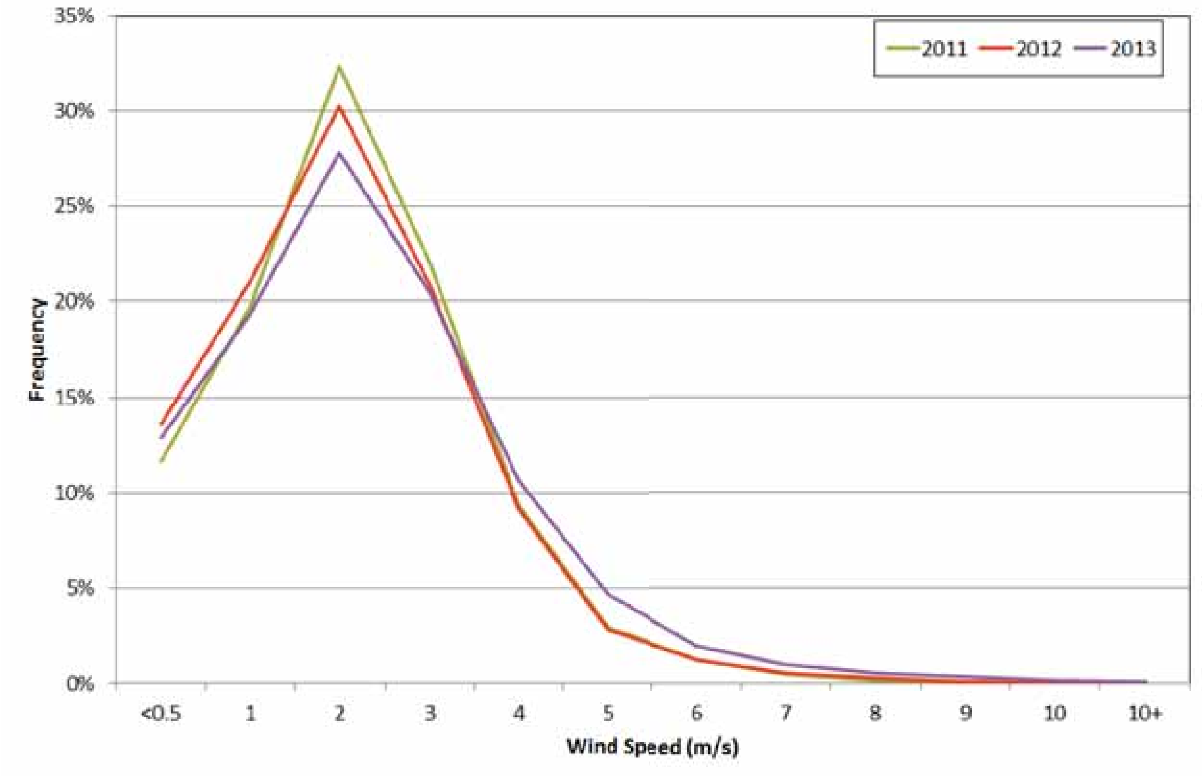

Figure 5: Wind speed frequency comparison – OEH Prospect observations – 2011 to 2013

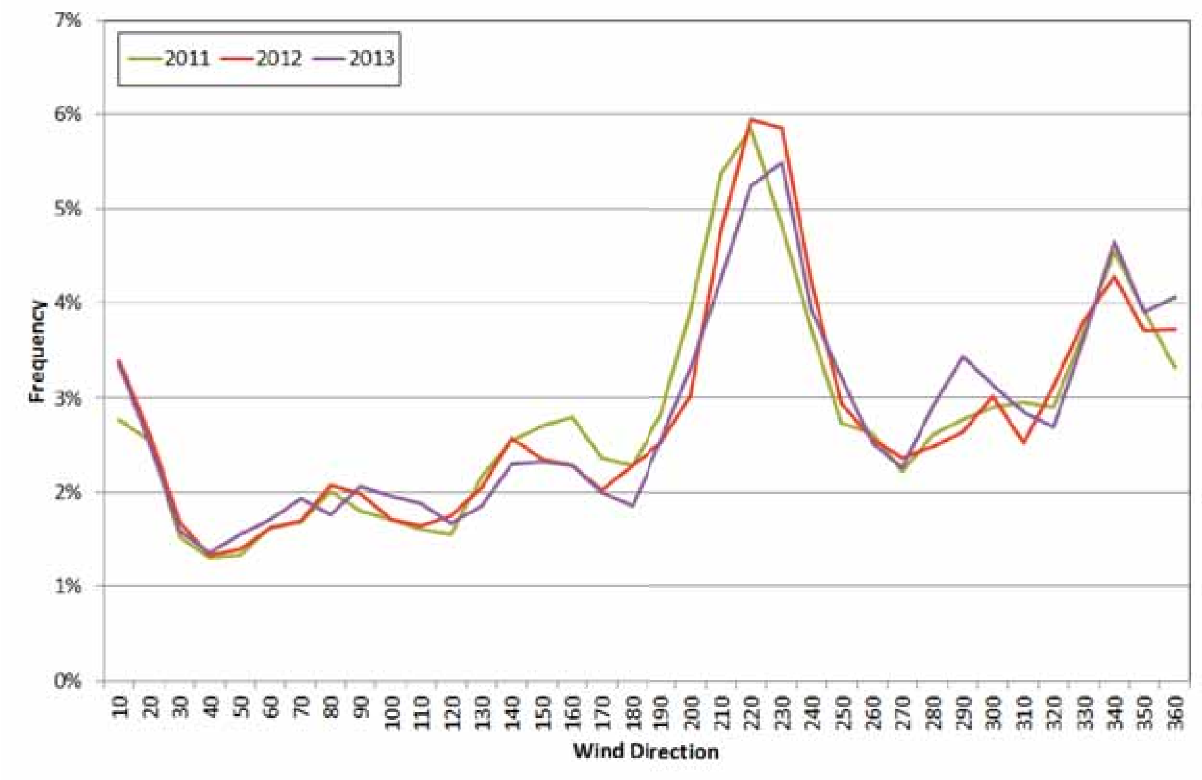

Figure 6: Wind direction frequency comparison – OEH Prospect observations – 2011 to 2013

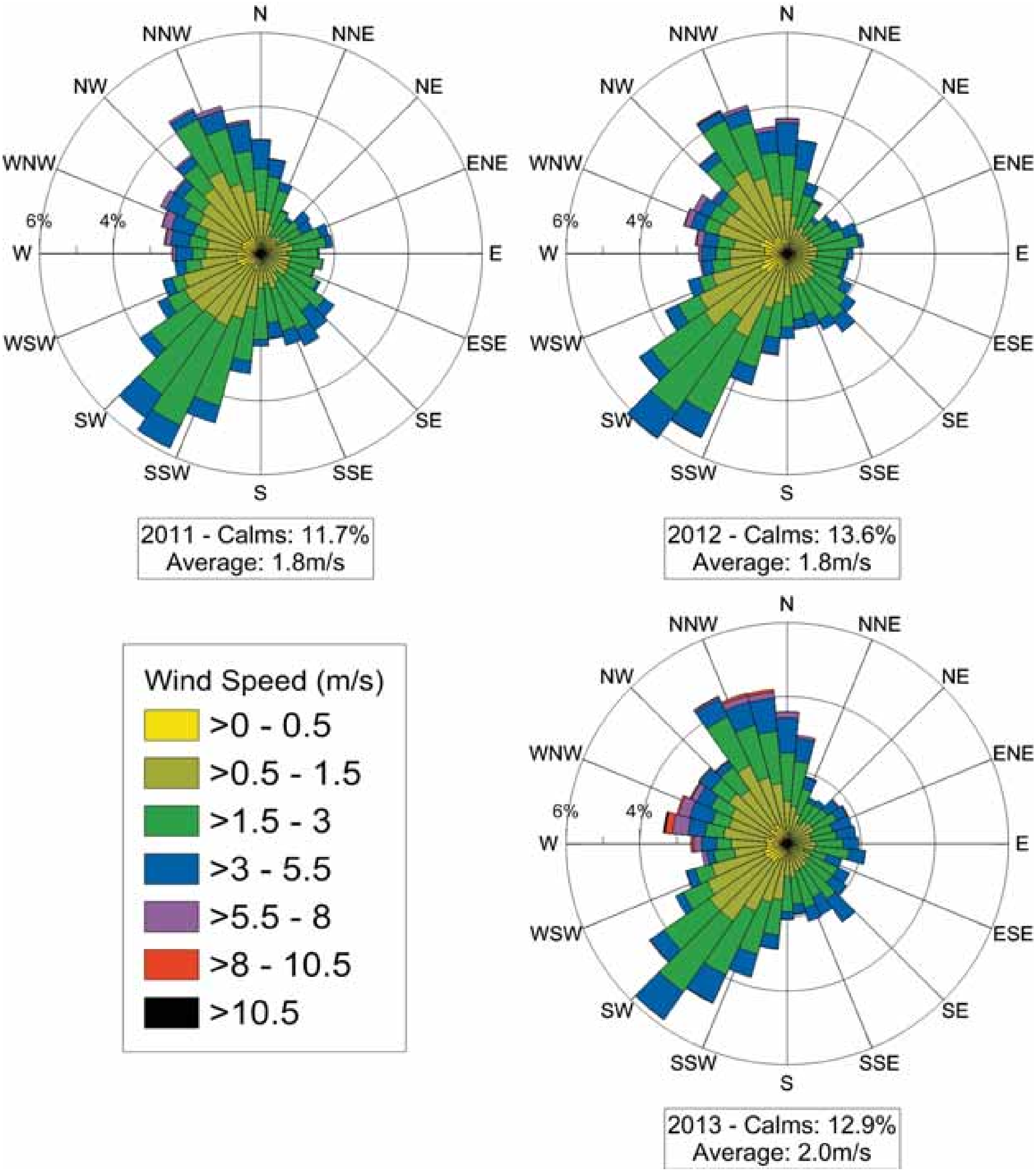

Figure 7: Annual Wind Roses – OEH Prospect – 2011 to 2013

5.4 Ambient temperature

Monthly mean minimum temperatures are in the range of 5°C to 18°C, with monthly mean maxima of 17°C to 28°C, based on the long-term average record from the BoM Bankstown Airport AWS. Peak temperature occurs during summer months with the highest temperatures typically being recorded between November and March. The lowest temperatures are usually experienced between May and September.

The temperatures recorded during 2013 at the OEH Prospect station have been compared with long-term trends recorded at the BoM Bankstown Airport AWS to determine the representativeness of the dataset. **Figure 8** presents the monthly variation in recorded temperature during 2013 compared with the recorded regional mean, minimum and maximum temperatures. There is good agreement between temperatures recorded during 2013 and the recorded historical trends, indicating that the dataset is representative of conditions experienced in the region.

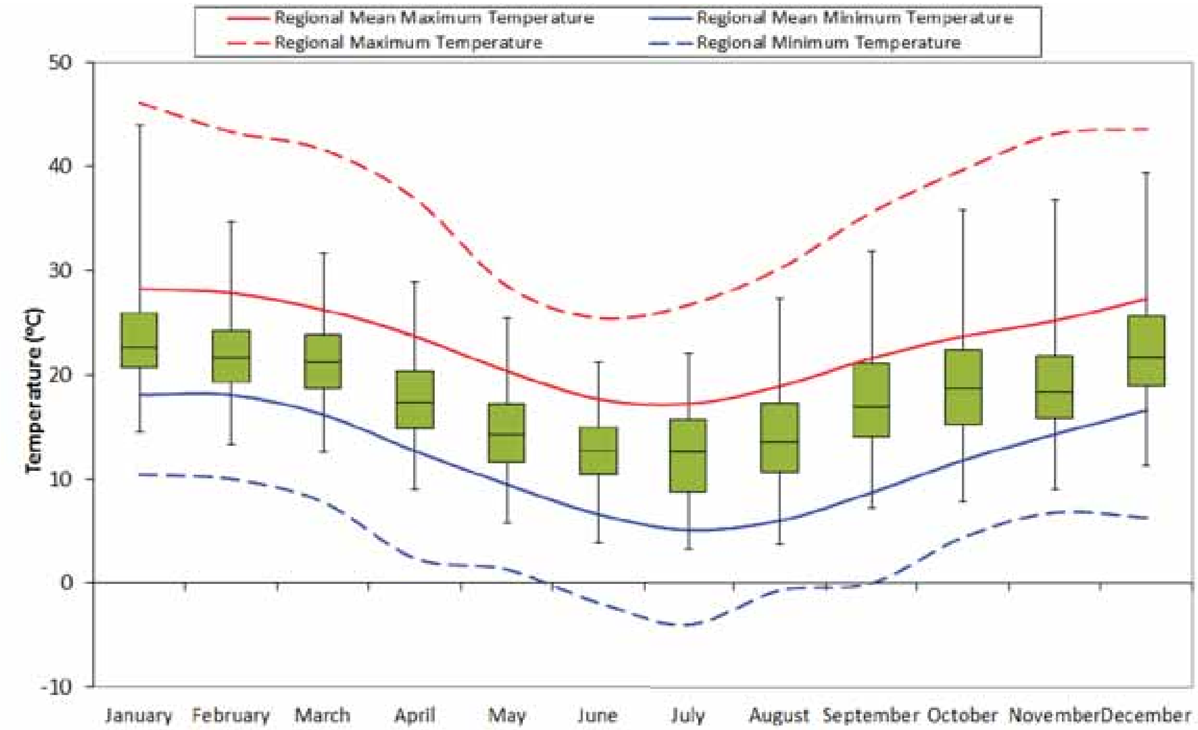

Figure 8: Temperature comparison between NSW OEH Prospect 2013 data and historical averages (1968-2013) – BoM Bankstown Airport

Note: Temperatures recorded during 2013 at the OEH Liverpool station 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 BoM Bankstown Airport are depicted as line graphs.

5.5 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 since 1968 at Bankstown Airport, the region is characterised by moderate rainfall, with a mean annual rainfall of 870 mm, and an annual rainfall range between 493 mm and 1,398 mm. There is significant variation in monthly rainfall throughout the year, with the summer and autumn months typically experiencing higher falls than the remainder of the year.

To provide a conservative (upper bound) estimate of the airborne particulate matter concentrations occurring due to the proposal, wet deposition (removal of particles from the air by rainfall) was excluded from the dispersion modelling simulations undertaken in this report.

5.6 Atmospheric stability and boundary layer depth

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. This layer is directly affected by the earth's surface, either through the retardation of air flow due to the frictional drag of the earth's surface (mechanical mechanisms), or as result of the heat and moisture exchanges that take place at the surface (convective mixing) (Stull, 1997; Oke, 2003).

During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the extension of the mixing layer to the lowest elevated subsidence inversion. Elevated inversions may occur for a variety of reasons including anticyclonic subsidence and the passage of frontal systems. Due to radiative flux divergence, nights are typically characterised by weak to no vertical mixing and the predominance of stable conditions. These conditions are normally associated with low wind speeds and hence lower dilution potentials.

Hourly-varying atmospheric boundary layer depths were generated for the NSW OEH Prospect station by AERMET, the meteorological processor for the AERMOD dispersion model (see **Section 8** for further information), using a combination of surface observations from the NSW OEH Prospect station, 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 NSW OEH Prospect station is illustrated in **Figure 9**. 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 respectively. As turbulence increases so too does the depth of the boundary layer, generally contributing to greater mixing depths and potential for 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). Wharton and Lundquist (2010) provide typical value ranges for L for widely referenced atmospheric stability classes, as listed within **Table 7**.

Table 7: Monin-Obukhov length with respect to atmospheric stability

Monin-Obukhov length (L) range	Stability class
-50 < L < 0	Very Unstable
-600 < L < -50	Unstable
|L| > 600	Neutral
100 < L < 600	Stable
0 < L < 100	Very Stable

Source: Table 2, Wharton and Lundquist (2010)

Figure 10 illustrates the diurnal variation of atmospheric stability derived from the Monin-Obukhov length calculated by AERMET based on the data recorded by the NSW OEH Prospect station during 2013. 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.

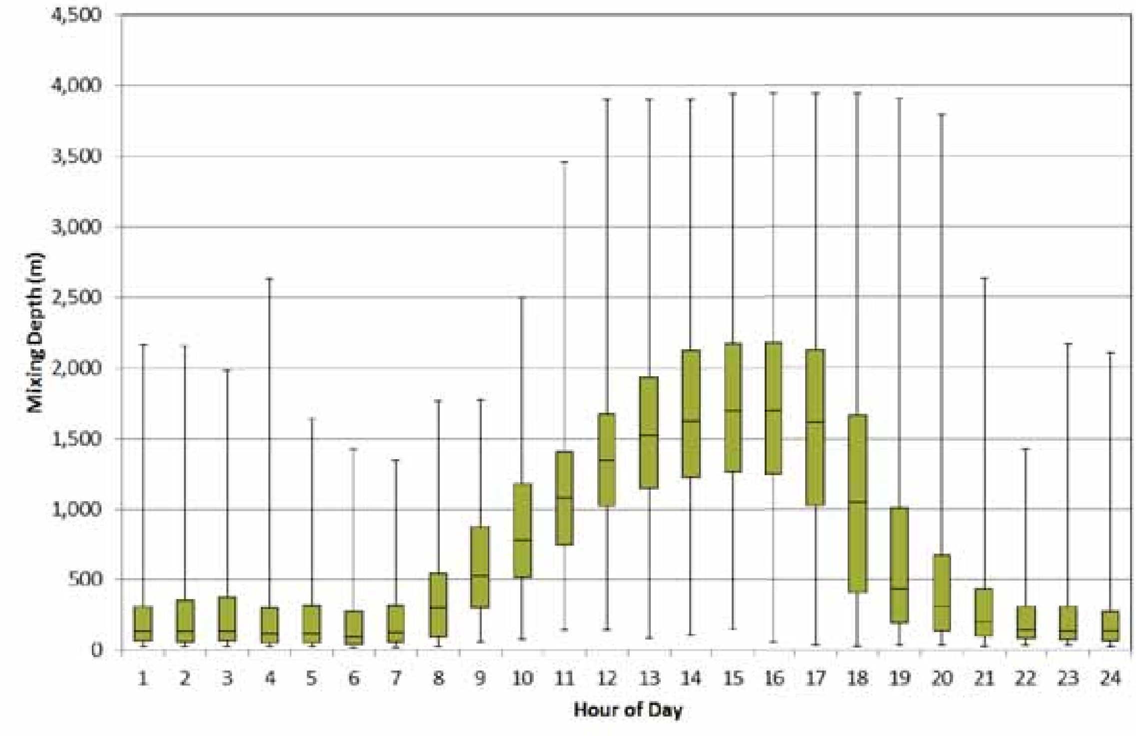

Figure 9: AERMET-generated diurnal variations in average boundary layer depth – NSW OEH Prospect - 2013

Note: Boxes indicate 25th percentile, Median and 75th percentile of AERMET-generated mixing height data while upper and lower whiskers indicate maximum and minimum values.

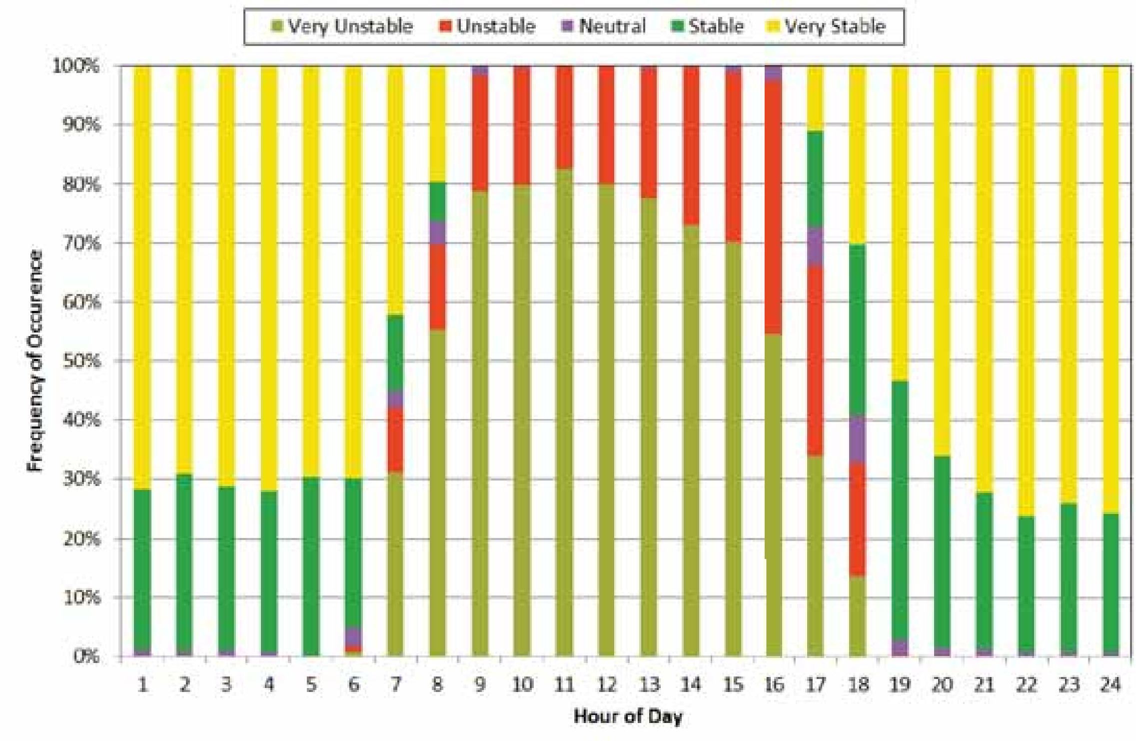

Figure 10: Diurnal variations in AERMET-generated atmospheric stability for NSW OEH Prospect – 2013

6 Ambient Air Quality Characterisation

The quantification of cumulative air pollution concentrations and the assessment of compliance with ambient air quality criteria necessitate the characterisation of baseline air quality. The following sections provide a review of surrounding air pollution sources and air quality monitoring data.

6.1 Existing Sources of Air Emissions

The National Pollutant Inventory (NPI) database was reviewed to identify significant existing sources of air pollution emissions in the surrounding local area. All sources of particulate matter (PM_{10} and $PM_{2.5}$) within 2 km of the facility boundary were reviewed.

The NPI database for the 2012-2013 reporting period lists the following operations in the surrounding 2 km from the facility:

- SITA recycling facility, located approximately 0.5 km to the southeast (NPI1);
- Steritech gamma irradiation sterilization facility, located approximately 0.5 km to the south-southeast (NPI2);
- Transpacific Waste Oil Recycling facility, located approximately 0.6 km to the southwest (NPI3);
- Albright and Wilson surfactant manufacturing plant, located approximately 1.0 km to the west-southwest (NPI4);
- Caroma Industries ceramic products factory, located approximately 1.2 km to the south (NPI5);
- Visy beverage can manufacturing plant, located approximately 1.2 km to the east (NPI6);
- CSR gyprock manufacturing plant, located approximately 1.2 km to the south-southwest (NPI7); and
- Dairy Farmers milk processing facility, located approximately 1.7 km to the southwest (NPI8).

Reported emissions from these sources include particulate matter (PM_{10} and $PM_{2.5}$), oxides of nitrogen, carbon monoxide, sulphur dioxide, heavy metals and volatile organic compounds.

Given proximity of these emission sources to the facility and surrounding sensitive receptors, it is considered that potential exists for direct cumulative impacts with emissions generated by the proposal that may not be accounted for by the monitoring data collected at the NSW OEH Prospect air quality monitoring station. Consequently, reported emissions for 2012-2013 from these listed sources have been used to predict ground level concentrations of particulate matter in the area surrounding the facility. Further details on this process are provided in **Section 6**.

In addition to the above industrial operations in the area around the facility, it is considered that the following sources contribute to air pollution emissions in the vicinity of the facility:

- Dust entrainment and fuel combustion emissions from vehicle movements along public roads;

- Wind generated dust from exposed areas within the surrounding region;
- Seasonal emissions from household wood burning fires; and
- Episodic emissions from regional vegetation (e.g. bush and grass) fires and dust storms.

Regarding regional episodic events like dust storms and bushfires, dust storms predominately contribute primary particulates from mechanical attrition, whereas bushfires are a source of combustion pollutants and fine particulates.

6.2 Monitoring Data Available for Baseline Air Quality Characterisation

Boral conducts routine monthly dust deposition monitoring at two locations surrounding the facility in accordance with its EPL.

In addition to the data recorded by these dust deposition monitoring locations, air quality monitoring data recorded between 2011 and 2013 at the NSW OEH ambient air quality monitoring stations at Prospect, Liverpool and Chullora were collated for use in quantifying baseline air quality.

The Prospect monitoring site is located approximately 4 km north of the facility and records continuous concentrations of PM_{10}, oxides of nitrogen, ozone and carbon monoxide. In the absence of $PM_{2.5}$ monitoring at the Prospect station and to supplement data gaps in the Prospect PM_{10} monitoring, data from the NSW OEH Liverpool and Chullora stations (located 11 km south and 14 km east of the facility respectively) has also been collated and reviewed.

6.2.1 PM_{10}

Hourly-average PM_{10} data were collated from the NSW OEH Prospect air quality monitoring station, with 24-hour average concentrations calculated. It is noted that only days with a data completeness for hourly-average concentrations of greater than 75% were included in the calculation of 24-hour average concentrations. The key statistics of the 2011, 2012 and 2013 24-hour average PM_{10} datasets are presented in **Table 8**.

A time-series of 24-hour average PM_{10} concentrations recorded at the NSW OEH Prospect stations between 2011 and 2013 is presented in **Figure 11**. Additionally, concurrent concentrations recorded at the Chullora and Liverpool monitoring stations are also presented in **Figure 11**.

Table 8: PM_{10} monitoring statitics – OEH Prospect – 24-hour averages – 2011 to 2013			
Parameter	**2011**	**2012**	**2013**
Number of Observations	253	356	357
Average	15.8 μg/m³	17.2 μg/m³	19.2 μg/m³
Lower Quartile	10.9 μg/m³	13.0 μg/m³	13.3 μg/m³
Median	15.1 μg/m³	16.3 μg/m³	17.6 μg/m³
Upper Quartile	19.3 μg/m³	20.4 μg/m³	23.2 μg/m³
Minimum	4.5 μg/m³	5.1 μg/m³	5.3 μg/m³
Maximum	41.5 μg/m³	38.7 μg/m³	81.8 μg/m³
Number of Days > 50 μg/m³	0	0	4
Highest Concentration < 50 μg/m³	41.5 μg/m³	38.7 μg/m³	49.2 μg/m³

The following key points are identified from the table and figure:

- The PM_{10} concentrations recorded at the three NSW OEH monitoring stations exhibit similarities across the three analysed years of data, both in magnitude and the daily variability of concentrations;
- No exceedance of the NSW EPA criterion of 50 μg/m³ was recorded during 2011 or 2012 at the Prospect monitoring station. Exceedances were experienced during 2011 and 2012 at the Chullora station and during 2011 at the Liverpool station. In its annual ambient air quality report, the NSW OEH (2012 and 2013) identify that the exceedances at Chullora during 2011 were attributable to localised construction activities, whilst the 2011 Liverpool and 2012 Chullora exceedance events coincided with hazard reduction burn events;
- Notable exceedances of the NSW EPA criterion were recorded during 2013 at all three monitoring stations. These elevated concentrations are directly attributable to extensive bushfire events in the Greater Sydney Metropolitan Region between September and November 2013; and
- Average PM_{10} concentrations during all years at all three NSW OEH monitoring stations were below the NSW EPA criterion of 30 μg/m³.

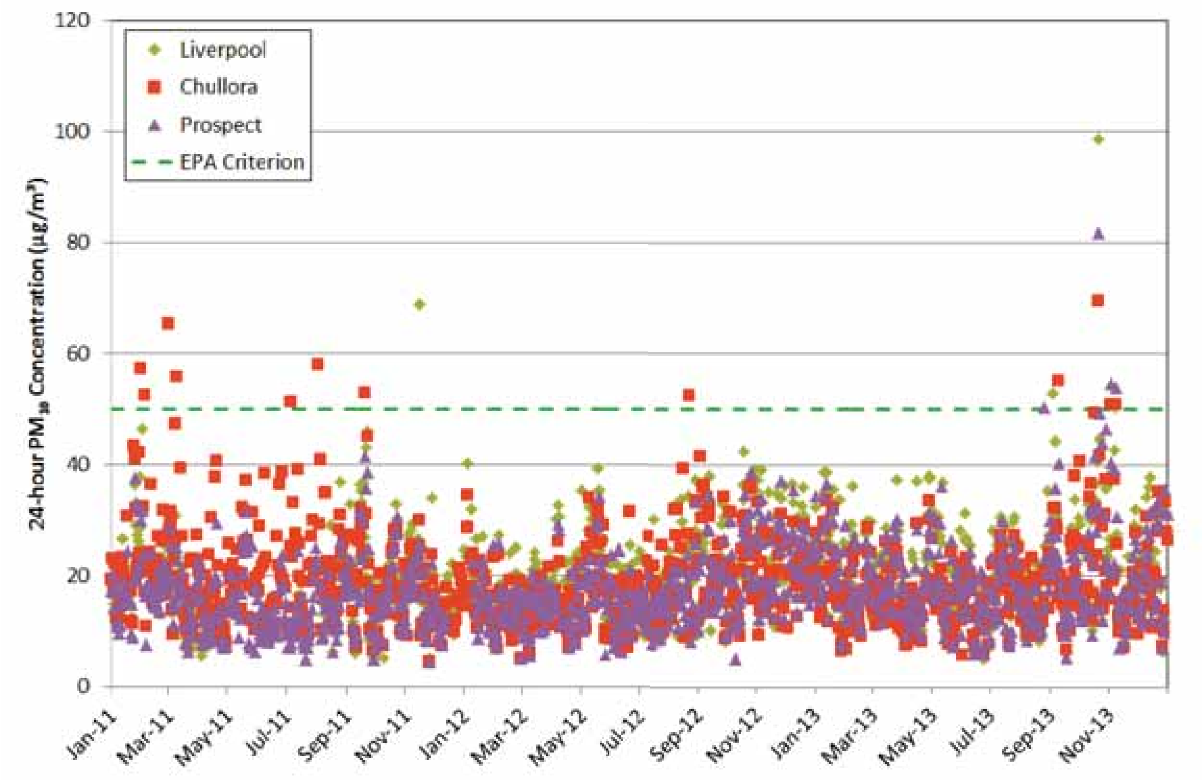

Figure 11: Timeseries comparison of 24-hour average PM_{10} concentrations between 2011 and 2013 – NSW OEH Prospect, Chullora and Liverpool

It can be seen from the data presented in **Figure 11** that there is notable inter-annual variation in ambient PM_{10} concentrations in the region surrounding the facility, with 2013 experiencing higher concentrations than 2011 and 2012. The key driver for elevated 24-hour average PM_{10} concentrations across the three years was the occurrence of regional-scale bushfires. Localised emissions sources (construction activities and hazard reduction burns) also caused exceedances at Chullora and Liverpool. Outside of these local and regional scale events, daily varying PM_{10} concentrations across the three reviewed NSW OEH monitoring stations were very comparable between 2011 and 2013.

In assessing cumulative impacts from the proposal with ambient air quality, daily varying monitoring data from the NSW OEH Prospect monitoring station has been applied. Gaps in the Prospect PM_{10} air quality monitoring dataset were supplemented by the Liverpool and Chullora datasets. A summary of this combined PM10 baseline dataset is presented in **Table 9**.

Table 9: PM_{10} Background Statitics – OEH Prospect supplemented by Liverpool and Chullora – 24-hour averages – 2011 to 2013			
Parameter	**2011**	**2012**	**2013**
Number of Observations	365	366	365
Average	15.8 µg/m³	17.6 µg/m³	19.2 µg/m³
Lower Quartile	11.0 µg/m³	13.2 µg/m³	13.4 µg/m³
Median	15.4 µg/m³	16.5 µg/m³	17.6 µg/m³
Upper Quartile	19.3 µg/m³	20.7 µg/m³	23.2 µg/m³
Minimum	4.5 µg/m³	5.1 µg/m³	5.3 µg/m³
Maximum	41.5g/m³	40.1 µg/m³	81.8 µg/m³
Number of Days > 50 µg/m³	0	0	4
Highest Concentration < 50 µg/m³	41.5 µg/m³	40.1 µg/m³	49.2 µg/m³

6.2.2 $PM_{2.5}$

As stated previously, $PM_{2.5}$ monitoring is not conducted at the NSW OEH Prospect station. In order to derive a $PM_{2.5}$ background dataset consistent with the PM_{10} monitoring dataset (**Section 6.2.1**), the ratio between concurrent 24-hour average PM_{10} and $PM_{2.5}$ station was calculated for the NSW OEH Liverpool and Chullora monitoring stations between 2011 and 2013. The average ratio at Liverpool and Chullora was 38.5%. This value has been applied to the daily-varying PM_{10} concentrations recorded at the NSW OEH Prospect station between 2011 and 2013 to derive a concurrent $PM_{2.5}$ baseline dataset.

The key statistics of the derived $PM_{2.5}$ concentrations for Prospect are presented in **Table 10**.

Table 10: $PM_{2.5}$ statistics – Derived from OEH Prospect PM_{10} – 24-hour averages – 2011 to 2013			
Parameter	**2011**	**2012**	**2013**
Number of Concentrations	365	365	365
Average	6.1 µg/m³	6.8 µg/m³	7.4 µg/m³
Lower Quartile	4.2 µg/m³	5.1 µg/m³	5.2 µg/m³
Median	5.9 µg/m³	6.4 µg/m³	6.8 µg/m³
Upper Quartile	7.4 µg/m³	8.0 µg/m³	8.9 µg/m³
Minimum	1.7 µg/m³	2.0 µg/m³	2.1 µg/m³
Maximum	16.0g/m³	15.4 µg/m³	31.5 µg/m³
Number of Days > 25 µg/m³	0	0	1
Highest Concentration < 25 µg/m³	16.0 µg/m³	15.4 µg/m³	21.0 µg/m³

The following key points are identified from the table and figures:

- The bushfire events between September and November 2013 in the Greater Sydney Metropolitan Region, discussed in **Section 6.2.1**, caused elevated $PM_{2.5}$ concentrations in 2013 relative to 2011 and 2012. In the $PM_{2.5}$ dataset derived from the NSW OEH Prospect PM_{10} dataset, one exceedance of the 24-hour average NEPM advisory reporting goal of 25 µg/m³ occurs. It is noted that the ratio of ambient $PM_{2.5}$ to PM_{10} may be higher during bushfire periods than the annual ratio applied (as above); and
- Furthermore, the annual average $PM_{2.5}$ concentration is notably higher for 2013 than 2011 and 2012 due to influence of these bushfire events. The annual average $PM_{2.5}$ concentration, 7.4 µg/m³, is very close to the annual average NEPM advisory reporting goal of 8 µg/m³. It is noted that the removal of data recorded during the period of bushfire activity reduces the annual average concentration to below 7 µg/m³, illustrating the influence of natural events of ambient air quality. In the interest of conservatism, the data recorded during the bushfire events has been retained in this assessment.

6.2.3 TSP

No publicly available TSP monitoring is conducted in the vicinity of the facility. Historically, the NSW OEH recorded concurrent 24-hour average TSP and PM_{10} concentrations on a one-in-six day sampling regime at Earlwood, Rozelle and the Sydney CBD, 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, PM_{10} concentrations recorded by the NSW OEH were 48% of TSP concentrations.

In the absence concurrent TSP monitoring data, this PM_{10}/TSP relationship from the 2003-2004 NSW OEH monitoring reports has been applied to the NSW OEH Prospect station PM_{10} monitoring data. The derived annual average TSP concentration for 2011, 2012 and 2013 is therefore 33.1 µg/m³, 36.7 µg/m³, 40.0 µg/m³ respectively.

6.2.4 Dust deposition

Monitoring for dust deposition is conducted at two locations at the facility; the southwest and southeast corners of the site boundary. Recorded annual average dust deposition levels (as total insoluble solids) are presented in **Table 11**.

It can be seen from these results that the recorded deposition levels in 2012 were below the NSW EPA criterion, while the 2013 levels were above the criterion. It is noted that the monthly deposition levels recorded at both locations between September 2013 and November 2013 were significantly higher than all other months in 2012 and 2013. These elevated events coincided with extensive bushfire events in the Sydney region, as previously discussed in this report.

Table 11: Dust deposition monitoring for the facility (g/m^2/month)

Year	Monitoring Location	
	SW Corner of Site	**SE Corner of Site near ponds**
2012	3.1	3.6
2013	4.8	5.1
NSW EPA Criterion	**4**	

The assessment of cumulative dust deposition levels from the proposal would involve the pairing of a suitable baseline deposition rate with model predictions of dust deposition from the proposal. As the deposition monitoring locations are situated on the facility boundary and would therefore be influenced by emissions from current operations, this data is not considered appropriate to assess cumulative dust deposition levels as significant double counting of emissions would occur. Consequently, this assessment focuses on the increment only dust deposition levels generated by the proposal for comparison against the NSW EPA incremental dust deposition criterion.

6.3 Contribution of Local Emission Sources to Baseline Air Quality

As stated in **Section 6.1**, there are a number of existing emission sources located within 2 km of the facility. While baseline air quality will largely be quantified through available air quality monitoring datasets (**Section 6.2**), it is considered necessary to also incorporate the potential contribution of the local sources to impacts experienced at the sensitive receptor locations surrounding the facility.

In order to quantify impacts from the local emission sources listed in **Section 6.1**, reported annual emissions from the 2012-2013 NPI database have been input into the atmospheric dispersion model developed (see **Section 8** for further details) to predict ground level concentrations at the surrounding sensitive receptors.

The following points are noted in the quantification of impacts from local sources:

- Only PM_{10} and $PM_{2.5}$ emissions are reported to the NPI. In order to estimate TSP emissions from reported annual emissions, the PM_{10}/TSP ratio listed in **Section 6.2.3** has been applied to PM_{10} emissions;

- Due to a lack of site-specific source details, all emission sources were represented within the dispersion model as volume sources, with no accounting for potential stack releases (including thermal and mechanical buoyancy);
- With the exception of the SITA recycling facility, all annual emissions are assumed to be continuous in deriving a gram/second emission rate;
- SITA emissions were assumed to be released between the hours of 5am and 4.30pm, based on the reported site operating hours (SITA, 2014); and
- In the absence of annual emissions of PM_{10} and $PM_{2.5}$ for the SITA site (only emissions of zinc were reported to the NPI for 2012-2013), annual emissions were estimated based on a similar methodology to emissions from the facility, including emission factors and material handling/processing assumptions. Emission estimation assumptions for the SITA site are presented in **Appendix C**.

Annual emissions for the surrounding sources are presented in **Table 12**.

Table 12: Annual NPI Emissions – Local Sources

Source	Annual Emissions (kg/year)		
	TSP	PM_{10}	$PM_{2.5}$
NPI1 – SITA Recycling	26,738	8,915	1,140
NPI2 – Steritech	250	120	120
NPI3 – Transpacific	1,574	756	756
NPI4 – Albright and Wilson	434	208	208
NPI5 – Caroma	20,694	9,933	273
NPI6 – Visy	269	129	129
NPI7 – CSR	20,607	9,892	2,185
NPI8 – Dairy Farmers	852	409	409

Note: Emissions data source – NPI 2012/2013 reporting database

The predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations and annual average TSP, PM_{10} and $PM_{2.5}$ concentrations resulting from the eight identified local emission sources at the surrounding sensitive receptor locations are listed in **Table 13**. It is noted that these concentrations do not account for emissions from the current approved operations at the facility.

Table 13: Predicted Incremental Impact at Surrounding Sensitive Receptor Locations due to Local Sources

Receptor	Predicted Ground Level Concentration (µg/m³)				
	Annual TSP	Maximum 24-hour PM_{10}	Annual PM_{10}	Maximum 24-hour $PM_{2.5}$	Annual $PM_{2.5}$
R1	0.9	1.1	0.4	0.2	0.1
R2	1.7	1.9	0.7	0.3	0.1
R3	1.7	1.8	0.7	0.3	0.1
R4	0.6	1.6	0.2	0.2	<0.1
R5	2.3	2.4	0.9	0.4	0.1
R6	1.3	1.5	0.6	0.5	0.2
R7	2.0	3.7	0.8	0.5	0.1
R8	2.7	3.8	1.1	0.7	0.3
R9	0.9	1.9	0.4	0.3	0.1
R10	1.0	1.8	0.4	0.3	0.1
R11	0.9	1.0	0.4	0.2	0.1

6.4 Adopted Baseline Air Quality

Baseline air quality at the facility will be accounted for by the combination of the background ambient air quality monitoring data recorded during 2013 (as per **Section 6.2**) and dispersion model predictions for local sources (as per **Section 6**) at each of the receptor locations. The baseline air quality will therefore vary spatially at each receptor location.

As stated in previous sections, ambient air quality measurements at the NSW OEH Prospect station during 2013 were influenced by significant bushfire events. The recorded particulate matter concentrations were notably higher during 2013 than both 2011 and 2012. The use of the 2013 monitoring dataset to assess cumulative air quality impacts is therefore considered to be conservative (ie the impacts are over-estimated).

The baseline air quality, consisting of paired model predictions for local sources and NSW OEH Prospect monitoring data recorded during 2013, at each of the surrounding receptors is presented in **Table 14**. It can be seen that the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations are above the applicable NSW EPA criterion and NEPM advisory reporting goal respectively. For 24-hour average PM_{10} concentrations, the combination of model predictions from local sources with 2013 monitoring data from OEH Prospect results in an additional exceedance day at receptors R2, R3, R5 and R8, beyond the existing four exceedance events actually monitored during 2013.

It is noted that the Prospect monitoring station, as a measure of regional air quality, will incorporate the contribution from both the current approved operations at the facility and the identified surrounding NPI emissions sources. By adding the contribution of the facility and the NPI sources to the baseline monitoring data, it is considered that the cumulative assessment conducted within this report is conservative.

Table 14: Baseline Air Quality Levels at Surrounding Sensitive Receptor Locations – Combined NSW OEH Prospect Monitoring Data and Local Source Predictions

Receptor	Baseline Concentration (µg/m³)						
	Annual TSP	Maximum 24-hour PM_{10} [1]	Days > 50 µg/m³	Annual PM_{10}	Maximum 24-hour $PM_{2.5}$ [1]	Days > 25 µg/m³	Annual $PM_{2.5}$
R1	40.9	82.2	4	19.6	31.6	1	7.5
R2	41.7	82.5	5	19.9	31.6	1	7.5
R3	41.7	82.5	5	19.9	31.6	1	7.5
R4	40.0	82.1	4	19.4	31.5	1	7.4
R5	42.3	82.7	5	20.1	31.6	1	7.5
R6	41.3	82.3	4	19.8	31.6	1	7.6
R7	42.0	82.5	4	20.0	31.6	1	7.5
R8	42.7	82.8	5	20.3	31.7	1	7.6
R9	40.9	82.1	4	19.6	31.6	1	7.5
R10	41.0	82.1	4	19.6	31.5	1	7.5
R11	40.9	82.2	4	19.6	31.6	1	7.6

Note 1: 24-hour average PM_{10} and $PM_{2.5}$ baseline concentrations are daily varying for the 2013 modelling period (i.e. 365 different concentrations)

An example of the daily-varying background concentrations is presented in **Figure 12**, which illustrates the combination of 24-hour average measured concentrations from the NSW OEH Prospect station and model predictions for local sources at receptor R8. For each receptor location and pollutant modelled (TSP, PM_{10} and $PM_{2.5}$), a different daily-varying baseline dataset has been generated.

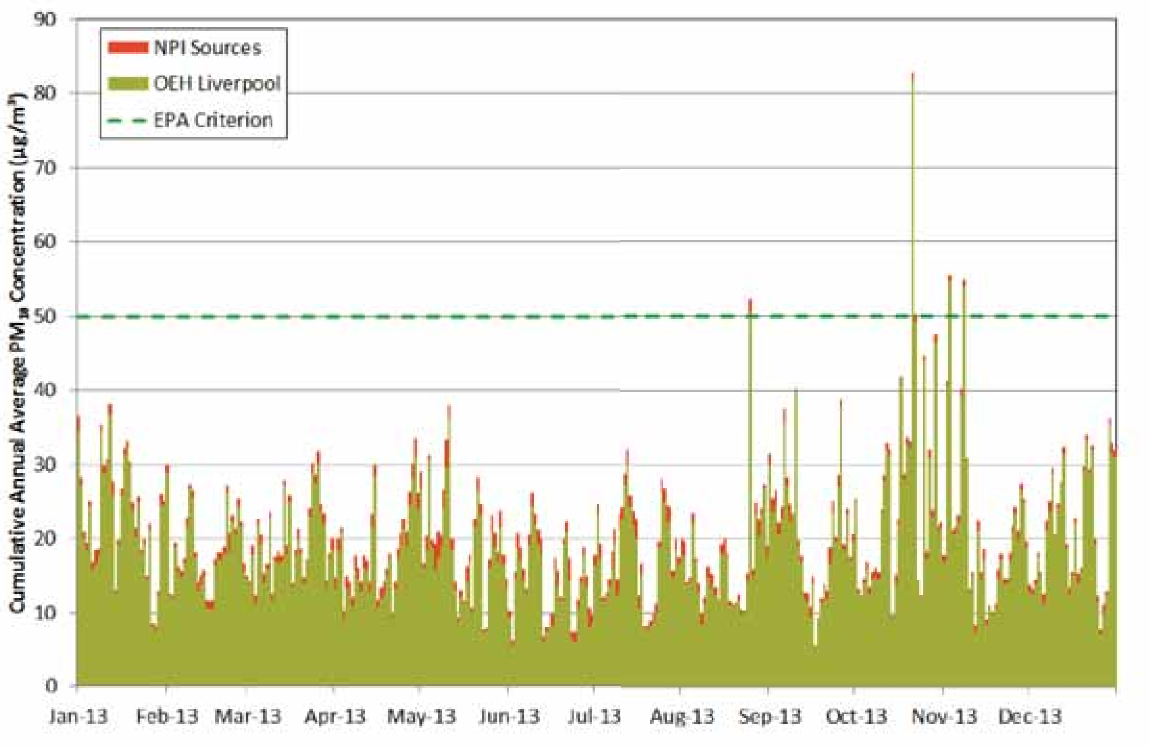

Figure 12: Example of Daily-Varying PM_{10} Baseline Concentrations – Receptor 8 – NSW OEH Prospect and Model-predictions for Local Sources

7 Emission Estimation

Fugitive dust sources associated with the operation of the facility 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. Particulate releases were quantified for various particle size fractions, with the TSP fraction being estimated to provide an indication of dust deposition rates. Fine particulates (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).

7.1 Sources of Operational Emissions

Sources of atmospheric emissions associated with the proposal include:

- Vehicle entrainment of particulate matter due to the haulage of material along the sealed and unsealed haul roads about the facility;
- Unloading of material to the raw material storage area;
- Breaking of larger material and handling to stockpiles/crusher hopper;
- Crushing and screening plant operations;
- Conveying, transfer points and loading of crushed rock material to stockpiles;
- Handling and transfer of crushed material to blend plant;
- Blend plant and handling/stockpiling of blended final product;
- Loading of product to truck for dispatch; and
- Wind erosion associated with exposed areas and material stockpiles.

It is noted that all of the above sources are the same as current operations. Emissions of pollutants associated with diesel fuel combustion are likely to be minor in nature relative to particulate matter emissions. Such emissions were not included in this assessment.

Emissions associated with the realignment of the internal haul road, as illustrated in **Figure 2**, are considered to be short-term and low in emissions potential relative to other activities. The potential emissions from this source would be managed using conventional techniques (e.g. use of water trucks) and therefore these specific emissions have not been considered further within this assessment.

7.2 Odour Emissions

Material handled at the facility is largely inert materials such as building construction and demolition waste. The proposal would not involve the introduction of odour-potential waste streams, including glass or green waste. The potential for odour emissions and impacts to the surrounding environment arising from current and proposed operations at the facility is considered negligible.

7.3 Emission Scenarios

To assess the potential change in emissions associated with the proposal, two emission scenarios were assessed:

- Scenario 1 – Current operations – 750,000 tpa; and
- Scenario 2 – Proposed operations – 1,000,000 tpa.

The modelling assumptions made in this assessment are listed within **Appendix B**

7.4 Emission Reduction Factors

Based on information provided by Boral, the following dust mitigation measures are in place at the facility:

- Stockpile water sprays (three installed);
- Watering of paved and unpaved roadways (two carts in use);
- Limit of vehicle travel speed along roads at the site to 30km/hr;
- Sweeping of paved surfaces and roads (two units in use);
- Water sprays at the crushing and screening plant and blending plant (currently eight sprays, to be increased to twelve under the proposal); and
- Enclosure of the crushing and screening plant and blending plant.

To account for these control measures, the following emission reduction factors were applied to account for controls that are currently in place at the facility:

- Unpaved haul roads – 75% reduction for water application (NPI, 2012) and 44%[1] reduction for travel speed less 40 km/hr (Countess Environmental, 2006). A combined emission reduction factor of 86% was derived, as per the approach for multiple controls presented in NPI 2012;
- Paved haul roads – 30% reduction for water application (US-EPA, 2011);
- Water spraying at stockpiles - 50% reduction for water sprays (NPI, 2012);
- Crushing and screening plant – controlled emission factors applied to account for the use for water sprays and enclosure; and
- The US EPA (2004b) states that material processing plants that implement wet suppression techniques to maintain relatively high material moisture contents can effectively control particulate matter emissions throughout the process. Therefore, the use of water at the crushing/screening plant will also assist in the control of emissions from the conveying to stockpiles and rehandle of material for product dispatch. To account for this, a 50% reduction in emissions has been applied.

7.5 Particulate Matter Emissions

Annual particulate matter emission estimates for the facility from fugitive emission sources are presented within **Table 15**. Annual TSP, PM_{10} and $PM_{2.5}$ for current and proposed operations are compared in **Figure 13**. The significance of each primary source category to annual emissions is illustrated in **Figure 14**, **Figure 15** and **Figure 16** for TSP, PM_{10} and $PM_{2.5}$ emissions respectively.

[1] The WRAP Fugitive Dust Handbook (Countess Environmental, 2006) specifies in Chapter 6 that an emission reduction of 44% can be achieved by limiting vehicle travel speed on unpaved roads to approximately 40 km/hr relative to 70 km/hour. The emission estimation factor does not account for site specific vehicle travel speed and was based on travel speeds ranging up to 70 km/hr (USEPA, 2006). A traffic speed limit of 30km/hr is marked at the facility. Consequently, this reduction factor is considered appropriate for application

These tables and figures highlight that the changes associated with the proposal will increase emissions of TSP, PM_{10} and $PM_{2.5}$ by approximately 30% relative to current operations. The most notable increases are related to the unpaved road movements and processing plant emissions. The significance of this increase in annual emissions to air quality impacts is assessed by dispersion modelling, with results presented in **Section** 9.

Further details regarding emission estimation factors and assumptions are provided in **Appendix B**.

Table 15: Calculated Annual TSP, PM_{10} and $PM_{2.5}$ Emissions – Current and Proposed Operations

Emission Source	Annual TSP Emissions (tpa)			Annual PM_{10} Emissions (tpa)			Annual $PM_{2.5}$ Emissions (tpa)		
	Current	Proposed	Difference	Current	Proposed	Difference	Current	Proposed	Difference
Material Delivery - Paved	6.41	8.54	2.14	1.23	1.64	0.41	0.21	0.27	0.07
Material Delivery - Unpaved	3.37	4.50	1.12	0.86	1.15	0.29	0.09	0.11	0.03
Truck Unloading	0.80	1.06	0.27	0.38	0.50	0.13	0.06	0.08	0.02
Raw Material Handling	0.80	1.06	0.27	0.38	0.50	0.13	0.06	0.08	0.02
Oversize concrete breaking	0.41	0.54	0.14	0.18	0.24	0.06	0.03	0.04	0.01
Unpaved haulage between Raw and Product	3.15	4.20	1.05	0.80	1.07	0.27	0.08	0.11	0.03
FEL to Hopper	1.32	1.76	0.44	0.36	0.49	0.12	0.04	0.05	0.01
Hopper loading	0.12	0.16	0.04	0.06	0.08	0.02	0.01	0.01	0.00
Crushing (2 points)	0.90	1.20	0.30	0.41	0.54	0.14	0.08	0.10	0.03
Screening (3 points)	2.48	3.30	0.83	0.83	1.11	0.28	0.06	0.08	0.02
Conveyor Transfer Points (3 points)	1.20	1.60	0.40	0.57	0.75	0.19	0.09	0.11	0.03
Stockpile Loading	0.40	0.53	0.13	0.19	0.25	0.06	0.03	0.04	0.01
Crushed material to product stockpiling area	1.32	1.76	0.44	0.36	0.49	0.12	0.04	0.05	0.01
Crushed material Handling	0.40	0.53	0.13	0.19	0.25	0.06	0.03	0.04	0.01
Blend Plant	1.41	1.88	0.47	0.48	0.65	0.16	0.07	0.10	0.02
Post-blend plant stockpile loading	0.40	0.53	0.13	0.19	0.25	0.06	0.03	0.04	0.01
Product Truck Loading	0.40	0.53	0.13	0.19	0.25	0.06	0.03	0.04	0.01
Product Transportation - Unpaved	4.50	6.00	1.50	1.15	1.53	0.38	0.11	0.15	0.04
Product Transportation - Paved	3.20	4.27	1.07	0.61	0.82	0.20	0.10	0.14	0.03
Wind Erosion - Exposed surfaces and stockpiles	2.04	2.34	0.30	1.02	1.17	0.15	0.15	0.18	0.02
TOTAL	**35.01**	**46.30**	**11.29**	**10.44**	**13.72**	**3.29**	**1.37**	**1.80**	**0.43**

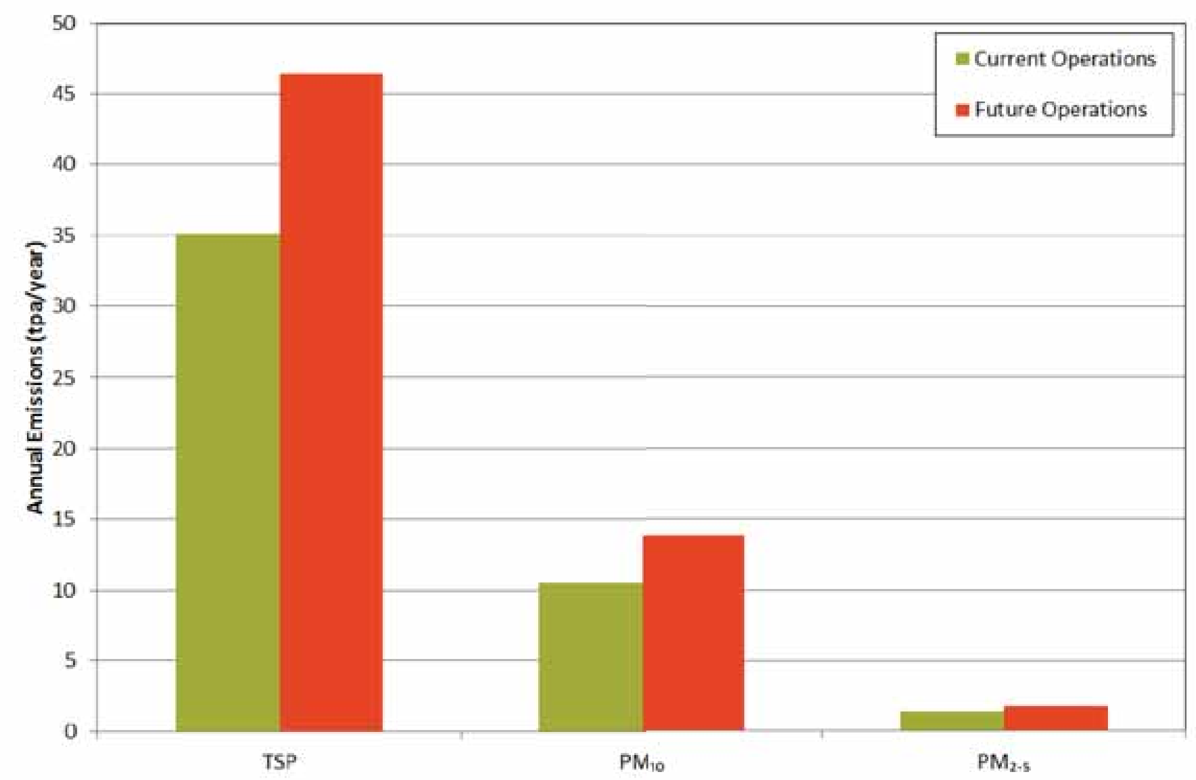

Figure 13: Comparison of Calculated Annual Emissions – Current vs Proposed

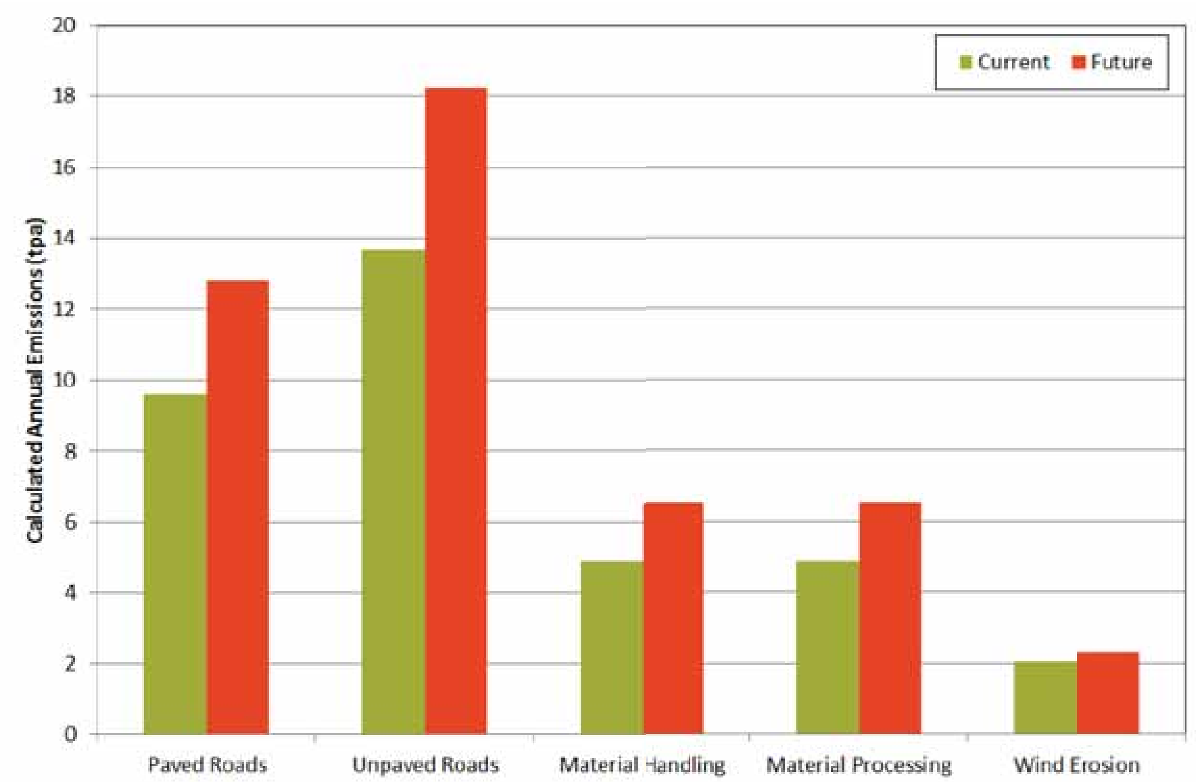

Figure 14: Calculated Annual TSP Emissions by Source Type

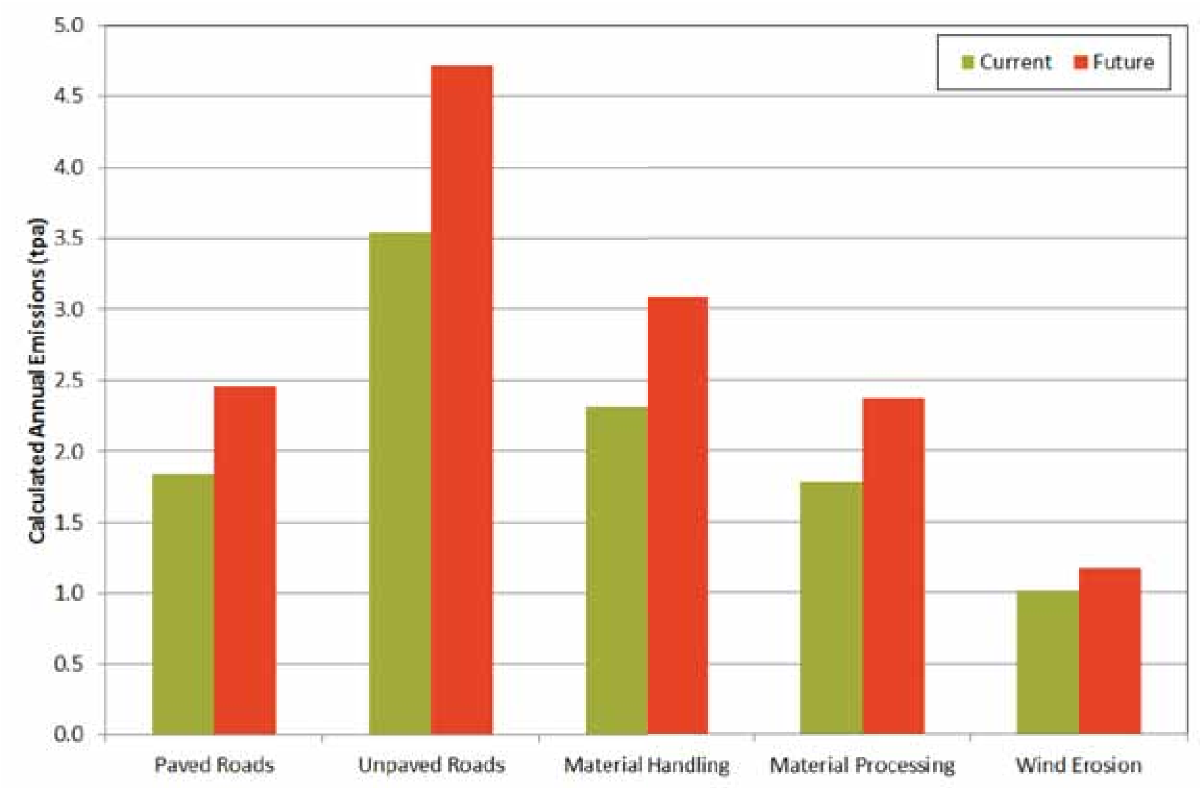

Figure 15: Calculated Annual PM_{10} Emissions by Source Type

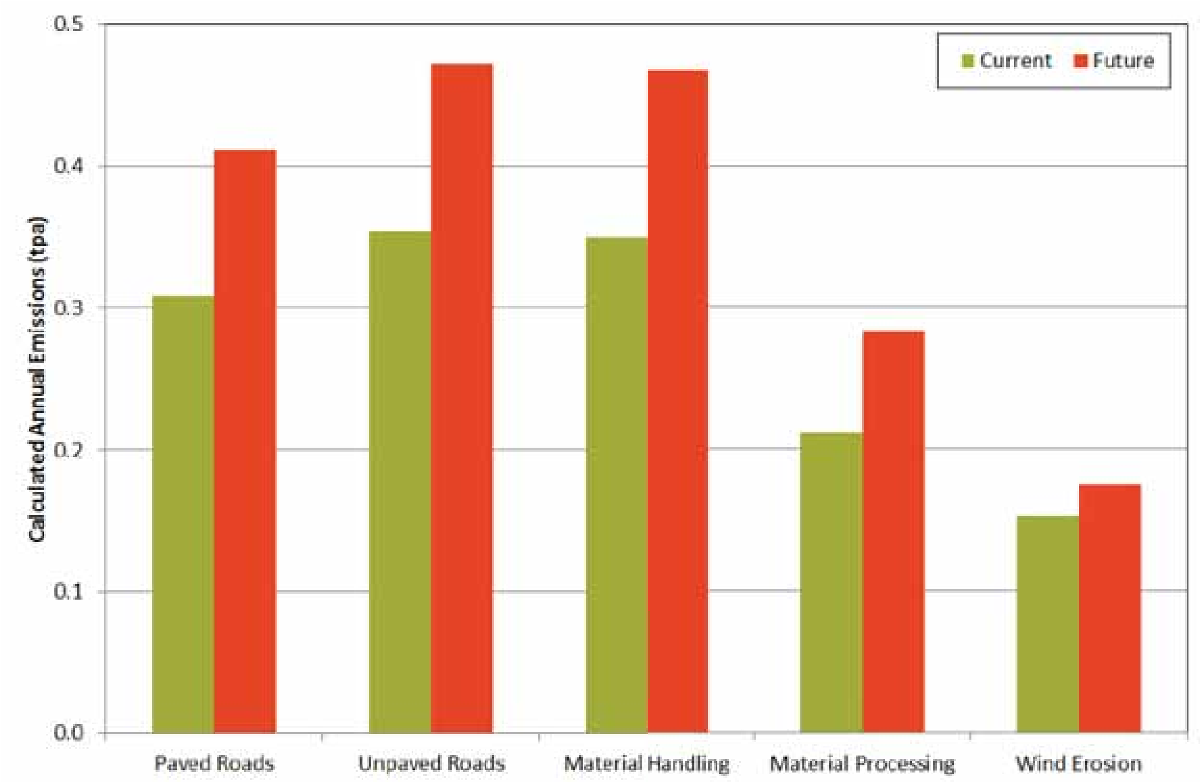

Figure 16: Calculated Annual $PM_{2.5}$ Emissions by Source Type

8 Dispersion Modelling Methodology

8.1 Dispersion Model Selection and Application

The atmospheric dispersion modelling completed within this assessment used the AMS/US-EPA regulatory model (AERMOD) (US-EPA, 2004a). 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 and deposition rates were calculated for a regular Cartesian receptor grid covering a 3.5 km by 3.5 km computational domain centered over the facility, with a grid resolution of 100 m. In addition, concentrations and deposition rates were predicted at the sensitive receptor locations listed in **Table 3**.

Simulations were undertaken for the 12 month period between 1 January 2013 and 31 December 2013 using the AERMET generated file based on the NSW OEH Prospect meteorological monitoring dataset as input (see **Section** 5 for description of input meteorology).

8.2 Modelling Scenarios

As identified in **Section 7.3**, two emission scenarios were developed to estimate emissions of TSP, PM_{10} and $PM_{2.5}$ from the current and proposed operations. The air dispersion modelling has predicted the resultant concentrations from the estimated emissions generated for both scenarios.

Wind erosion and materials handling emissions are varied relative to hourly wind speed. Further details are provided in **Appendix B**.

8.3 Source and Emissions Data

The methodology and results of the emissions inventory developed for this study are presented in **Section** 7 and **Appendix B**. Emissions were allocated spatially in accordance with the site layout illustrated in **Figure 2**.

8.4 Model Results

Dispersion simulations were undertaken to predict the concentrations of TSP, PM_{10}, $PM_{2.5}$ and dust deposition. Incremental facility-related concentrations and deposition rates occurring due to the current and proposed operations were modelled. Model results are expressed as the maximum predicted concentration for each averaging period at the selected assessment locations over the 2013 modelling period.

The results are presented in the following formats:

- Tabulated results of particulate concentrations and dust deposition rates at the selected assessment locations are presented and discussed in **Section** 9.

- Isopleth plots, illustrating spatial variations in facility-related incremental TSP, PM_{10}, $PM_{2.5}$ and dust deposition are provided in **Appendix C**.

Isopleth plots of the maximum 24-hour average concentrations presented in **Appendix C** 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 2013 modelling period.

8.5 Cumulative Impacts

The cumulative impact to surrounding sensitive receptors was assessed through the combination of ground level concentration predictions resulting from emissions from the facility (current and proposed operations) and the existing air quality environment, which as documented in **Section** 6 is a pairing of daily-varying measurements from the NSW OEH Prospect station and model predictions for local emission sources.

As stated in **Section 6.2.1**, the NSW EPA assessment criterion of 50 µg/m³ for 24-hour average PM_{10} was exceeded on four days during 2013 at the NSW OEH Prospect station. Additionally, the 24-hour average $PM_{2.5}$ NEPM advisory reporting goal of 25 µg/m³ was exceeded on one occasion. These exceedances were all attributable to bushfire related impacts.

Furthermore, the addition of predicted 24-hour average PM_{10} impacts from local emission sources (see **Section 6**) contributed to an additional exceedance day at several of the surrounding sensitive receptors (receptors R2, R3, R5 and R8). The final baseline levels are presented in **Section 6.4**.

Consequently, the background levels adopted for the facility will include exceedances of the PM_{10} and $PM_{2.5}$ criterion without any increment associated with the proposal or local emission sources.

Section 5.1.3 of the Approved Methods for Modelling provides the following guidance for dealing with elevated background concentrations when assessing cumulative impacts associated with proposed developments:

> *In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical.*

In accordance with the Approved Methods for Modelling, the likelihood of further exceedances of the impact assessment criteria occurring due to the proposal was evaluated.

9 Dispersion Modelling Results

9.1 Annual Average TSP

Table 16 presents the annual average concentrations predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility. For each scenario, the table presents:

- Facility-only increment
  The annual average TSP concentration attributable to operations at the site only;
- Baseline (OEH Prospect + NPI)
  The combination of TSP concentration predictions attributable to the surrounding NPI sources and the derived ambient TSP background based on PM_{10} monitoring data for 2013 at Prospect;
- Cumulative
  The sum of the facility only increment and baseline columns; and
- EPA criterion
  The NSW EPA criterion for TSP.

Table 16: Predicted Annual Average TSP Concentrations

Receptor	Annual Average TSP Concentrations (µg/m³)			
	Facility Only Increment	Baseline (OEH Prospect + NPI)	Cumulative	EPA Criterion
Scenario 1 - Current Operations				
R1	1.2	40.9	42.1	90
R2	2.1	41.7	43.8	90
R3	3.3	41.7	45.0	90
R4	0.6	40.6	41.2	90
R5	3.3	42.3	45.5	90
R6	1.2	41.3	42.5	90
R7	1.1	42.0	43.1	90
R8	6.8	42.7	49.5	90
R9	2.9	40.9	43.8	90
R10	1.6	41.0	42.6	90
R11	3.7	40.9	44.6	90
Scenario 2 - Proposed Operations				
R1	1.7	40.9	42.6	90
R2	2.9	41.7	44.6	90
R3	4.5	41.7	46.2	90
R4	0.8	40.6	41.4	90
R5	4.5	42.3	46.8	90
R6	1.7	41.3	43.0	90
R7	1.6	42.0	43.6	90
R8	9.8	42.7	52.5	90
R9	4.0	40.9	44.9	90
R10	2.2	41.0	43.2	90
R11	5.2	40.9	46.1	90

It can be seen from the results presented within **Table 16** that the predicted cumulative annual average TSP concentrations at all surrounding sensitive receptors are below the NSW EPA assessment criterion for both current and proposed operations.

9.2 24-hour Average PM_{10}

Table 17 presents the 24-hour average PM_{10} concentrations predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility. For each scenario, the table presents:

- Maximum facility-only increment
  The maximum 24-hour average PM_{10} concentration attributable to the operations at the site only across the entire 2013 modelling period;
- Maximum cumulative concentration
  For each day of the 2013 modelling period, the predicted 24-hour average PM_{10} concentration attributable to the facility is summed with the corresponding concentration in the 2013 PM_{10} baseline dataset presented in **Section 6.4** (combination of EPA monitoring data and NPI-source model predictions). This pairing returns 365 individual cumulative 24-hour average PM_{10} concentrations at each receptor location. This column presents the maximum cumulative 24-hour average PM_{10} concentration at each receptor;
- Corresponding facility increment
  The contribution of the facility only to the maximum cumulative 24-hour average PM_{10} concentration (as presented in the previous column) at each receptor;
- Corresponding background (OEH Prospect + NPI)
  The contribution of the background (OEH Prospect background + predicted NPI sources concentration) to the "Maximum Cumulative Concentration" column. Number of additional exceedance days (beyond OEH + NPI baseline)
  The number of additional days where the cumulative 24-hour average PM_{10} concentration (Facility only + NPI + OEH Prospect) is greater than the NSW EPA criterion of 50µg/m³. As per **Section 6.2**, there were four days in 2013 greater than 50µg/m³, all of which were attributed to bushfire events; and
- EPA criterion
  The NSW EPA 24-hour average criterion for PM_{10}.

Table 17: Predicted 24-hour Average PM_{10} Concentrations

Receptor	24-hour Average PM_{10} Concentrations (µg/m³)					
	Maximum Facility-Only Increment	Maximum Cumulative	Corresponding Facility Increment	Corresponding Background (OEH Prospect + NPI)	Number of Additional Exceedance Days (beyond OEH+NPI baseline)	EPA Criterion
Scenario 1 - Current Operations						
R1	3.6	**82.3**	0.1	**82.2**	0	50
R2	5.2	**82.8**	0.3	**82.5**	0	50
R3	7.5	**82.8**	0.3	**82.5**	0	50
R4	1.2	**82.2**	0.1	**82.1**	0	50
R5	6.5	**83.3**	0.6	**82.7**	0	50
R6	3.2	**82.5**	0.2	**82.3**	**1**	50
R7	2.4	**83.0**	0.5	**82.5**	**1**	50
R8	6.2	**84.8**	2.0	**82.8**	0	50
R9	3.6	**83.1**	1.0	**82.1**	**1**	50
R10	5.0	**82.3**	0.2	**82.1**	**1**	50
R11	3.7	**82.9**	0.7	**82.2**	**1**	50
Scenario 2 - Proposed Operations						
R1	5.1	**82.4**	0.2	**82.2**	**1**	50
R2	6.8	**82.9**	0.4	**82.5**	0	50
R3	9.6	**83.0**	0.5	**82.5**	0	50
R4	1.7	**82.2**	0.1	**82.1**	0	50
R5	8.8	**83.5**	0.8	**82.7**	0	50
R6	4.2	**82.5**	0.2	**82.3**	**1**	50
R7	3.4	**83.2**	0.7	**82.5**	**1**	50
R8	8.9	**85.7**	2.9	**82.8**	0	50
R9	5.0	**83.4**	1.3	**82.1**	**1**	50
R10	6.8	**82.4**	0.3	**82.1**	**1**	50
R11	5.0	**83.2**	1.0	**82.2**	**1**	50

It can be seen from the results presented within **Table 17** that maximum cumulative 24-hour average PM_{10} concentration is in exceedance of the EPA PM_{10} criterion (50 µg/m³) for both the existing and proposed operations at all modelled receptors. The key contributor to these exceedances is the ambient background concentration recorded at the NSW OEH Prospect station (81.8 µg/m³) during the peak of the October 2013 bushfire event in the Sydney region.

Table 17 indicates that additional exceedances of the NSW EPA criterion is predicted as follows:

- Scenario 1 - one additional exceedance day, beyond the four existing baseline exceedance days (as per **Table 14**), predicted at receptors R6, R7, R9, R10 and R11; and
- Scenario 2 - one additional exceedance day, beyond the four existing baseline exceedance days (as per **Table 14**), predicted at receptors R1, R6, R7 R9, R10 and R11.

To investigate the contributing factors to the additional exceedance day predicted, the corresponding facility-only increment, NPI Source increment and background concentration recorded at the OEH Prospect monitoring station have been extracted. The results for each receptor and scenario are presented in **Table 18**. It can be seen from these results that the contribution to additional exceedance day is dominated by the recorded background at the OEH Prospect station.

Table 18: Contribution to Additional Exceedance Day – 24-hour Average PM_{10} Concentration

Receptor	Cumulative 24-hour Average PM_{10} Concentration s (µg/m³)			
	Cumulative Concentration	Facility Only Increment	NPI Sources	OEH Prospect
Scenario 1 - Current Operations				
R6	50.8	1.0	0.6	49.2
R7	50.1	0.2	0.7	49.2
R9	50.6	0.6	0.8	49.2
R10	50.3	0.4	0.7	49.2
R11	50.7	1.1	0.4	49.2
Scenario 2 - Proposed Operations				
R1	50.1	0.4	0.5	49.2
R6	51.1	1.3	0.6	49.2
R7	50.2	0.3	0.7	49.2
R9	50.8	0.8	0.8	49.2
R10	50.5	0.5	0.8	49.2
R11	51.1	1.5	0.4	49.2

It is noted in Scenario 2, an additional exceedance is predicted for receptor R1 but not for receptors closer to the facility (such as R2, R3, R5 and R8). This is attributable to the proximity of receptor R1 to neighbouring source NPI6 (see **Section 6**) and the influence of that source on localised air quality impacts. Additionally, the pairing of NPI source predictions and the OEH Prospect monitoring data already returned an additional exceedance day (from four days in the monitoring data to five) without the inclusion of emission from the facility.

To provide further understanding of the contribution of the facility to cumulative 24-hour average PM_{10} concentrations, detailed analysis of the daily-varying cumulative concentrations predicted at receptor R10 for Scenario 2 (proposed operations) has been undertaken. Of the receptors with additional exceedances, receptor R10 has the highest maximum cumulative and facility-increment only 24-hour average PM_{10} concentrations for both Scenario 1 and 2.

The daily-varying cumulative 24-hour average PM_{10} concentrations at receptor R10 for Scenario 2 are illustrated in **Figure 17**. The ten-highest cumulative 24-hour average PM_{10} concentrations predicted for receptor R10 for Scenario 2 are illustrated in **Figure 18**. The following points are noted:

- As illustrated in **Figure 17**, across the 2013 modelling period, the contribution of the daily varying facility-only increment is significantly lower than the corresponding baseline concentration (combined NSW OEH Prospect and local sources);
- The additional exceedance day predicted at receptor R10 occurs on a day during the October 2013 bushfire event (see **Figure 17**). The ambient background concentration is the key contributor to the additional exceedance event; and
- Further, the additional exceedance day at receptor R10 is the fifth-highest cumulative concentration predicted for the 2013 modelling period, as presented in **Figure 18**. As can be seen, the fifth-highest cumulative concentration is heavily dominated by the ambient background concentration of 49.2μg/m³ (97% of the total cumulative concentration). As stated, this ambient background concentration from the NSW OEH Prospect station was recorded during the October bushfire event.

This analysis of cumulative 24-hour average PM_{10} concentrations predicted at receptor R10 during Scenario 2 is reflective of cumulative concentrations predicted at all receptor locations in both modelled scenarios. The conclusion from this analysis is that the ambient background concentrations experienced in the area (as recorded at the NSW OEH Prospect station) are the dominant factor in compliance for 24-hour average PM_{10}.

It is considered on the basis of the modelling results presented for 24-hour average PM_{10} that exceedance events at surrounding receptor locations would only occur during periods of elevated background concentrations where exceedances are likely in any case.

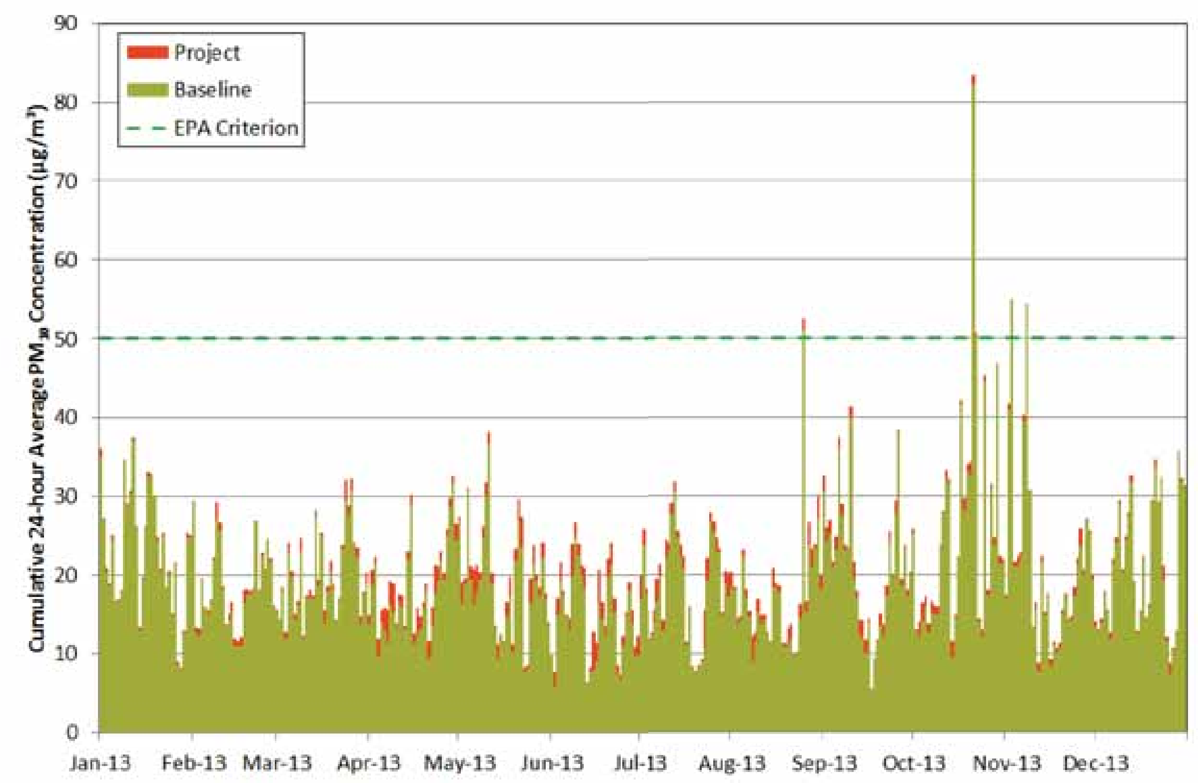

Figure 17: Daily-varying Cumulative 24-hour Average PM_{10} Concentrations – Receptor R10 – Scenario 2

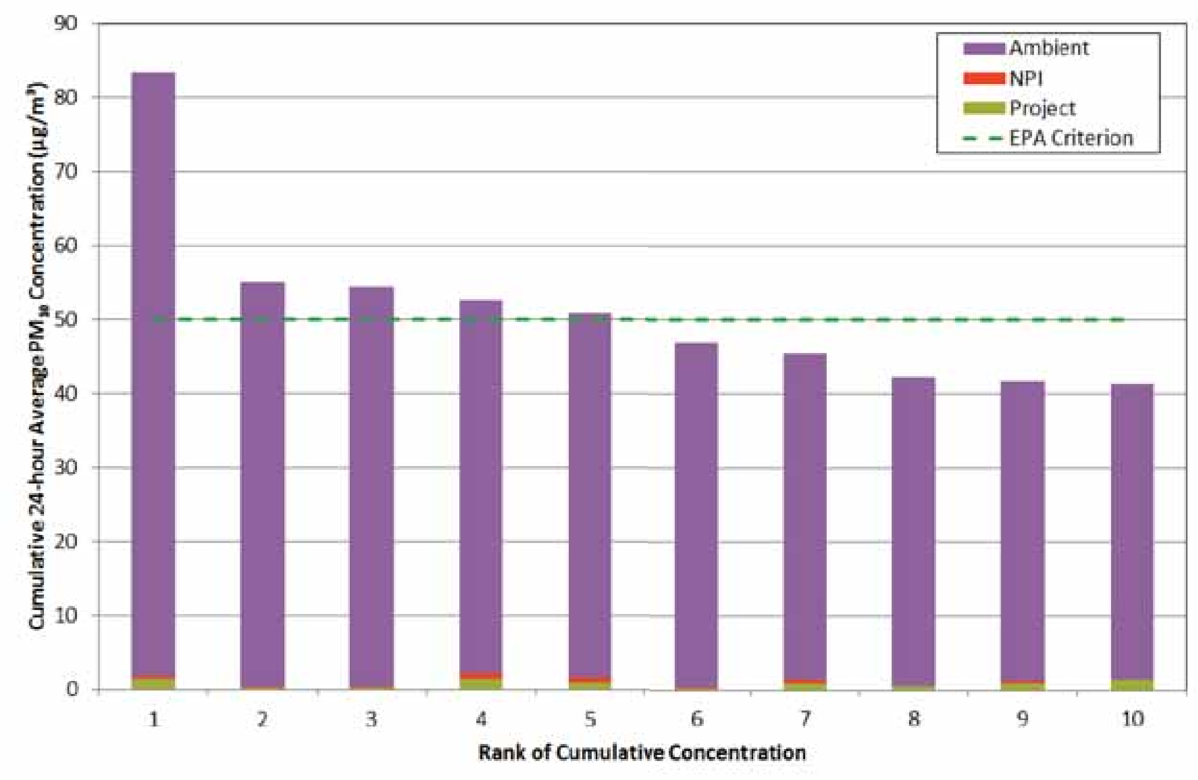

Figure 18: Ten Highest Cumulative 24-hour Average PM_{10} Concentrations – Receptor R10 – Scenario 2

9.3 Annual Average PM_{10}

Table 19 presents the annual average PM_{10} concentrations predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility. For each scenario, the table presents:

- Facility-only increment
  The annual average PM_{10} concentration attributable to operations at the site only;
- Baseline (OEH Prospect + NPI)
  The combination of PM_{10} concentration predictions attributable to the surrounding NPI sources and the ambient PM_{10} background concentration from the 2013 monitoring data recorded at Prospect;
- Cumulative
  The sum of the facility only increment and baseline columns; and
- EPA criterion
  The NSW EPA criterion for annual average PM_{10}.

Table 19: Predicted Annual Average PM_{10} Concentrations

Receptor	Annual Average PM_{10} Concentrations (µg/m³)			
	Facility Only Increment	Baseline (OEH Prospect + NPI)	Cumulative	EPA Criterion
Scenario 1 - Current Operations				
R1	0.3	19.6	19.9	30
R2	0.6	19.9	20.5	30
R3	0.9	19.9	20.8	30
R4	0.2	19.4	19.6	30
R5	0.9	20.1	21.0	30
R6	0.3	19.8	20.1	30
R7	0.3	20.0	20.3	30
R8	1.8	20.3	22.1	30
R9	0.7	19.6	20.3	30
R10	0.4	19.6	20.0	30
R11	1.0	19.6	20.6	30
Scenario 2 - Proposed operations				
R1	0.5	19.6	20.0	30
R2	0.8	19.9	20.7	30
R3	1.2	19.9	21.1	30
R4	0.2	19.4	19.7	30
R5	1.2	20.1	21.3	30
R6	0.5	19.8	20.2	30
R7	0.4	20.0	20.4	30
R8	2.6	20.3	22.9	30
R9	1.0	19.6	20.6	30
R10	0.6	19.6	20.2	30
R11	1.4	19.6	21.0	30

It can be seen from the results presented within **Table 19** that the predicted cumulative annual average PM_{10} concentrations at all surrounding sensitive receptors are below the NSW EPA assessment criterion for both current and proposed operations.

9.4 24-hour Average $PM_{2.5}$

Table 20 presents the 24-hour average $PM_{2.5}$ concentrations predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility. For each scenario, the table presents:

- Maximum facility-only increment
  The maximum 24-hour average $PM_{2.5}$ concentration attributable to the operations at the site only across the entire 2013 modelling period;
- Maximum cumulative concentration
  For each day of the 2013 modelling period, the predicted 24-hour average $PM_{2.5}$ concentration attributable to the facility is summed with the corresponding concentration in the 2013 $PM_{2.5}$ baseline dataset presented in **Section 6.4** (combination of EPA monitoring data and NPI-source model predictions). This pairing returns 365 individual cumulative 24-hour average $PM_{2.5}$ concentrations at each receptor location. This column presents the maximum cumulative 24-hour average $PM_{2.5}$ concentration at each receptor;
- Corresponding facility increment
  The contribution of the facility only to the maximum cumulative 24-hour average $PM_{2.5}$ concentration (as presented in the previous column) at each receptor;
- Corresponding background (OEH Prospect + NPI)
  The contribution of the background (OEH Prospect background + predicted NPI sources concentration) to the “Maximum Cumulative Concentration” column;
- Number of additional exceedance days (beyond OEH + NPI baseline)
  The number of additional days where the cumulative 24-hour average $PM_{2.5}$ concentration (facility only + NPI + OEH Prospect) is greater than the NEPM Advisory Goal of 25µg/m³. As per **Section 6.2**, there was one day in 2013 greater than 25 µg/m³, attributed to the October bushfire events; and
- NEPM Advisory Reporting Goal
  The NEPM advisory reporting goal for 24-hour average criterion for PM_{10}.

Table 20: Predicted 24-hour Average $PM_{2.5}$ Concentrations

Receptor	24-hour Average $PM_{2.5}$ Concentrations (µg/m³)					
	Maximum Facility Only Increment	Maximum Cumulative	Corresponding Facility Increment	Corresponding Background (OEH Prospect + NPI)	Number of Additional Exceedance Days (beyond OEH+NPI baseline)	NEPM Advisory Reporting Goal
Scenario 1 - Current Operations						
R1	0.5	**31.6**	<0.1	**31.6**	0	25
R2	0.7	**31.6**	<0.1	**31.6**	0	25
R3	1.1	**31.6**	<0.1	**31.6**	0	25
R4	0.2	**31.5**	<0.1	**31.5**	0	25
R5	0.9	**31.7**	0.1	**31.6**	0	25
R6	0.4	**31.6**	<0.1	**31.6**	0	25
R7	0.3	**31.7**	0.1	**31.6**	0	25
R8	0.7	**32.0**	0.3	**31.7**	0	25
R9	0.5	**31.7**	0.1	**31.6**	0	25
R10	0.6	**31.6**	<0.1	**31.6**	0	25
R11	0.5	**31.7**	0.1	**31.6**	0	25
Scenario 2 - Proposed operations						
R1	0.6	**31.6**	<0.1	**31.6**	0	25
R2	0.9	**31.6**	<0.1	**31.6**	0	25
R3	1.3	**31.7**	0.1	**31.6**	0	25
R4	0.2	**31.5**	<0.1	**31.5**	0	25
R5	1.2	**31.7**	0.1	**31.6**	0	25
R6	0.6	**31.6**	<0.1	**31.6**	0	25
R7	0.4	**31.7**	0.1	**31.6**	0	25
R8	1.0	**32.1**	0.4	**31.7**	0	25
R9	0.6	**31.7**	0.1	**31.6**	0	25
R10	0.9	**31.6**	<0.1	**31.6**	0	25
R11	0.6	**31.7**	0.1	**31.6**	0	25

It can be seen from the results presented within **Table 20** that maximum cumulative 24-hour average $PM_{2.5}$ concentration is in exceedance of the NEPM advisory reporting goal of 25 µg/m³ for both current and proposed operations. However, the key contributor to this exceedance is the ambient background concentration (31.6 µg/m³) coinciding with the peak 24-hour average PM_{10} concentration during the October 2013 bushfire event in the Sydney region.

As listed in **Table 20**, no additional exceedances of the NEPM advisory reporting goal for 24-hour average $PM_{2.5}$ are predicted at any receptor during Scenario 1 or 2. It is therefore considered on the basis of the modelling results presented for 24-hour average $PM_{2.5}$ that exceedance events at surrounding receptor locations would only occur during periods of elevated background.

9.5 Annual Average $PM_{2.5}$

Table 21 presents the annual average $PM_{2.5}$ concentrations predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility. For each scenario, the table presents:

- Facility-only increment
  The annual average $PM_{2.5}$ concentration attributable to operations at the site only;
- Baseline (OEH Prospect + NPI)
  A combination of $PM_{2.5}$ concentration predictions attributable to the surrounding NPI sources and the derived ambient $PM_{2.5}$ background concentration from the 2013 monitoring data recorded at Prospect;
- Cumulative
  The sum of the facility only increment and baseline columns; and
- NEPM advisory reporting goal
  The NEPM advisory reporting goal of 8 µg/m³.

Table 21: Predicted Annual Average $PM_{2.5}$ Concentrations				
Receptor	Annual Average $PM_{2.5}$ Concentrations (µg/m³)			
	Facility Only Increment	Baseline (OEH Prospect + NPI)	Cumulative	NEPM Advisory Reporting Goal
Scenario 1 - Current Operations				
R1	<0.1	7.5	7.5	8
R2	0.1	7.5	7.6	8
R3	0.1	7.5	7.6	8
R4	<0.1	7.4	7.5	8
R5	0.1	7.5	7.7	8
R6	<0.1	7.6	7.6	8
R7	<0.1	7.5	7.5	8
R8	0.2	7.6	7.8	8
R9	0.1	7.5	7.6	8
R10	0.1	7.5	7.6	8
R11	0.1	7.5	7.6	8
Scenario 2 - Proposed operations				
R1	0.1	7.5	7.6	8
R2	0.1	7.5	7.6	8
R3	0.2	7.5	7.7	8
R4	<0.1	7.4	7.5	8
R5	0.2	7.5	7.7	8
R6	0.1	7.6	7.7	8
R7	0.1	7.5	7.6	8
R8	0.3	7.6	7.9	8
R9	0.1	7.5	7.6	8
R10	0.1	7.5	7.6	8
R11	0.2	7.5	7.7	8

It can be seen from the results presented within **Table 21** that the predicted cumulative annual average $PM_{2.5}$ concentrations at all surrounding sensitive receptors are below the NEPM advisory reporting goal for both current and proposed operations. The baseline concentration is the dominant factor in the cumulative concentrations, with incremental concentrations at all receptors for both modelling scenarios comparatively minor.

9.6 Annual Average Dust Deposition

As stated in **Section 6.2.4**, due to the proximity of the dust deposition monitoring locations to the facility and the likelihood of double-counting, the monitoring data is not considered appropriate to pair with model predictions as ambient dust deposition background to assess cumulative dust deposition levels. Consequently, only incremental dust deposition levels from the proposal have been assessed for comparison with NSW EPA incremental criterion of 2 g/m^2/month.

Table 22 presents the incremental annual average monthly dust deposition levels predicted for each of the surrounding sensitive receptors for both current and proposed operations at the facility.

Table 22: Predicted Annual Average Monthly Dust Deposition

Receptor	Annual Average Monthly Dust Deposition (g/m^2/month)		
	Scenario 1 – Current Operations	Scenario 2 – Proposed operations	EPA Incremental Criterion
R1	<0.1	<0.1	2
R2	<0.1	0.1	2
R3	0.1	0.1	2
R4	<0.1	<0.1	2
R5	0.1	0.1	2
R6	<0.1	<0.1	2
R7	<0.1	<0.1	2
R8	0.2	0.3	2
R9	0.1	0.2	2
R10	<0.1	<0.1	2
R11	0.1	0.2	2

It can be seen from the results presented within **Table 22** that the predicted incremental dust deposition levels are below the NSW EPA incremental assessment criterion at all surrounding receptors for both Scenario 1 and 2.

Due to the close proximity of the dust monitoring gauges to operations on the site, Boral would also review the location of the existing dust monitoring network in consultation with the EPA to ensure the existing monitors are suitably located.

9.7 Summary of Modelling Results

The results of the dispersion modelling conducted for Scenario 1 and 2 in the previous sections highlight the following:

- The proposed increase in raw material receipt, processing and product dispatch at the facility is predicted to result in a very small increase in the ambient particulate concentrations in the surrounding environment relative to existing operations;
- Facility-only incremental particulate concentrations and deposition levels from both current and proposed operations are low relative to applicable assessment criterion at surrounding receptors;

- Taking background ambient air quality concentrations into account, compliance with short-term criterion for PM_{10} and $PM_{2.5}$ is heavily influenced by elevated concentrations caused by natural events such as bushfires. Excluding these events, exceedance of short-term criterion is considered unlikely; and
- Taking background ambient air quality concentrations into account, including elevated natural events, annual average TSP, PM_{10} and $PM_{2.5}$ concentrations are predicted to comply with applicable assessment criterion at all surrounding receptors for both current and proposed operations at the facility.

10 Greenhouse Gas Assessment

Operation of the facility will generate greenhouse gas (GHG) emissions. The NSW Department of Planning and Environment Secretary's Environmental Assessment Requirements (SEARs) for the proposal specify the requirement to undertake a quantitative assessment of the potential Scope 1 and 2 GHG emissions from the proposal.

This section of the report presents results from the quantification of Scope 1 and 2 GHG emissions from a range of sources related to the facility. The extent of such emissions is presented relative to the total NSW and Australian GHG emissions, and the implications of such emissions are qualitatively considered.

10.1 Greenhouse Gases and Climate Change

GHGs are gases present in the atmosphere that have the ability to absorb long-wave radiation reflected from the Earth's surface, adding heat to the atmosphere. GHGs include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

With the exception of water vapour, atmospheric concentrations of GHGs are influenced by human activities. The Intergovernmental Panel on Climate Change (IPCC, 2007) states that over the past 250 years, atmospheric concentrations of CO_2, CH_4, N_2O and other GHGs have notably increased and are attributable to human activities since the Industrial Revolution. The extra heat absorbed by increasing quantities of GHGs in the atmosphere has been linked to observed changes in the climate system over recent decades by the IPCC.

10.2 Methodology Adopted

This section sets out the boundaries for the facility, both organisational and operational and provides methodology adopted to derive Scope 1 and 2 GHG emissions for the proposal and the types of GHG emissions reported in this assessment. The SEARs for the facility did not require the quantification of Scope 3 emissions.

10.2.1 Organisational Boundary

The organisational boundary for this assessment has been defined using the Operational Control approach, which is defined in the *National Greenhouse and Energy Reporting Act* (NGER Act - Australian Government, 2007). In the case of the proposal, Boral will account for 100% of GHG emissions over which it has operational control. It will not account for emissions in which it owns an interest but does not have operational control.

Section 11 of the NGER Act defines Operational Control as follows:

> *A corporate group member has operational control of a facility if it has the authority to introduce and implement any or all of the operating, health and safety and environmental policies for the facility. Only one corporation or group member can have operational control of a facility at a time.*
>
> *If there is uncertainty as to which corporation or member has operational control of a facility, the corporation or member deemed to have operational control will be the one with the greatest authority to introduce and implement operating and environmental policies.*

Emissions associated with independent trucking contractors transporting material to and from site are outside the control of Boral and will not be accounted for in this assessment.

10.2.2 Operational Boundary (Emission Scopes)

Direct and indirect GHG emissions are defined by the Department of Environment (DoE, then Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education) within the *National Greenhouse Gas Accounting Factors 2013* workbook (NGAF 2013 – DIICCSRTE, 2013), as the following:

Direct emissions are produced from sources within the boundary of an organisation and as a result of that organisation's activities. These emissions mainly arise from the following activities:

- *generation of energy, heat, steam and electricity, including carbon dioxide and products of incomplete combustion (methane and nitrous oxide);*
- *manufacturing processes which produce emissions (for example, cement, aluminium and ammonia production);*
- *transportation of materials, products, waste and people (for example, use of vehicles owned and operated by the reporting organisation);*
- *fugitive emissions: intentional or unintentional GHG releases (such as methane emissions from coal mines, natural gas leaks from joints and seals); and*
- *on-site waste management, such as emissions from landfill sites.*

Indirect emissions are emissions generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation. Examples of indirect emission sources include:

- *consumption of purchased electricity;*
- *upstream emissions generated in the extraction and production of fossil fuels;*
- *downstream emissions from transport of an organisation's product to customers; and*
- *emissions from contracted/outsourced activities.*

On the basis of the above definitions, the NGAF 2013 workbook prescribes a range of emission factors to estimate associated GHG emissions. These emissions factors are activity-specific, with the scope of the activity determining the emission factor used. Specifically, the scope that emissions are reported under is determined by whether the activity is within the organisational boundary (direct—Scope 1) or outside it (indirect—Scope 2). The NGAF 2013 workbook defines the scope of emissions through the following:

- **Direct (or point-source)** emission factors give the kilograms of carbon dioxide equivalent (CO_2-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate Scope 1 emissions.
- **Indirect** emission factors are used to calculate ***Scope 2 emissions*** from the generation of the electricity purchased and consumed by an organisation as kilograms

of CO_2-e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.

10.3 Emission Sources

Direct (Scope 1) and indirect (Scope 2) GHG emissions have been defined for the proposal as follows:

- Scope 1 – Diesel fuel combustion by mobile plant; and
- Scope 2 – Consumption of purchased electricity

It is considered that the emissions sources listed above represent the most significant GHG sources associated with the facility. Other minor sources of GHG emissions may be associated with the facility, including those generated by waste disposal and fugitive leaks from high voltage switch gear. These emissions are anticipated to be relatively negligible in comparison with the emission sources listed above and have therefore not been considered further in this assessment.

10.4 Reporting of GHG

The assessment has calculated annual emissions for the following GHGs, emitted by the emission sources identified in **Section 10.3**:

- CO_2;
- CH_4; and
- N_2O

The relative importance of a GHG is measured in terms of its Global Warming Potential (GWP). The GWP is an index used to convert relevant non-CO_2 gases to a carbon dioxide equivalent (CO_2-e) by multiplying the quantity of the gas by its GWP. The GWP for each type of GHG has been taken from NGAF 2013. The GWPs of relevance to this assessment are:

- CH_4: GWP of 21 (21 times more effective as a GHG than CO_2); and
- N_2O: GWP of 310 (310 times more effective as a GHG than CO_2).

Emissions from each of the assessed GHG have been reported in units of tonnes of carbon dioxide equivalents (t CO_2-e).

10.5 GHG Emission Factors

10.5.1 Scope 1 - Diesel Fuel Combustion

Emissions from diesel fuel consumption have been calculated based on equations provided in the NGAF 2013 workbook.

The following equation is used to calculate fuel-related emissions for solid, liquid and gaseous fuels.

$$GHG\ Emissions_{fuel} = (Fuel\ Quantity \times Energy\ Content) \times (Emission\ Factor) / 1000$$

where,

GHG Emissions $_{fuel}$ is the emissions attributed to a particular GHG (CO_2, CH_4 or N_2O), in tonnes of carbon dioxide equivalent (t CO_2-e), due to the combustion of a particular fuel;

Fuel Quantity is the quantity of fuel combusted in one year, (kL/yr);

Energy Content is the energy content of the fuel combusted, (GJ/kL); and

Emission Factor is the GHG emission factor (kg CO_2-e/GJ) for the relevant GHG (CO_2, CH_4 or N_2O), emitted due to fuel combustion.

Table 23 shows the energy content and GHG emission factor for diesel fuel.

Table 23: Fuel Energy Content and GHG Emission Factors

Types of fuel combusted (Stationary and Non-Stationary)	Energy Content Factor (GJ/kL)	Emission Factor for GHG Assessed from Fuel Combustion (kg CO_2-e/GJ)		
		CO_2	CH_4	N_2O
Diesel	38.6	69.2	0.1	0.2

10.5.2 Scope 2 - Purchased Electricity Consumption

Emissions from the consumption of purchased electricity have been calculated based on equations provided in NGAF 2013 workbook. Scope 2 emissions from purchased electricity can be quantified using the equation below:

$$GHG\ Emissions_{\ purchased\ electricity} = Amount\ of\ electricity\ purchased \times Emission\ factor / 1000$$

where,

GHG Emissions $_{purchased\ electricity}$ is the total amount of GHG emitted in tonnes of carbon dioxide equivalent per year (t CO_2-e/year), as a result of purchased electricity;

Amount of electricity purchased refers to the amount of electricity purchased from the grid annually (kWh/year); and

Emission factor, factor applicable for estimating emissions from purchase of electricity (kg CO_2–e/ kWh). This emission factor is based on geographic location within Australia from where the electricity is purchased.

The applicable emission factor for the facility is shown in **Table 24**.

Table 24: Applicable Emission Factor for Calculating Emissions from Purchased Electricity

Electricity purchased in NSW	0.89 (kg CO_2 –e/ kWh)

10.6 Operational Details

GHG emissions generated by the facility have been calculated for operations at 750,000 tpa (current operations) and 1,000,000 tpa (proposed operations), consistent with Scenario 1 and Scenario 2 in the dispersion modelling conducted within this report.

Annual diesel consumption and electricity consumption for current operations at the facility were provided by Boral and are as follows:

- Diesel consumption – 480 kL/annum; and
- Electricity consumption – 1,166,744 kWh/annum.

In order to estimate energy consumption for proposed operations, the current diesel and electricity consumption rates were scaled proportionally to the planned increase in material handling and processing as a result of the proposal. For proposed operations, annual energy consumption is therefore estimated as follows:

- Diesel consumption – 640 kL/annum; and
- Electricity consumption – 1,555,659 kWh/annum.

10.7 Calculated Greenhouse Gas Emissions and Environmental Impact

10.7.1 Calculated Annual GHG Emissions

Table 25 provides the calculated annual GHG emissions (as CO_2-e) for each source detailed above, based on peak operations of the facility.

Table 25: Calculated Annual GHG Emissions

Emission Scope / Source	Annual GHG Emissions (t CO_2-e / year)	
	Scenario 1	Scenario 2
Scope 1 – Diesel Fuel	1,295	1,727
Scope 2 – Purchased Electricity	1,015	1,353
Total	**2,310**	**3,080**

10.7.2 Impacts of Emissions on Environment

The extent of the warming produced by a given rise in GHG concentrations depends on ‘feedback’ processes in the climate system, which can either amplify or dampen a change (CSIRO, 2011, p.15). According to the CSIRO (2011) the net effect of all climate feedbacks, given global GHG emissions, is to amplify the warming caused by increasing CO_2 and other GHGs of human origin. The best estimate of annual average warming by 2030 (above 1990 temperatures) is given as being around 1.0ºC across Australia, with warming of 0.7°C to 0.9ºC in coastal areas and 1°C to1.2ºC inland (CSIRO, 2011, p. 35). In regard to rainfall, the CSIRO notes that drying is likely in southern areas of Australia, especially in winter, and in southern and eastern areas in spring, due to a contraction in the rainfall belt towards the higher latitudes of the southern hemisphere. More extreme intense rainfall events are predicted for most locations, with the drying and increased evaporation resulting in a decline in soil moisture over parts of Australia. An increase in fire-weather risk is given as being likely with warmer and drier conditions (CSIRO, 2011).

Potential environmental effects in Australia associated with climate change due to global GHG emissions, are documented to include loss of biodiversity, water security issues in parts of Australia, increased drought and fire incidents, and risks of sea level rise and coastal flooding (IPCC, 2007).

Given the complexity of climate feedback processes, the non-linear relationship between GHG emissions and climate changes, and uncertainties in climate change projections, the specific impact of GHG emissions from the facility on the climate system, and as a consequence the broader environment, cannot be quantified with any certainty. The relative significance of GHG emissions from the facility may however be qualitatively evaluated by considering the magnitude of such emissions compared to total GHG emissions released within NSW and Australia.

The most recently published annual GHG emissions for NSW and Australia have been resourced from the *State and Territory Greenhouse Gas Inventories 2011-2012* (DoE, 2014). According to this Inventory, annual GHG emissions for NSW and Australia in 2011-2012 totalled 165.6 Mt and 554.9 Mt CO_2-e/yr respectively.

The significance of facility-related GHG emissions with regards to NSW and Australian annual GHG emissions is presented within **Table 26**.

Table 26: Comparison of Annual Facility-generated GHG Emissions with NSW and Australian GHG Emissions

	Significance of Annual GHG Emissions from Facility	
	Scenario 1	**Scenario 2**
NSW	0.00140%	0.00186%
Australia	0.00042%	0.00056%

It can be seen from the results presented within **Table 26** that Scope 1 and Scope 2 emissions generated by the facility represent 0.0014% and 0.00042% of annual NSW and Australian GHG emissions for Scenario 1 and represent 0.0019% and 0.00056% of annual NSW and Australian GHG emissions for Scenario 2.

10.8 Energy management & GHG emission mitigation

As identified above, the most significant contributor to direct emissions from the facility is the consumption of diesel fuel by mobile plant and equipment and onsite power generation. The following recommendations are made for direct emission reductions:

- Ensure onsite equipment is regularly maintained and serviced to maximise fuel efficiency;
- Reduce fuel consumption by minimising the vehicle kilometres travelled on site; and
- Progressively review and implement energy efficiency measures throughout the life of the facility.

11 Conclusions

ENVIRON was commissioned by EMM on behalf of Boral to undertake an Air Quality Impact Assessment for the proposed production increase at the Widemere Recycling Facility.

Emissions of particulate matter were estimated for existing and proposed operations at the facility. Atmospheric dispersion modelling predictions of air pollution emissions was undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted for the current and future scenarios highlight the following:

- The proposed increase in raw material receipt, processing and product dispatch at the facility is predicted to result in a very small increase in the ambient particulate concentrations in the surrounding environment relative to existing operations;
- Facility increment-only particulate concentrations and deposition levels from both current and proposed operations are low relative to applicable assessment criterion at surrounding receptors;
- Taking background ambient air quality concentrations into account, compliance with short-term criterion for PM_{10} and $PM_{2.5}$ is heavily influenced by elevated concentrations caused by natural events such as bushfires. Excluding these events, exceedance of short-term criterion is considered unlikely; and
- Taking background ambient air quality concentrations into account, including elevated natural events, annual average TSP, PM_{10} and $PM_{2.5}$ concentrations are predicted to comply with applicable assessment criterion at all surrounding receptors for both current and proposed operations at the facility.

The potential for adverse impact upon the surrounding environment due to air emissions from current or proposed operations was concluded to be low. Criteria exceedances are only likely during periods of elevated ambient air quality due to significant natural events such as bushfires. On the basis of the modelling conducted within this assessment, it is considered unlikely that emissions from the proposed increased production rates at the facility would negatively impact upon the surrounding area.

To evaluate the facility’s GHG emissions and determine the contribution to NSW and Australian annual GHG emissions as a result of the proposal, emissions were estimated based on information provided by Boral and relevant GHG emission factors.

GHG emissions were calculated for:

- Direct emissions produced from sources within the boundary of the facility and as a result of facility activities (Scope 1 emissions); and
- Indirect emissions generated in the wider economy as a consequence of facility activities, but which are physically produced by the activities of another organisation indirectly (Scope 2 emissions).

The GHG assessment’s key findings are as follows:

- Total facility GHG emissions (from direct and indirect sources) were estimated to be 2.3 kt and 3.1 kt of Carbon Dioxide Equivalent per year (CO_2–e/yr) for current and future proposed operations; and
- Emissions generated by the facility represent between 0.0014% and 0.0019% of annual NSW GHG emissions and 0.0004% to 0.0006% of annual Australian GHG emissions (relative to 2011-2012 levels).

12 References

Australian Government (2007) National Greenhouse and Energy Reporting Act 2007

Australian Government DoE (2014). State and Territory Greenhouse Gas Inventories 2011-12.

Bureau of Meteorology (2014). Climate statistics and hourly observations from the Bankstown Airport AWS location.

Countess Environmental (2006) WRAP Fugitive Dust Handbook.

CSIRO (2011) Climate Change: Science and Solutions for Australia

DIICCSRTE (2013) National Greenhouse Accounts Factors, July 2013

National Environmental Protection Council (1998). National Environmental Protection Measure for Ambient Air Quality.

IPCC (2007) Climate Change 2007: Synthesis Report

National Environmental Protection Council (2003). National Environmental Protection Measure (Ambient Air Quality) Measure, as amended.

NPI (2012). National Pollutant Inventory, Emission Estimation Technique Manual for Mining, Version 3, Environment Australia.

NSW DEC (2005). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.

NSW OEH (2003), Quarterly Air Quality monitoring data. Part A: DEC Data (1-4).

NSW (2004), Quarterly Air Quality monitoring data. Part A: DEC Data (1-4).

NSW OEH (2012), New South Wales Annual Compliance Report 2011 - National Environment Protection (Ambient Air Quality) Measure.

NSW OEH (2013), New South Wales Annual Compliance Report 2012 - National Environment Protection (Ambient Air Quality) Measure.

NSW OEH (2014), Air quality monitoring data from Prospect, Liverpool and Chullora monitoring stations

Oke T.T. (2003). Boundary Layer Climates, Second Edition, Routledge, London and New York, 435 pp.

Pitts O. (2005). Improvement of NPI Fugitive Particulate Matter Emission Estimation Techniques, Final Report, Sinclair Knight Merz, RFQ No. 0027/2004.

Pope III C.A. and Dockery D.W.C. (2006). Health Effects of Fine Particulate Air Pollution: Lines that Connect, Journal of Air & Waste Management Association, 56, 709-742.

Seinfeld, J and Pandis, S, 2006. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change. Second Edition.

SITA (2014). Website Reference for operating hours http://www.sita.com.au/facilities/map-of-australia/wetherill-park/

Stull R. B. (1997). An Introduction to Boundary Layer Meteorology, Kluwer Academic Publishers, London.

Sturman A.P. and Tapper N.J. (2006). The Weather and Climate of Australia and New Zealand, Second Edition, Oxford University Press, 541 pp.

US-EPA (1998). AP-42 Emission Factor Database, Chapter 11.9 Western Surface Coal Mining, United States Environmental Protection Agency, 1998.

US-EPA (2004a). User's Guide for the AMS/EPA Regulatory Model - AERMOD.

US-EPA (2004b). AP42 Emission Factor Database, Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing, United States Environmental Protection Agency, 2004.

US-EPA (2006a). AP42 Emission Factor Database, Chapter 13.2.2 Unpaved Roads, United States Environmental Protection Agency, November 2006.

US-EPA (2006b). AP42 Emission Factor Database, Chapter 13.2.4 Aggregate Handling and Storage Piles, United States Environmental Protection Agency, 2006.

US-EPA (2006c). AP42 Emission Factor Database, Chapter 13.2.5 Industrial Wind Erosion, United States Environmental Protection Agency, November 2006.

US-EPA (2011). AP42 Emission Factor Database, Chapter 13.2.1 Paved Roads, United States Environmental Protection Agency, 2011.

Wharton, S and Lundquist, J, (2010). Assessing atmospheric stability and the impacts on wind characteristics at an onshore wind farm. 19th Symposium on Boundary Layers and Turbulence, Session 2B Observations and Modeling Related to Renewable Energy Application II, 2B.3, 2010

WHO (2007). Health Relevance of Particulate Matter from Various Sources, Report on a World Health Organisation Workshop, Bonn, Germany, 26-27 March 2007.

13 Glossary of Acronyms And Symbols

AEMR Annual Environmental Monitoring Report

AHD Australian Height Datum

Approved Methods for Modelling Approved Methods for the Modelling and Assessment of Air Pollutants in NSW

AWS Automatic Weather Station

BoM Australian Bureau of Meteorology

Boral Boral Recycling Pty Limited

CH_4 Methane

CO_2-e CO2 equivalent

CSIRO Commonwealth Scientific and Industrial Research Organisation

DCCEE Department of Climate Change and Energy Efficiency

DEC NSW Department of the Environment and Conservation

DIICCSRTE Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education

DGRs Director General’s Assessment Requirements

DoE Department of Environment

EMM EMGA Mitchell McLennan

ENVIRON ENVIRON Australia Pty Ltd

EP&A Act Environmental Planning and Assessment Act 1979

EPL Environmental Protection Licence

GHG Greenhouse Gas

GWP Global Warming Potential

HFCs Hydrofluorocarbons

IPCC Intergovernmental Panel on Climate Change

LGA Local government area

µg Microgram (g x 10-6)

µm Micrometre or micron (metre x 10-6)

m^3 Cubic metre

NEPC National Environment Protection Council

NEPM National Environment Protection Measure

NGAF National Greenhouse Accounts Factors

NGER Act National Greenhouse and Energy Reporting Act 2007

NPI National Pollutant Inventory

NO_2 Nitrogen Dioxide

N_2O Nitrous Oxide

PAA Project Application Area

PFCs perfluorocarbons

PM_{10} Particulate matter less than 10 microns in aerodynamic diameter

$PM_{2.5}$ Particulate matter less than 2.5 microns in aerodynamic diameter

POEO Act Protection of the Environment Operations Act 1997

OEH Office of Environment and Heritage

SEARs Secretary's Environmental Assessment Requirements

TAPM "The Air Pollution Model"

The facility The Widemere Recycling Facility

tpa Tonnes per annum

TSP Total Suspended Particulate

US-EPA United States Environmental Protection Agency

VOC Volatile Organic Compounds

VKT Vehicle Kilometres Travelled

Appendix A

Seasonal and Diurnal Wind Roses

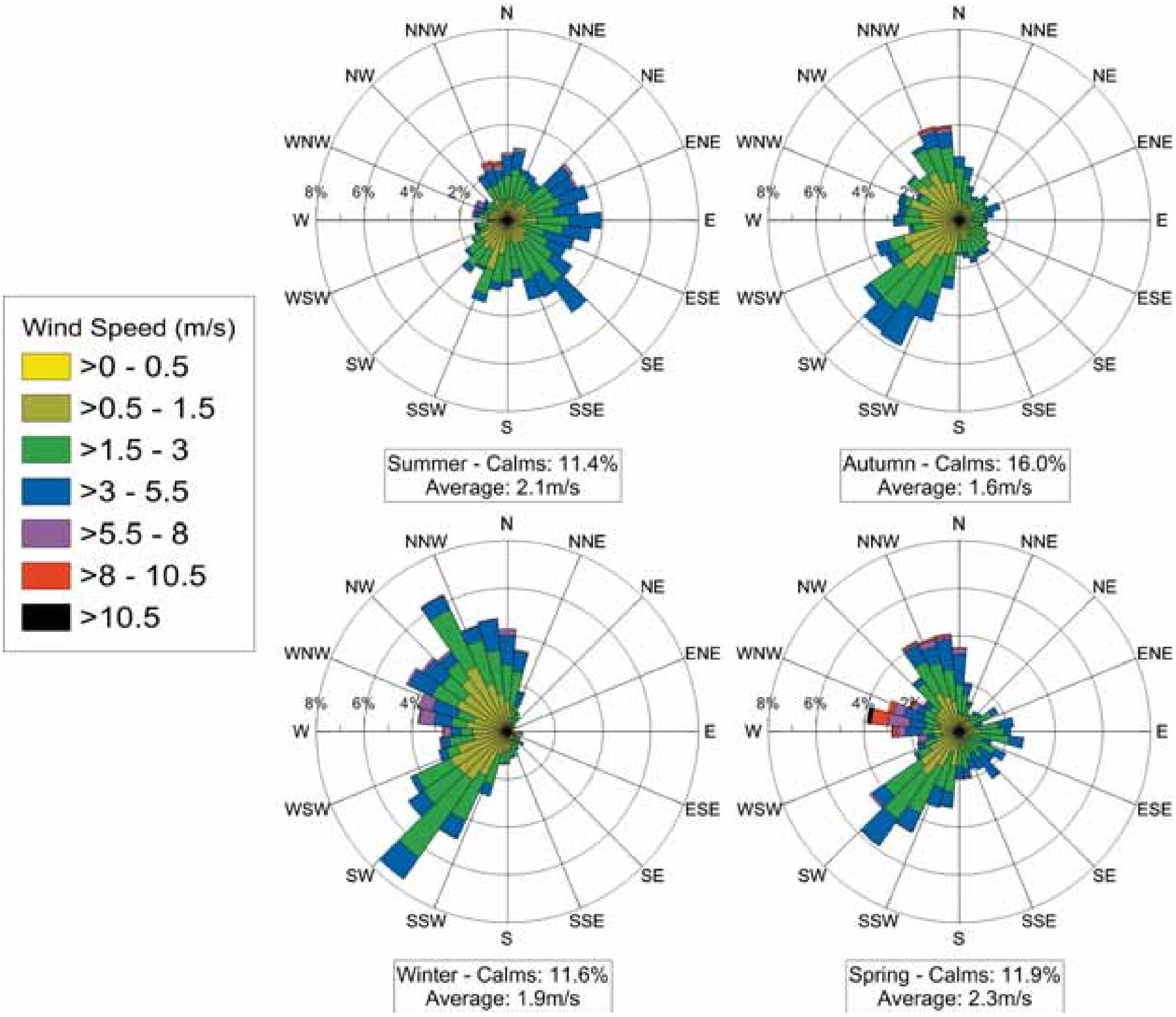

Figure A1 – Seasonal Wind Roses – NSW OEH Prospect - 2013

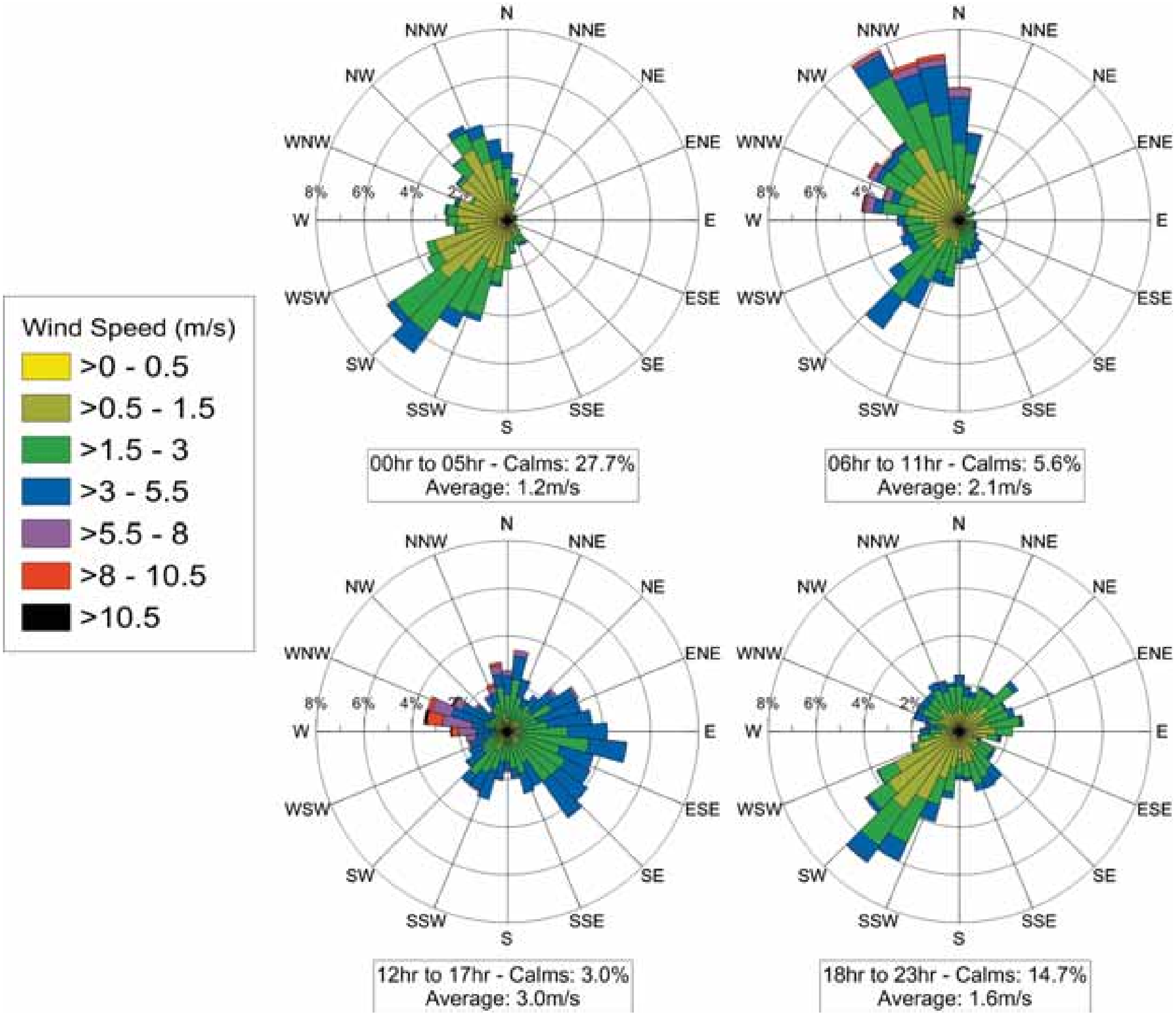

Figure A2 – Diurnal Wind Roses – NSW OEH Prospect - 2013

Appendix B

Emissions Inventory Background

Introduction

Air emission sources associated with the various phases of the Project 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);
- AP-42 Chapter 11.19.2 –Crushed Stone Processing and Pulverized Mineral Processing (US-EPA, 2004b);
- AP-42 Chapter 13.2.2 – Unpaved Roads (US-EPA 2006a);
- AP-42 Chapter 13.2.4 – Aggregate Handling and Storage Piles (US-EPA 2006b);
- AP-42 Chapter 13.2.1 – Paved Roads (US-EPA 2011); and
- AP-42 Chapter 11.9 - Western Surface Coal Mining (US-EPA 1998).

Particulate emissions were quantified for various particle size fractions. TSP emissions were estimated and modelled to predict dust deposition rates and TSP concentrations. PM_{10} and $PM_{2.5}$ emissions were estimated using ratios for the different particle size fractions available within the literature, as documented in subsequent sections.

Sources of Particulate Matter Emissions

Air emissions associated with the facility will primarily comprise of fugitive particulate matter releases. Sources of atmospheric emissions associated with the facility include:

- Vehicle entrainment of particulate matter due to the haulage of material along the sealed and unsealed haul roads about the facility;
- Unloading of material to the raw material storage area;
- Breaking of larger material and handling to stockpiles/crusher hopper;
- Crushing and screening plant operations;
- Conveying, transfer points and loading of crushed rock material to stockpiles;
- Handling and transfer of crushed material to blend plant;
- Blend plant and handling/stockpiling of blended final product
- Loading of product to truck for dispatch; and
- Wind erosion associated with exposed areas and material stockpiles.

Operational Assumptions

To compile an emissions inventory for current and proposed operations at the facility, the following general assumptions were made:

- Operational activities, occur between 6am and midnight;

- Delivery, processing and dispatch rate of material is 750,000 tpa in Scenario 1 and 1,000,000 tpa for Scenario 2;
- Areas for wind erosion sources were assumed to be 4.8 ha for Scenario 1 and 5.5 ha for Scenario 2.
- Haul distances for both scenarios are as follows:

Road	Length
Paved material delivery	0.2km
Unpaved material delivery	0.3km
Western unpaved haul road	0.7km
Paved material dispatch	0.4 km
Unpaved material dispatch	0.1 km

- Average truck weights (accounting for loaded and unloaded weights):
  - Internal haul truck – 38.5 t; and
  - Product delivery/dispatch truck – 30 t.

Particulate Matter Emission Factors Applied

The emission factor equations applied within the assessment are documented in this subsection. **Table B1** 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 published default.

Table B1 Emission Estimation Factors Applied for All Scenarios

Emission Source	Emission Factor			Emission Factor Unit	Source of Factor
	TSP	PM_{10}	$PM_{2.5}$		
Material Delivery - Paved	0.61	0.12	0.02	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Material Delivery - Unpaved	2.14	0.55	0.05	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Truck Unloading	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Raw Material Handling	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Oversize concrete breaking	0.0027	0.0012	0.0002	kg/tonne	USEPA AP-42 11.19.2 - Tertiary Crushing Factor
Unpaved haulage between Raw and Product	2.57	0.66	0.07	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
FEL to Hopper	3.15	0.87	0.09	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Hopper loading	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Crushing (2 points)	0.0006	0.0003	0.0001	kg/tonne	USEPA AP-42 11.19.2 -

Table B1 Emission Estimation Factors Applied for All Scenarios

Emission Source	Emission Factor			Emission Factor Unit	Source of Factor
	TSP	PM_{10}	$PM_{2.5}$		
					Tertiary Crushing Factor
Screening (3 points)	0.0011	0.0004	0.0000	kg/tonne	USEPA AP-42 11.19.2 - Screening Factor
Conveyor Transfer Points (3 in total)	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Stockpile Loading	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Crushed material to product stockpiling area	3.15	0.87	0.09	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Crushed material Handling	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Blend Plant	0.0125	0.0043	0.0006	kg/tonne	USEPA AP-42 11.19.2 - Screening Factor
Post-blend plant stockpile loading	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Product Truck Loading	0.0011	0.0005	0.0001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Product Transportation - Unpaved	2.14	0.55	0.05	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Product Transportation - Paved	0.61	0.12	0.02	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Wind Erosion - Exposed surfaces and stockpiles	850.0	425.0	63.8	kg/ha/year	AP-42 11.9 - Wind erosion of exposed areas factor

Details relating to the emission equations referenced in Table B1 are presented in the following sections.

Unpaved Roads Equation

The emissions factors for unpaved roads, as documented within AP42 Chapter 13.2.2 - “Unpaved Roads” (US-EPA 2006a), was applied as follows:

$$E = k\,(s/12)^{a}(W*1.1023/3)^{b}$$

Where:

E = Emissions Factor (lb/VMT)

s = surface material silt content (%)

W = mean vehicle weight (tonnes)

The following constants are applicable:

Constant	TSP (assumed from PM_{30})	PM_{10}	$PM_{2.5}$
K (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

The metric conversion from lb/VMT to g/VKT is as follows:

1 lb/VMT = 0.2819 kg/VKT

Material parameters are listed in Table B2.

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)

The following constants are applicable:

Constant	TSP (assumed from PM_{30})	PM_{10}	$PM_{2.5}$
k (g/VKT)	4.9	1.5	0.15

Material parameters are listed in **Table B2**.

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 $PM_{2.5}$

Emission rates were calculated on an hourly basis to reflect hourly variations in the wind field.

This emission factor was applied to the following sources:

- Dumping and loading of material to/from trucks;
- Various transfer points about along the processing circuit (conveyor points, loading to transfer bins, stockpile loading, etc).

Distribution of Wind Erosion Emissions by Wind Speed

Annual wind erosion emissions were varied by hour to reflect the increase in wind erosion potential with increasing wind speed. Proportion of annual emissions by wind speed was determined by applying the US-EPA's erosion potential equation (US-EPA 2006c, Chapter 13.2.5). A friction threshold velocity value of 5.4 m/s was adopted, based on the wind speed referenced within the NPI Mining Active Coal Stockpile equation (considered to be conservative for material at the Project Site).

Erosion potential (P) corresponding to the hourly fastest mile of wind (derived by increase hourly wind speed by factor of 1.3 - Pitts (2005)) for the ith period between disturbances (g/m^2), calculated by:

$$P\ (g/m^2) = 58(u^* - ut^*) + 25(u^* - ut^*)$$

$$P = 0 \text{ for } u^* \leq ut^*$$

Where,

u^* = friction velocity (m/s)

ut^* = threshold friction velocity (m/s)

Materials Input Data

Material property inputs used in the emission equations presented in **Table B1** and following subsections are detailed in **Table B2**.

Table B2 Material Parameters Applied for All Scenarios

Material Properties	Units	Value	Source of Information
Silt loading of paved road surfaces	g/m^2	8.2	Default loading value for Quarry - US-EPA AP42 (2011)
Silt content of unpaved road surfaces	%	4.8	Default value for Sand and Gravel Processing Facility – Plant Road US-EPA AP42 13.2.2 (2006a)
Silt content of unpaved road surface – stockpiling area	%	7.1	Default value for Sand and Gravel Processing Facility – Materials Storage Area. US-EPA AP42 13.2.2 (2006a)
Moisture content of material	%	2.1	Default value for Stone Quarrying and Processing. US-EPA AP42 13.2.2 (2006c)

Appendix C

Local Sources Modelling Background

As highlighted in **Section 6.1**, the inclusion of emissions and related ground-level concentrations from neighbouring emission sources to the Project in the assessment of local air quality was considered necessary. The NPI emission inventory for 2012/2013 was reviewed and the following sources were identified in the surrounding 2 km to the Project Site:

- SITA recycling facility, located approximately 0.5 km to the southeast (NPI1);
- Steritech gamma irradiation sterilization facility, located approximately 0.5 km to the south-southeast (NPI2);
- Transpacific Waste Oil Recycling facility, located approximately 0.6 km to the southwest (NPI3);
- Albright and Wilson surfactant manufacturing plant, located approximately 1.0 km to the west-southwest (NPI4);
- Caroma Industries ceramic products factory, located approximately 1.2 km to the south (NPI5);
- Visy beverage can manufacturing plant, located approximately 1.2 km to the east (NPI6);
- CSR gyprock manufacturing plant, located approximately 1.2 km to the south-southwest (NPI7); and
- Dairy Farmers milk processing facility, located approximately 1.7 km to the southwest (NPI8).

The following points are noted in the quantification of impacts from local sources:

- Only PM_{10} and $PM_{2.5}$ emissions are reported to the NPI. In order to estimate TSP emissions from reported annual emissions, the PM_{10}/TSP ratio listed in **Section 6.2.3** has been applied to PM_{10} emissions.
- Due to a lack of site-specific source details, all emission sources were represented within the dispersion model as volume sources, with no accounting for potential stack releases (including thermal and mechanical buoyancy) or control technologies;
- With the exception of the SITA recycling facility, all annual emissions are assumed to be continuous in deriving a gram/second emission rate;
- SITA emissions were assumed to be released between the hours of 5am and 4.30pm, based on the reported site operating hours (SITA, 2014);
- In the absence of annual emissions of PM_{10} and $PM_{2.5}$ for the SITA site (only emissions of zinc were reported to the NPI for 2012-2013), annual emissions were estimated based on a similar methodology to emissions from the Project Site, including emission factors and material handling/processing assumptions.

In order to estimate SITA emissions, the area of recycling activities was calculated from publicly available aerial photographs of the site, with an area of 4 ha derived. Annual operations were scaled from existing operations at the Project Site (750,000 tpa) and the area of operations at the Project Site (4.8 ha). An annual production rate of 625,000 tpa was therefore assumed for the SITA operations. Emission factors and processes applied for the Project Site, as per **Appendix B**, were applied for calculation of SITA emissions.

Annual emissions for neighbouring sources were calculated as presented in **Table C1**.

Table C1 Emission Estimation - Local Sources

Emission Source	Annual Emissions (kg/annum)		
	TSP	**PM_{10}**	**$PM_{2.5}$**
NPI1	26,738	8,915	1,140
NPI2	250	120	120
NPI3	1,574	756	756
NPI4	434	208	208
NPI5	20,694	9,933	273
NPI6	269	129	129
NPI7	20,607	9,892	2,185
NPI8	852	409	409

Modelling of the above emissions was conducted using the same dispersion modelling process developed for the Project (see **Section 8**). Volume emission sources were applied at each of the local source locations from which the above emissions were released. All volume sources were allocated the following generic dimensions: vertical 10m and lateral 40m. The location of local sources adopted in the modelling process are presented in **Figure C1**. Results of the local source modelling are presented in **Section 6.3**.

Figure C1: Local Source Locations

Appendix D

Incremental Pollutant Isopleths

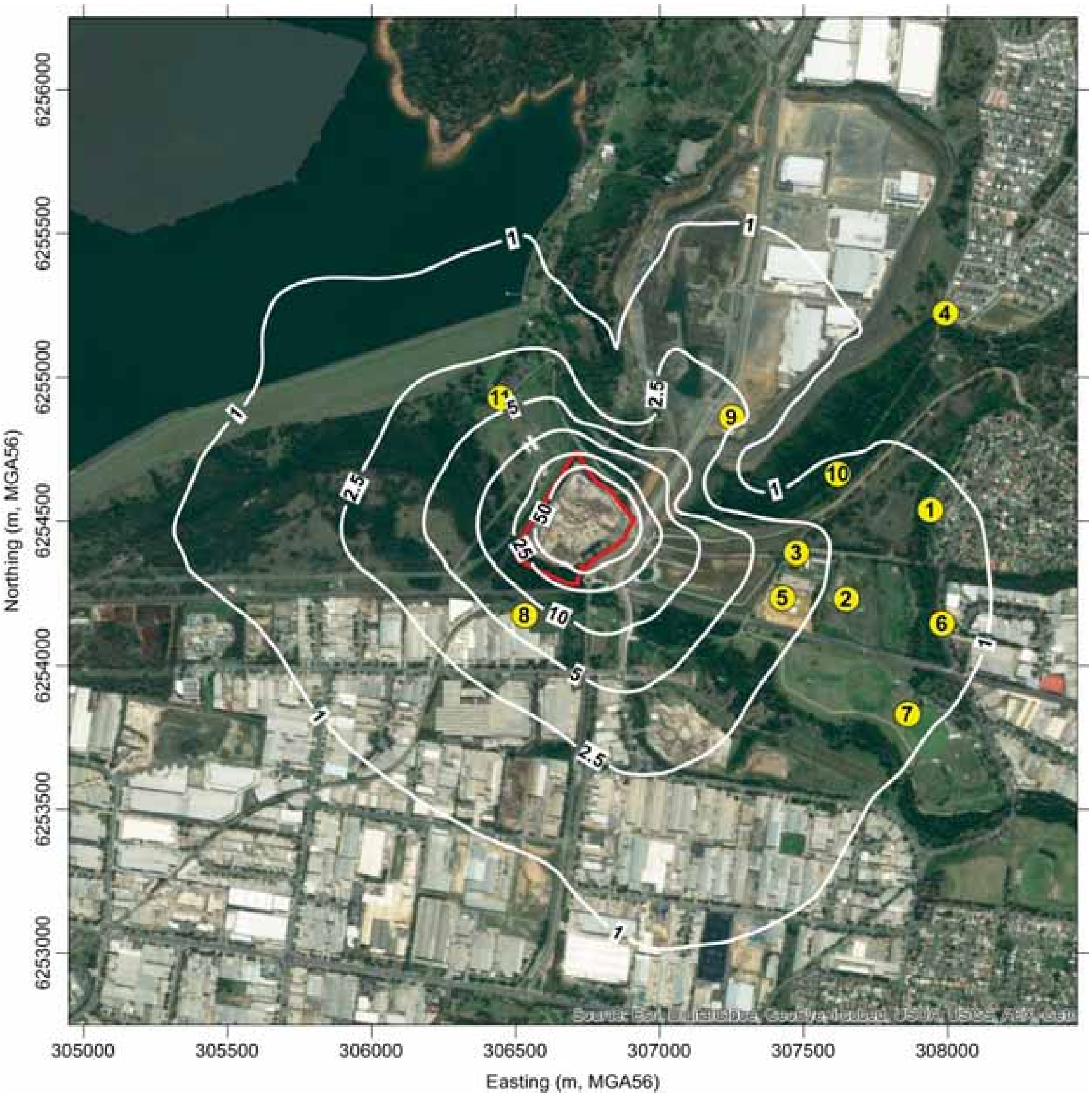

Figure D1 – Predicted Incremental Annual Average TSP Concentrations (µg/m³) – Scenario 1

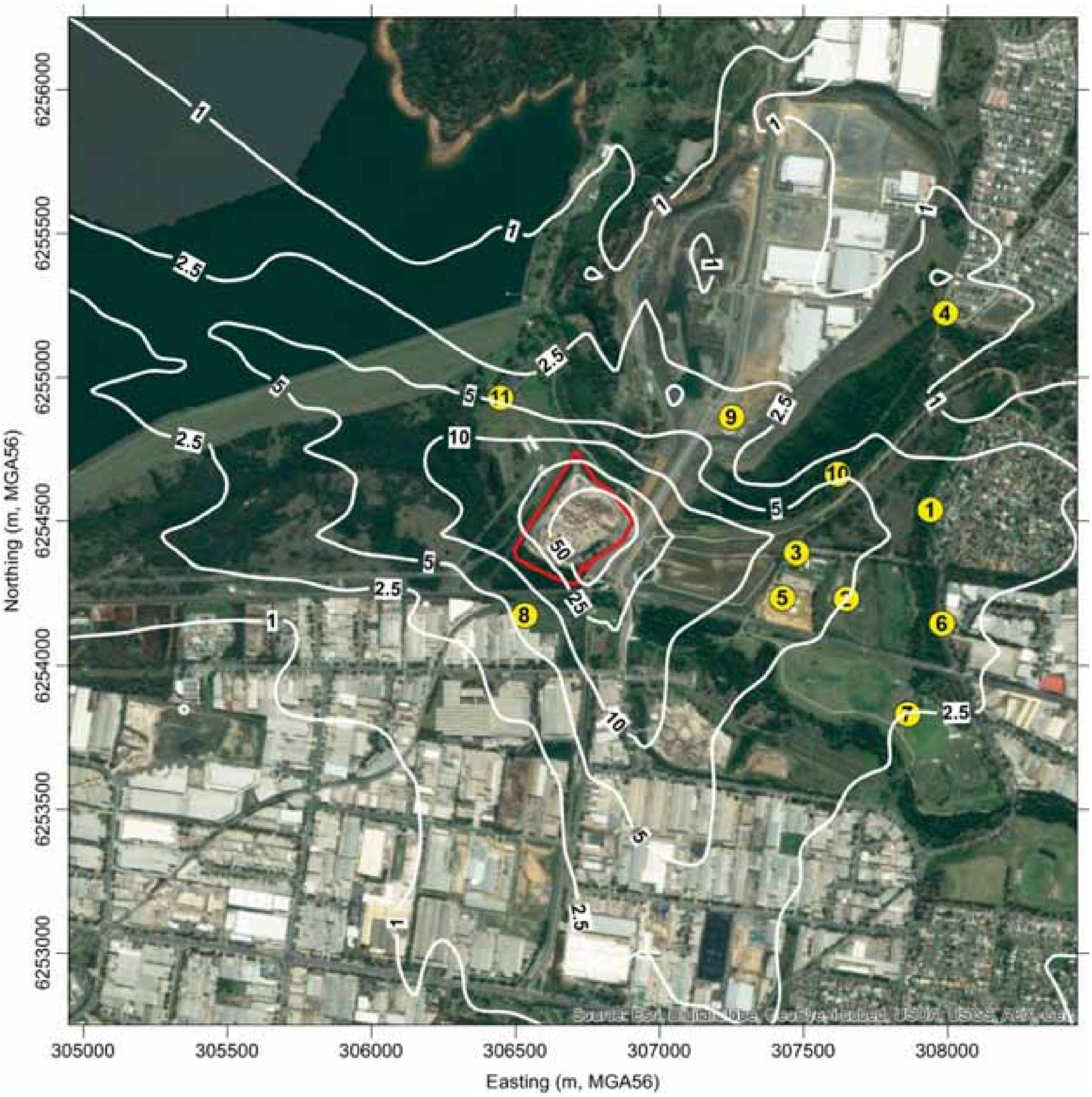

Figure D2 – Predicted Incremental Maximum 24-hour Average PM_{10} Concentrations (µg/m³) – Scenario 1

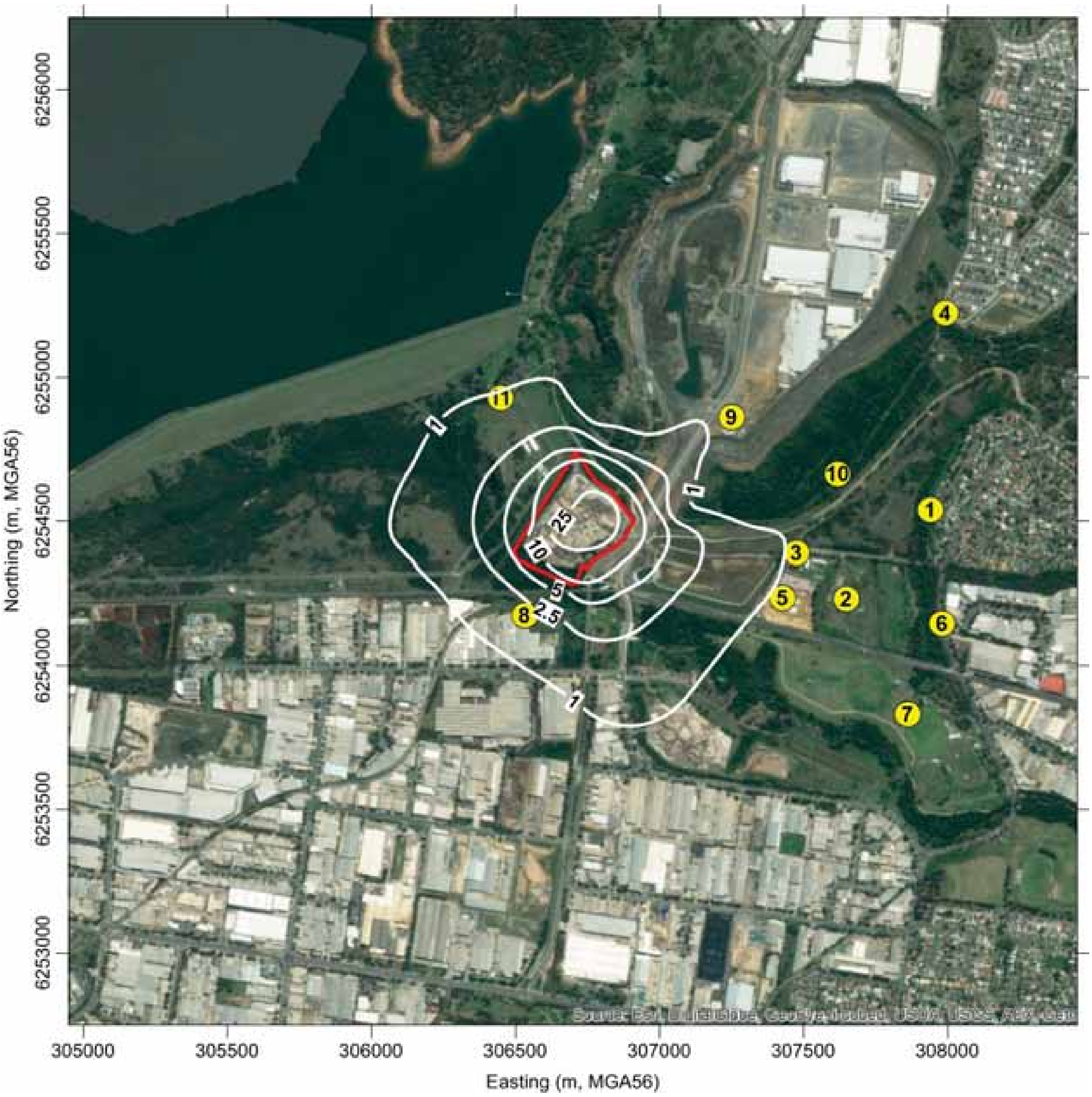

Figure D3 – Predicted Incremental Annual Average PM_{10} Concentrations (µg/m³) – Scenario 1

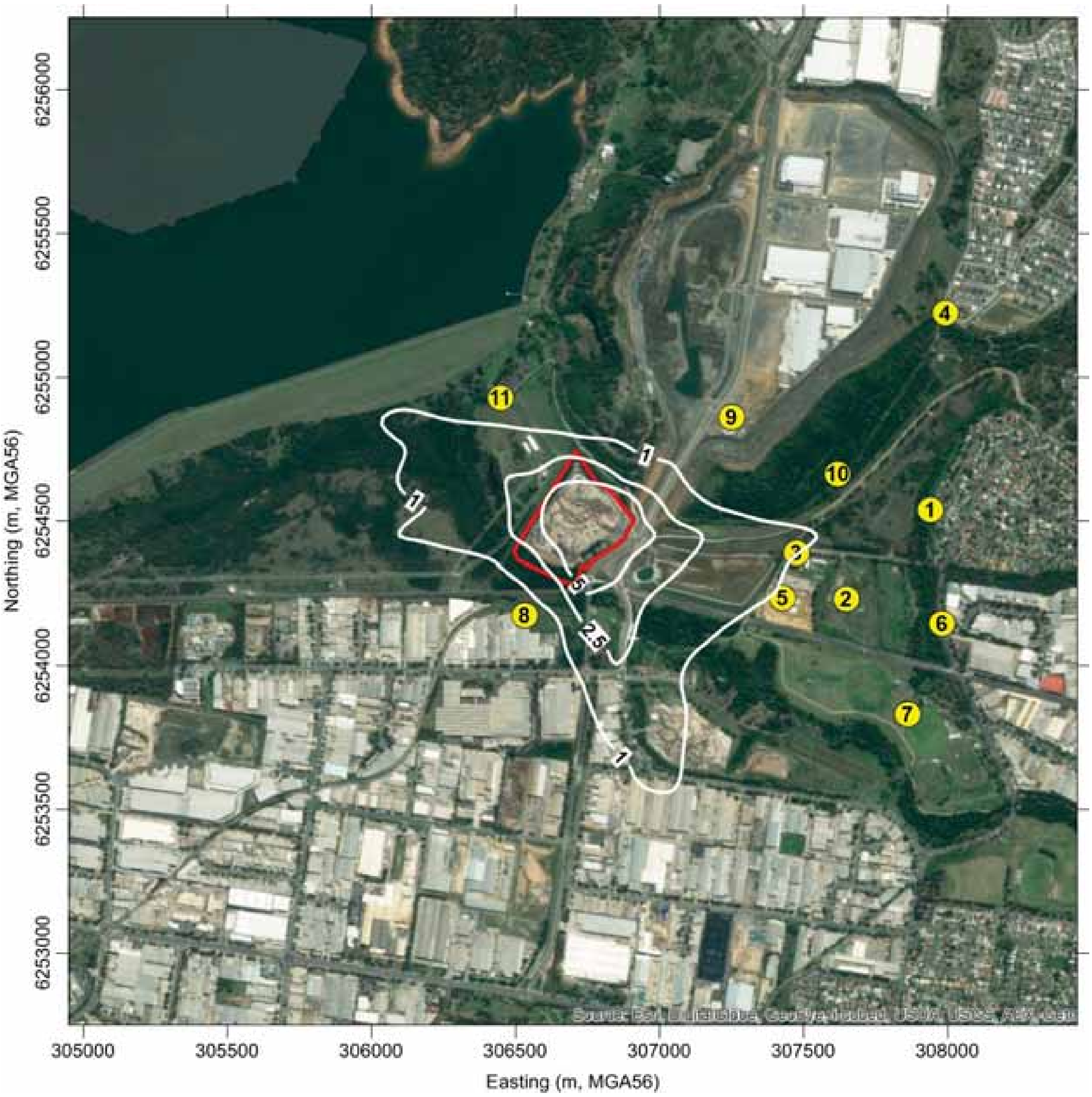

Figure D4 – Predicted Incremental 24-hour Average $PM_{2.5}$ Concentrations (µg/m³) – Scenario 1

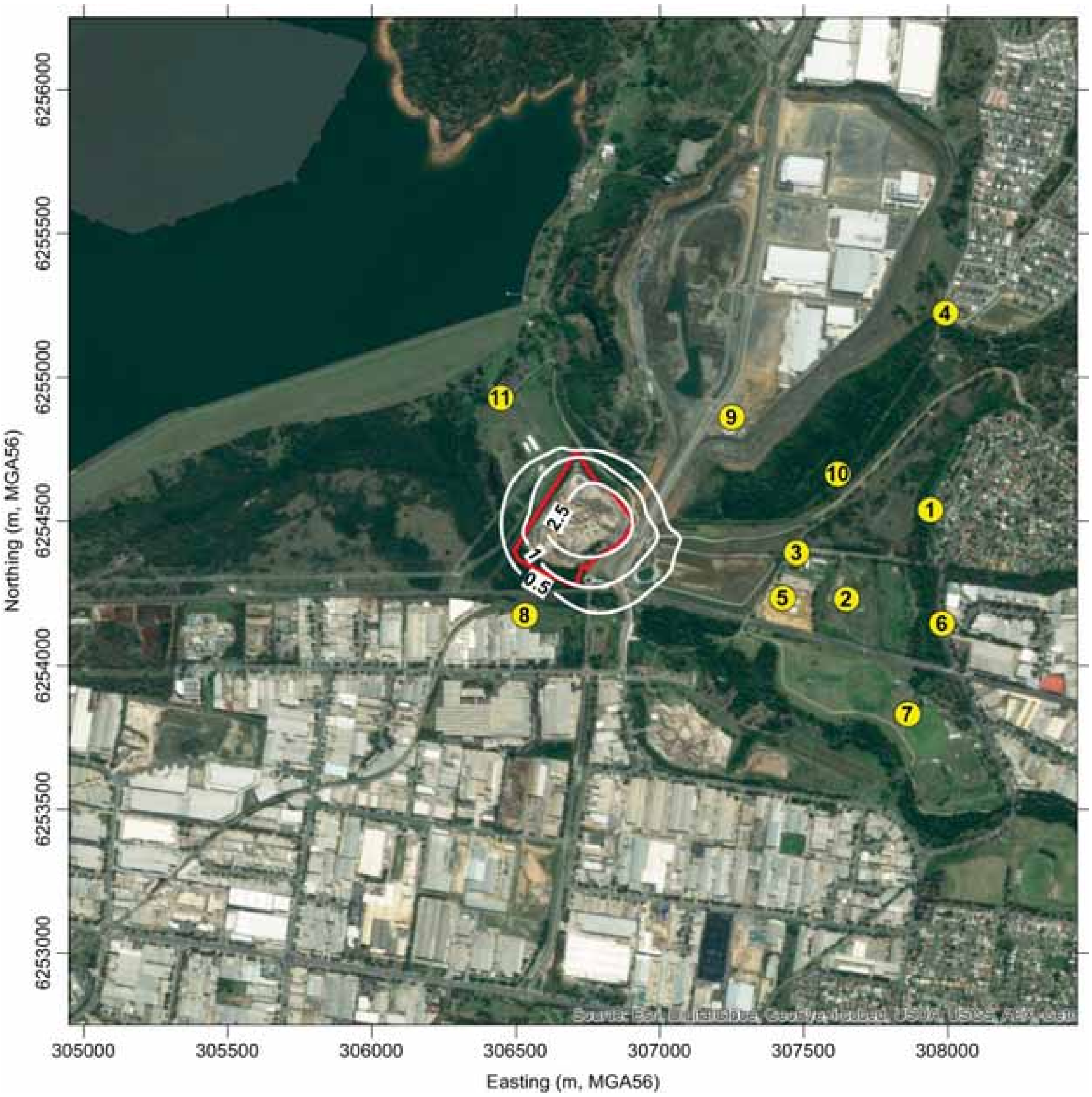

Figure D5 – Predicted Incremental Annual Average $PM_{2.5}$ Concentrations (µg/m³) – Scenario 1

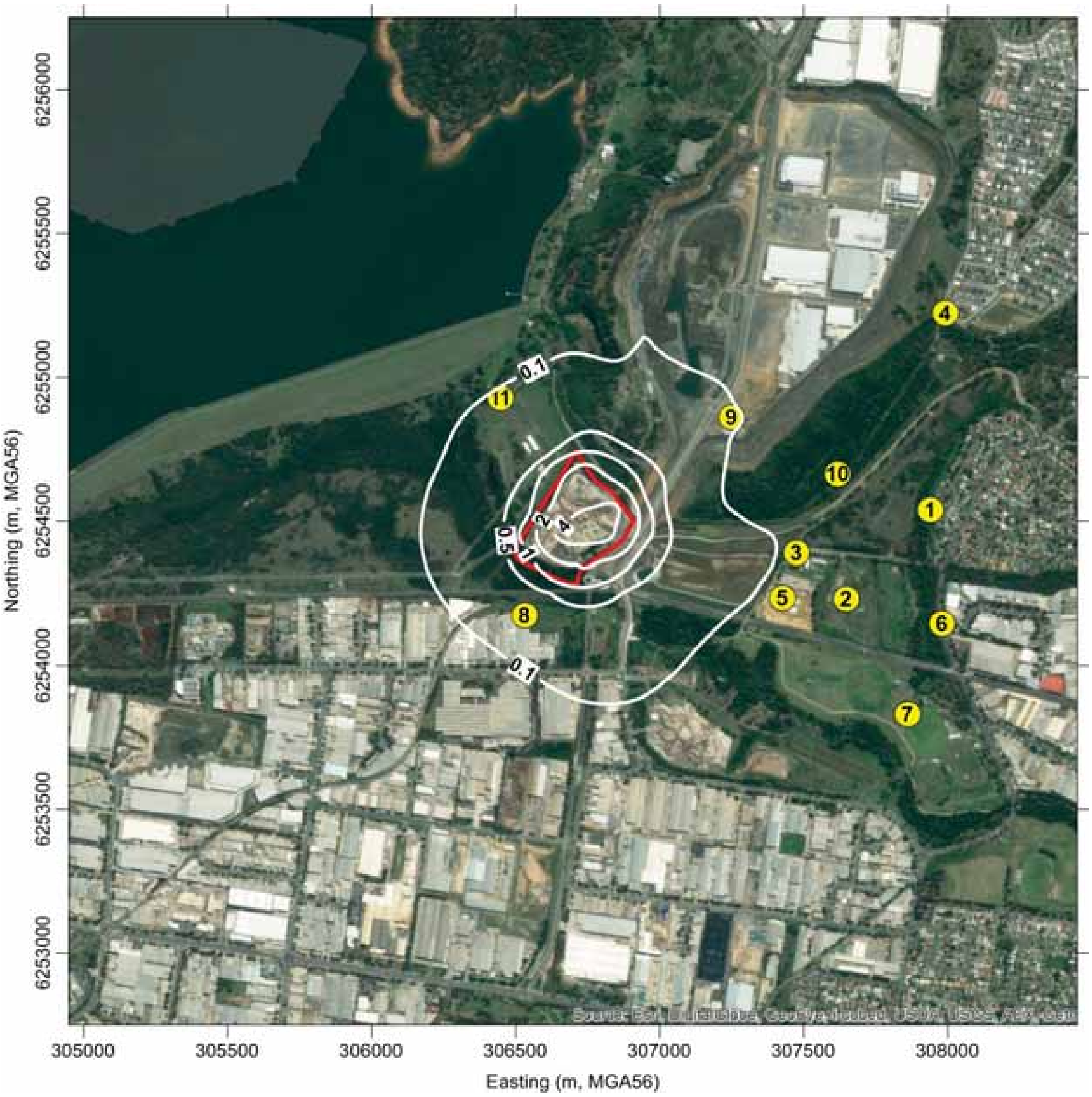

Figure D6 – Predicted Incremental Annual Average Dust Deposition Levels (g/m^2/month) – Scenario 1

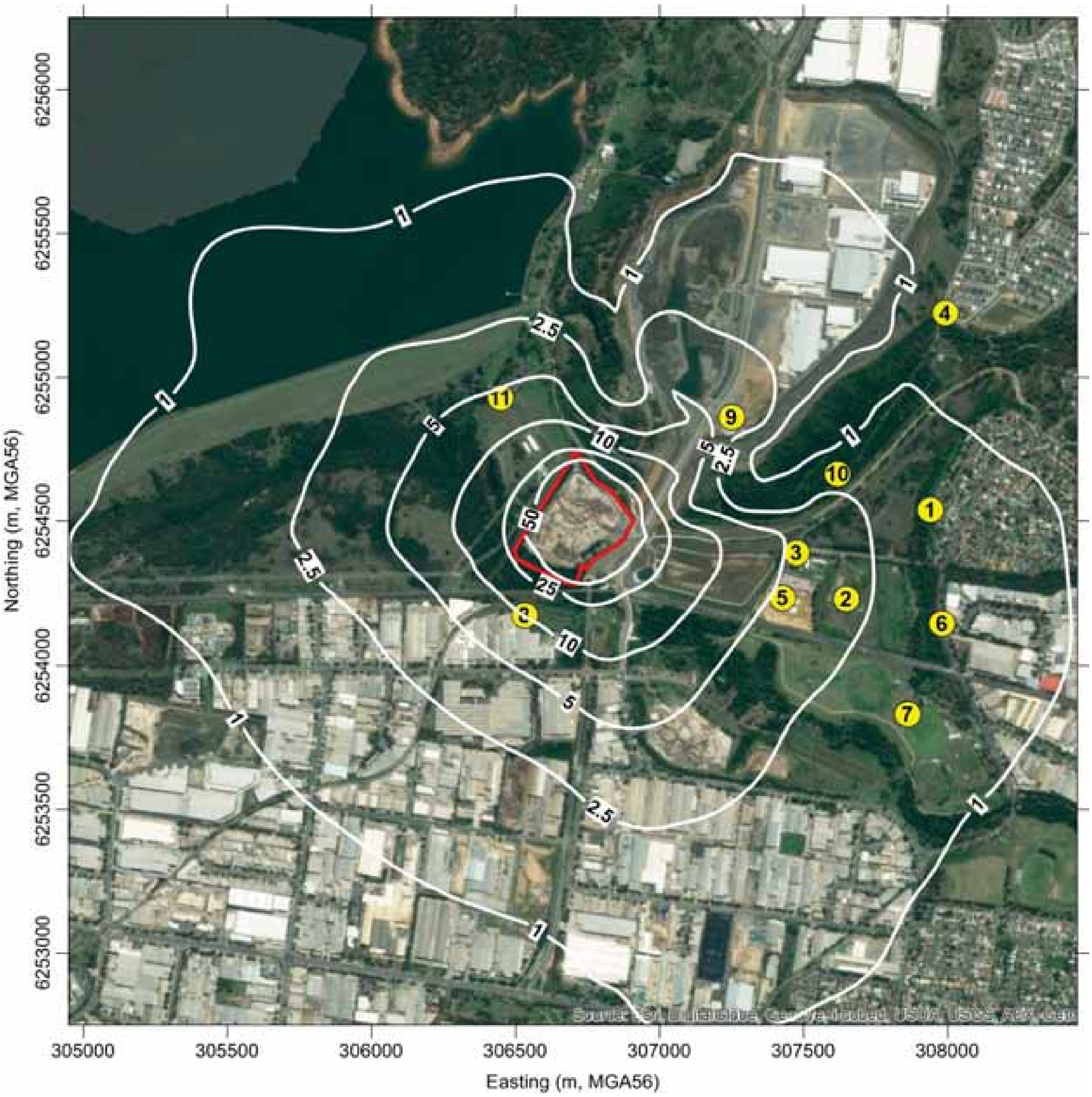

Figure D7 – Predicted Incremental Annual Average TSP Concentrations (µg/m³) – Scenario 2

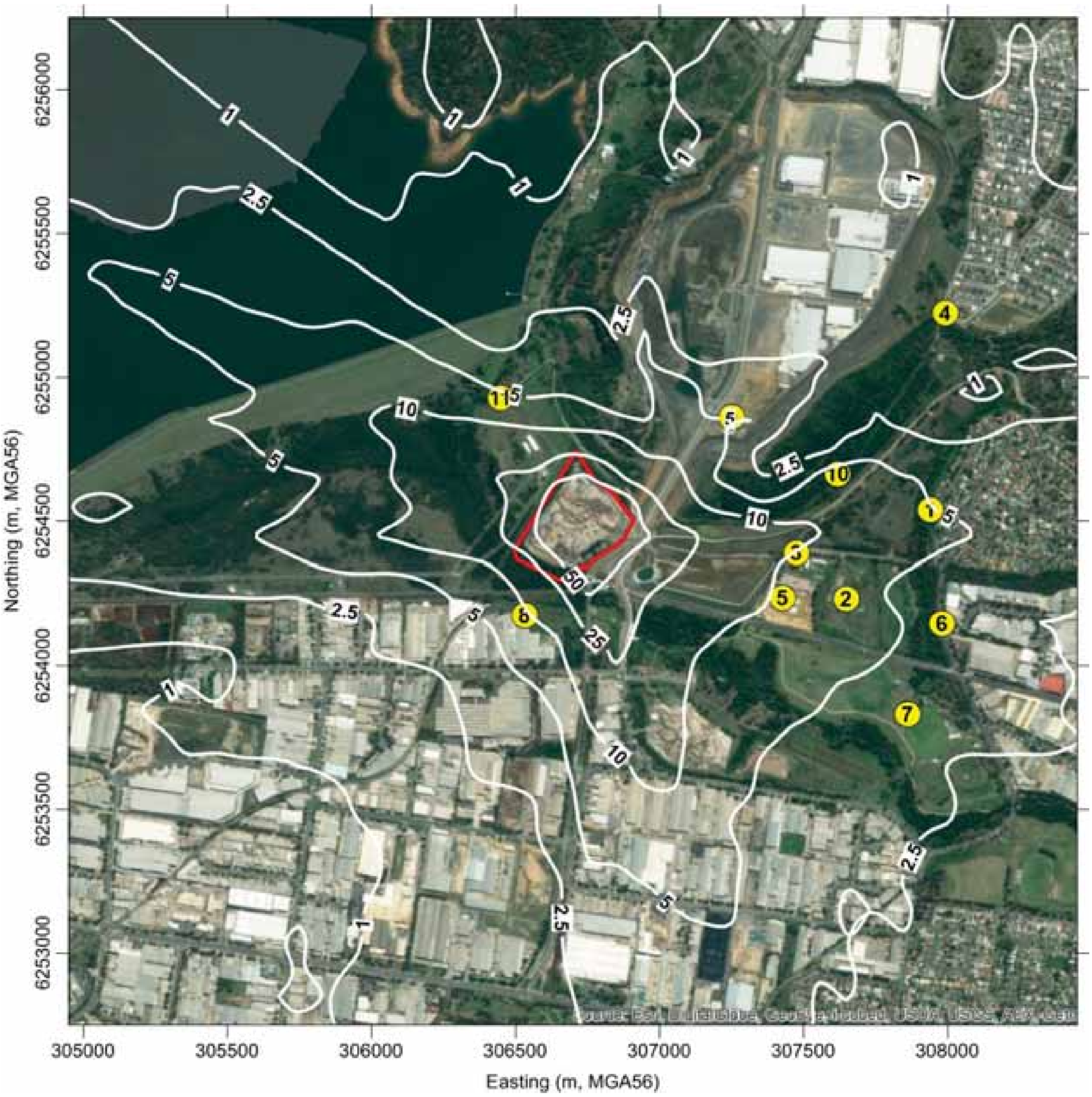

Figure D8 – Predicted Incremental Maximum 24-hour Average PM_{10} Concentrations (µg/m³) – Scenario 2

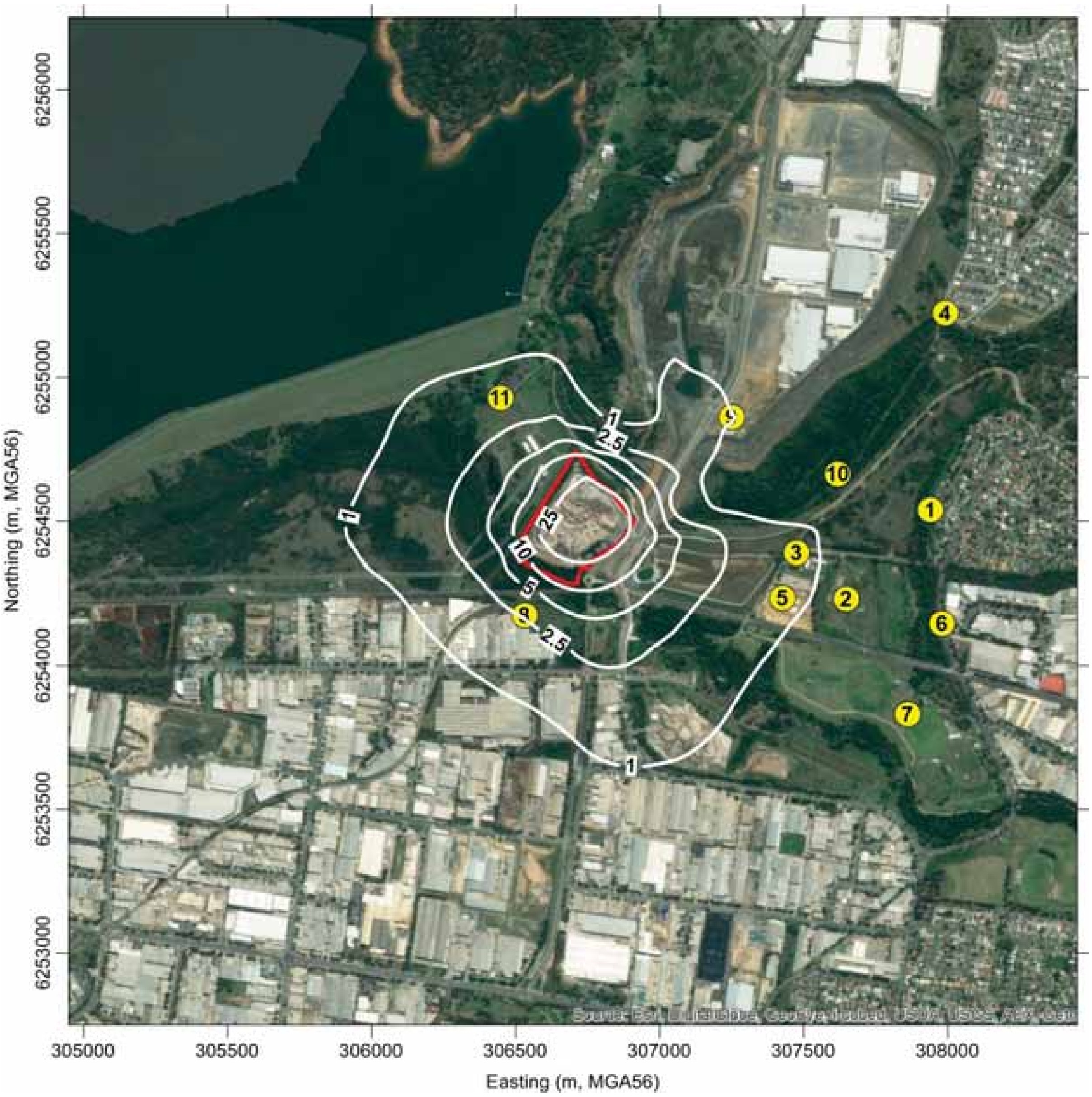

Figure D9 – Predicted Incremental Annual Average PM_{10} Concentrations (µg/m³) – Scenario 2

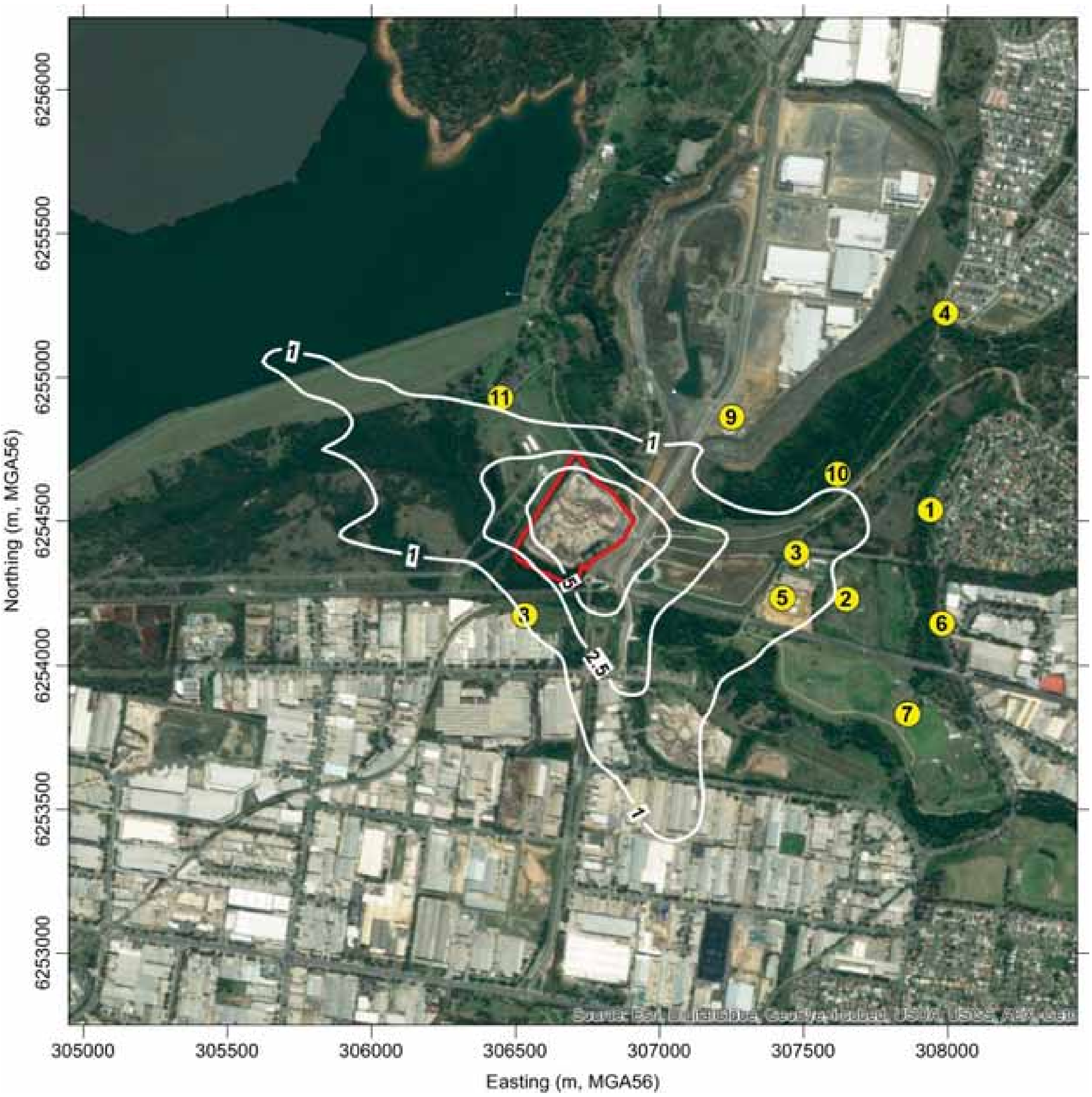

Figure D10 – Predicted Incremental 24-hour Average $PM_{2.5}$ Concentrations (µg/m³) – Scenario 2

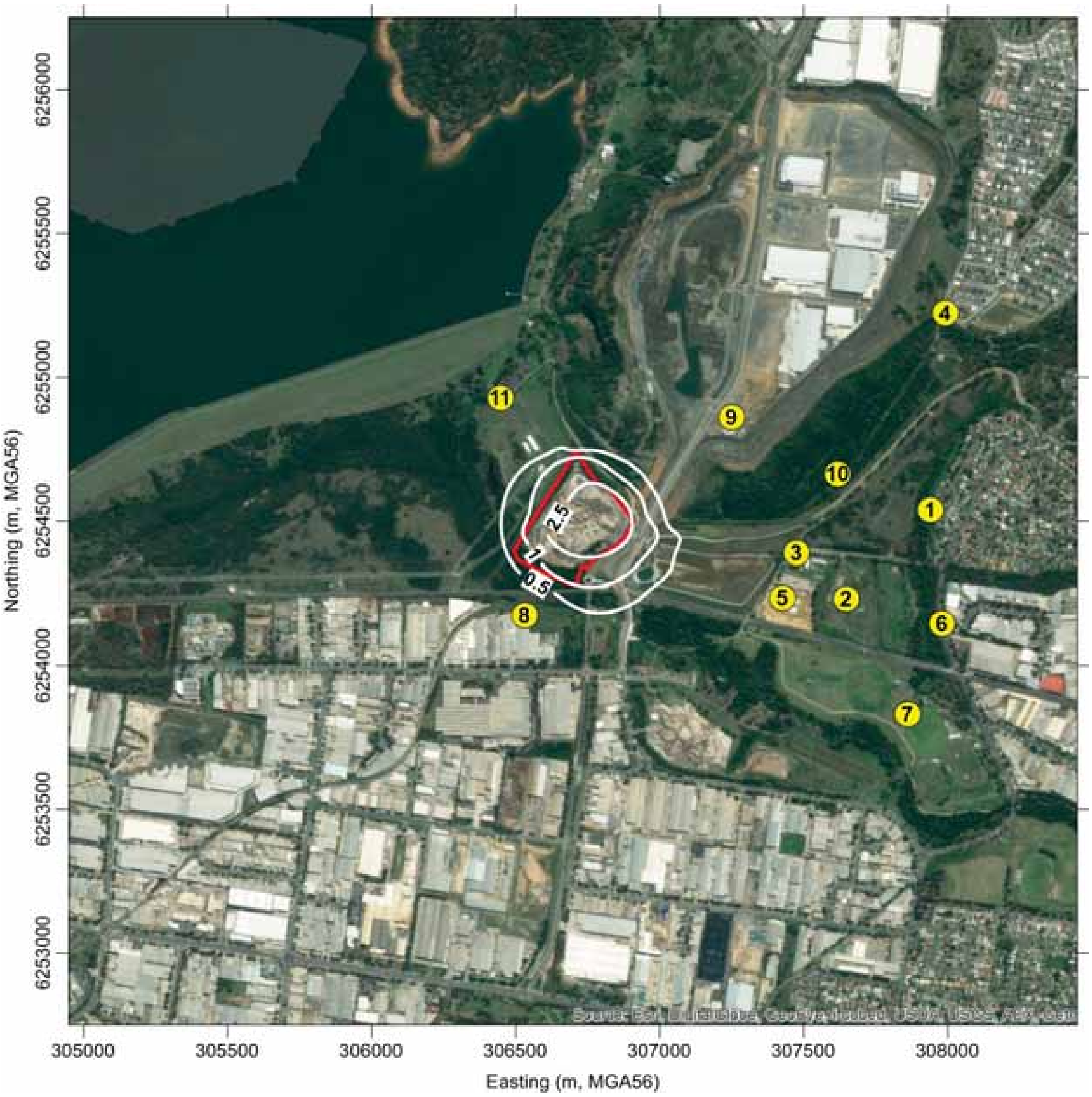

Figure D11 – Predicted Incremental Annual Average $PM_{2.5}$ Concentrations (µg/m³) – Scenario 2

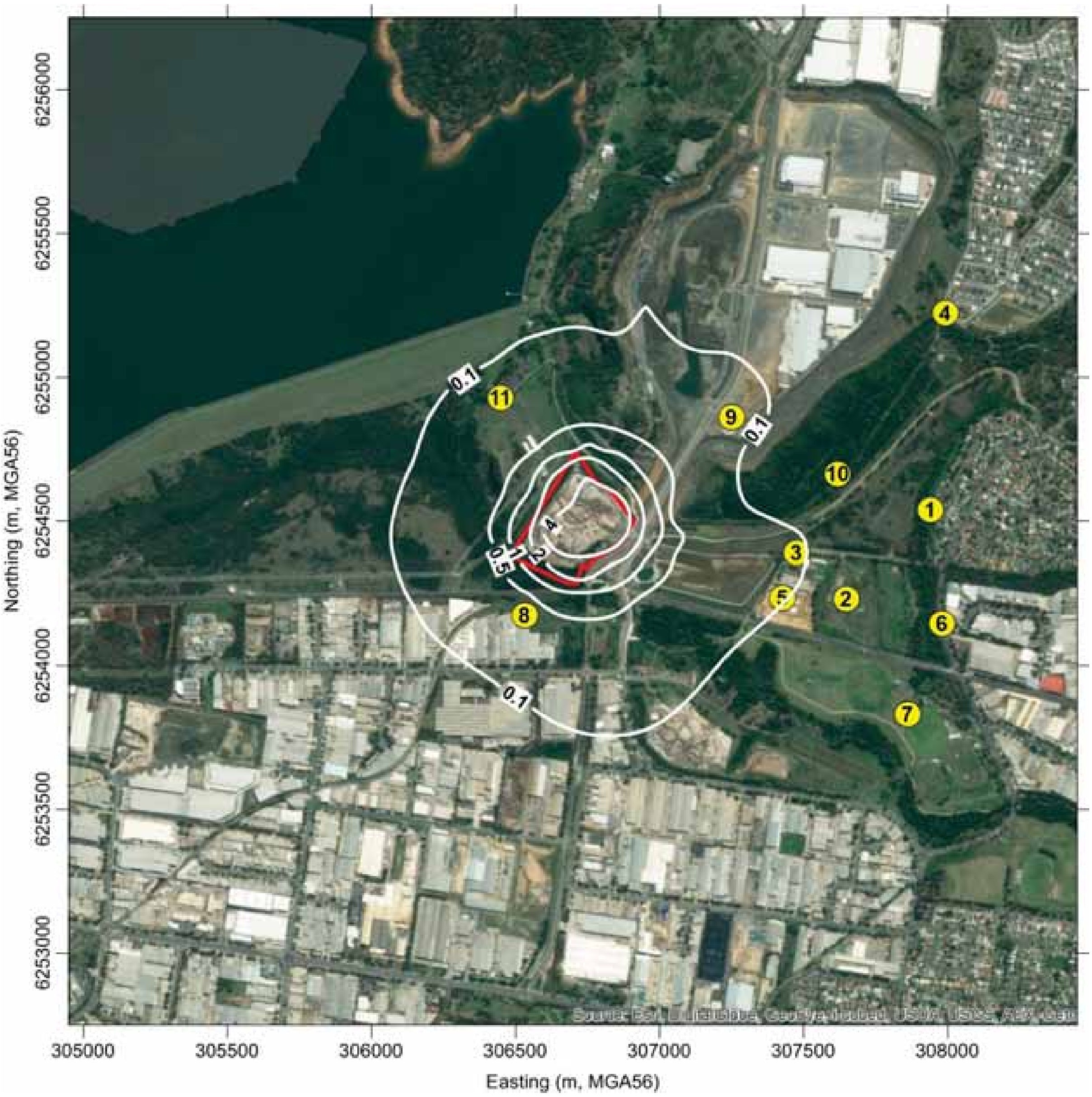

Figure D12 – Predicted Incremental Annual Average Dust Deposition Levels (g/m^2/month) – Scenario 2

Appendix D

Noise assessment

EMM
EMGA Mitchell McLennan

Widemere Recycling Facility

Noise impact assessment

Prepared for Boral Resources (NSW) Pty Ltd | 27 April 2015

Planning + Environment + Acoustics

Widemere Recycling Facility

Noise impact assessment

Prepared for Boral Resources (NSW) Pty Ltd | 27 April 2015

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Widemere Recycling Facility

Final

Report J13127RP1 | Prepared for Boral Resources (NSW) Pty Ltd | 24 April 2015

Approved by	**Najah Ishac**
Position	Director
Signature	
Date	27 April 2015

Document Control

Version	Date	Prepared by	Reviewed by
V1	18 December 2014	O. Muller	N. Ishac
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Executive summary

ES1 Introduction

Boral Recycling Pty Limited (Boral) operates the Widemere Recycling facility (the facility) at Wetherill Park. The facility accepts construction and demolition waste where it separates, crushes and blends it with quarry material to form construction materials. Boral is seeking to modify operations at the facility, including increasing the maximum processing rate from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the proposal).

The assessment considered the following noise-related aspects of the proposed modification:

- operational noise;
- sleep disturbance;
- construction noise;
- road traffic noise; and
- cumulative noise.

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

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

ES2 Operational noise

Noise modelling results presented in this assessment demonstrate that operational noise emissions from the proposed modifications will comply with the relevant criteria at all assessment locations.

The maximum noise levels are expected to satisfy the relevant sleep disturbance criteria at all assessment locations.

ES3 Construction noise

Noise from simultaneous construction and operation will comply with the relevant project specific noise levels (PSNLs) at all assessment locations.

ES4 Cumulative noise

The cumulative noise assessment identified that existing cumulative industrial noise would increase by up to 1 dB(A) at the worst affected receiver locations during the day period at residential assessment locations. Cumulative noise levels including the proposed facility will remain below relevant criteria at industrial and recreational assessment locations.

The proposed facility will increase existing cumulative noise at industrial and recreational receptors, however levels remain below the respective cumulative criteria.

ES5 Road traffic noise

Road traffic noise generated as a result of the proposed modification is expected to satisfy relevant criteria for privately owned assessment locations.

ES6 Conclusion

This assessment demonstrated noise from the proposed changes to the Widemere Recycling facility would satisfy all relevant guidelines.

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Appendices

1 Introduction

EMGA Mitchell McLennan Pty Limited (EMM) has been commissioned by Boral Recycling Pty Limited (Boral) to complete a noise assessment to accompany an environmental impact statement (EIS) and development application under the State Significant Development provisions within Division 4.1 of Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) for operational changes to the Widemere Recycling facility ('the facility').

The facility accepts construction and demolition waste where it separates, crushes and blends it with quarry material to form construction materials. Boral is seeking to modify operations at the facility, including increasing the maximum processing rate from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the proposal). The proposal also includes a minor internal road realignment, import of additional waste materials that are not currently listed on the facility's Environment Protection Licence (EPL), and minor changes to the operating hours of the facility.

The facility is located off Widemere Road, Wetherill Park within the Fairfield local government area (LGA), close to its boundary with the Holroyd LGA. It is located between the employment lands developed in Boral's Greystanes Estate and the Wetherill Park industrial area, one of Sydney's largest industrial precincts (see Figure 1.1).

To the north of the facility is the former Sydney Water Supply Canal and Boral's closed Prospect Quarry which is now used for commercial/light industrial purposes. Prospect Reservoir and its associated buffer area are to the west of the site. To the east of the facility is a large stormwater detention basin and the closest residential receptors are situated approximately 1 km to the east.

This noise assessment has been prepared in accordance with the following policies and guidelines:

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

A number of technical terms are required for the discussion of noise and vibration. These are explained in Appendix A.

EMM

Regional context

Noise Impact Assessment

Figure 1.1

2 Project description

2.1 Background

Approved operations at the facility include the receipt of permitted waste which is sorted, processed and blended on site to produce a range of recycled aggregate and road base products. The facility currently has approval to process 750,000 tpa of material, comprising no more than 600,000 tonnes of permitted waste with the balance being made up of blending material.

Boral is seeking a new development consent for the facility, which includes continuation of operations approved under the current development consent (as modified) for the facility, with the following modifications:

- increase in the maximum processing capacity to 1,000,000 tpa;
- addition of new waste streams to the permitted wastes received by the facility;
- minor changes to the site layout, including realigning the internal haul road (refer to Figure 2.1); and
- change in the operating hours of the facility.

2.2 Site layout

The facility occupies an area of approximately 9.8 hectares (ha), and comprises the following general areas (see Figure 2.1):

- receivals area which includes a weighbridge, spot checking platform, and administration buildings;
- incoming materials stockpile area where incoming vehicles unload waste material;
- processing plant;
- processed materials stockpiles including imported quarry product; and
- water management area (including retention basins).

Minor changes to the general layout of plant and equipment are proposed to accommodate the realignment of the southern haul road. However the overall site layout will remain generally consistent with current operations.

2.3 Deliveries, workforce and operating hours

The proposed increase in processing capacity will increase the number of vehicles travelling to and from the facility to 306 trucks (612 truck movements) per day.

Additionally, up to three full time equivalent employees will be generated by the proposal, with a total of 33 full time equivalent personnel.

Changes to the hours of operation proposed include maintenance activities from 6 am to 6 pm on Sundays and public holidays. Maintenance activities comprise a set of tasks performed post inspection of the plant to repair mobile and fixed plant problems occurring directly from processing of the raw feed. In addition, Boral is seeking approval to operate on up to 12 Sundays per year (one Sunday per month on average).

The hours of operation (receival of waste, product dispatch and processing activities) would be as follows:

- Monday to Saturday 6 am to midnight; and
- Sunday 6 am to 6 pm.

The current and proposed hours of operation are in Table 2.1.

Table 2.1 Current and proposed hours of operation

Current operations	Proposed operations
6 am-10 pm, Monday to Friday	6 am-midnight, Monday to Saturday
6 am-4 pm, Saturday	6 am-6 pm on one Sunday per month, on average
No operations on Sundays or public holidays	Maintenance activities 6 am-6 pm on Sundays and public holidays

2.4 Potential noise impacts

The aspects of the proposed changes with the potential to generate additional noise impacts are:

- the increase in processing capacity;
- construction of the internal haul road; and
- changes to the operating hours of the facility.

T:\Jobs\2013\J13127 - Boral Widemere\GIS\02_Maps\G007_EIS_Site_Layout_20140804_04.mxd 18/12/2014

Site layout

Noise Impact Assessment

Figure 2.1

3 Existing environment

3.1 Ambient noise environment

The facility is located within an existing industrial area that contains a number of noise-generating industries and land uses. The closest existing residential receptors are located approximately 1 km to the east of the facility.

To characterise the ambient noise environment, noise monitoring was undertaken at assessment locations surrounding the facility, representative of nearby sensitive receptors. Table 3.1 and Figure 3.1 present the assessment locations.

Table 3.1 Sensitive receptor locations

Assessment location ID	Address / description	Receptor type	Distance to facility (m)
R1	71 Munro St Greystanes	Residential	1,000
R2	146 Daruga Ave - Nelsons Ridge[1]	Residential	1,320
R3	Industrial area Greystanes	Industrial	1,150
R4	Industrial area - Davis Road	Industrial	220
R5	Southern Employment Lands	Industrial / commercial	300
R6	Hyland Road Youth Centre	Active recreation	590
R7	Gipps Road sporting complex	Active recreation	1,090
R9	Hyland Road Park	Active recreation	790
R10	Greystanes Estate - future high density residential[2]	Future residential	670

Notes: 1. Location identified as a future residence (HLA 2005).

2. Indicative location based on EAR MP 06_0181 (NSW Government 2007).

Location R10 to the north-east of the facility represents the approximate location of potential future residential development, which is zoned for high density residential land use. This is detailed in the NSW *Government's Environmental Assessment Report (EAR) Major Project Assessment – Greystanes Southern Employment Lands (SEL)* (MP06_0181) (July 2007).

3.1.1 Unattended noise monitoring

EMM conducted unattended noise monitoring from 2 to 15 May 2014 at two monitoring locations, L1 (near R1) and L2 (near R2) (see Figure 4.1), to quantify the existing background noise. Measurements were conducted in general accordance with the procedures described in Australian Standard (AS) 1055-1997, Acoustics - Description and Measurement of Environmental Noise and the INP (EPA 2000).

The noise logging was completed using two Acoustic Research Laboratories (ARL) environmental loggers El-215 (S/N 194449 and 16-207-005), and a Svantek 957 sound analyser (S/N 14572). The instruments were calibrated in field with no drift in calibration noted.

In accordance with the INP (EPA 2000) and AS 1055-1997, periods of rainfall and/or wind speed in excess of 5 m/s at the microphone were excluded from the analysis. Meteorological data was sourced from Bureau of Meteorology (BoM) Automatic Weather Station (AWS) 067119 at Horsley Park Equestrian Centre.

The results of unattended monitoring are provided in Table 3.2, with corresponding charts provided in Appendix B. The morning shoulder (6 am to 7 am) background levels (referred to as rating background levels, or RBLs) were determined using the midpoint between day and night RBLs for the monitoring period in accordance with the INP.

Table 3.2 Unattended noise measurement summary

Location	Period[1]	Rating background level $L_{eq(15\text{-}min)}$ (RBL) dB(A)	Measured existing ambient $L_{eq,period}$ noise level dB(A)
L1 (R1) - Greystanes [2]	Day	43	52
	Evening	42	49
	Night	39	47
	Morning shoulder	41[3]	51
L2 (R2)- Pemulwuy	Day	37	47
	Evening	37	44
	Night	35	44
	Morning shoulder	36[3]	-

Notes: *1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night is the remaining periods. Morning shoulder is the period 6 am to 7 am for the purposes of this assessment.*

2. Measurement ceased after 10 May 2014 due to battery failure. However, in accordance with the INP, at least seven days of suitable data was collected.

3. Morning shoulder (6 am to 7 am) rating background levels (RBLs) calculated as midpoint between day and night time RBLs in accordance with the INP.

Unattended monitoring was also conducted at a third location (L3) representative of the future residential location (R10), however data collected during the day and evening periods was found to be affected by noise from existing operations at the facility. Data collected during the night period was validated against that of L1 to the east of the facility and this data was found to be representative of the background noise environment in the vicinity of assessment location R10. As a result, background data from L1 was used to determine criteria at this location.

The measured (2014) data was compared against historic background data reported by Heggies as part of a previous assessment for the facility in 2005 (HLA Envirosciences 2005). Background noise levels in the vicinity of the facility were found to be generally unchanged and relatively consistent with this assessment at L1 (Greystanes).

3.1.2 Attended noise monitoring

EMM reviewed the historic data from the 2005 assessment (HLA Envirosciences 2005). Historic data included 15 minute measurements collected on 25 September 2003 at Munroe Street (assessment location L1) and the Southern Greystanes Estate (R10). The review identified that the subject facility is generally inaudible at the assessment locations.

The attended monitoring surveys for this assessment identified that the noise environment is influenced by distant traffic, insects and birds, and is typical of a suburban environment, with noise from nearby unrelated industrial operations also audible.

Table 3.3 Attended noise measurement summary

Location	Date	Start time	L_{eq}	L_{90}	L_{max}	Comments
Munroe St Greystanes (L1)(R1)	25/9/03	11:35	54	51	61	Traffic noise, dogs, construction and jackhammer noise, noise from Youth Centre.
Southern Greystanes Estate (R10)	25/9/03	13:15	47	43	67	Excavator tracking from construction activities, birds.

Source: Heggies (2005) for HLA Envirosciences (2005).

A comparison of historical data against data collected by EMM (2014) indicates that the acoustic environment in the vicinity of the facility remains consistent with historical observations, with levels more elevated in the vicinity of the future residential assessment location (R10) as a result of recent commercial and industrial development within the Greystanes Estate Southern Employment Lands.

3.2 Prevailing meteorological conditions

The INP provides procedures for identifying and combining prevailing meteorological conditions at a site (referred to as a 'feature' of the area) and assessing the noise levels against the relevant criteria. The INP defines a feature wind (3 m/s or lower speed) condition to be one that occurs for 30% of the time or more for a given season, period (day, evening, night) and direction.

During wind and temperature gradient conditions (eg temperature inversions), noise levels at receivers may increase or decrease compared with noise during calm conditions. This change is due to refraction caused by the varying speed of sound with increasing height above ground. The noise level received increases when the wind blows from source to receivers or under temperature inversion conditions. Conversely, the noise level decreases when the wind blows from receivers to source or under temperature lapse conditions.

3.2.1 Modelled meteorological conditions

For the purpose of this assessment, a simple (or 'maximum impact') approach has been adopted in accordance with section 5 of the INP. This approach assumes that source to receptor winds are a feature for the subject area, where the source to receptor wind would occur for more than 30% of the time in any period in any season.

The INP default inversion parameter has been adopted (F class inversion).

The INP states that a default wind drainage value should be applied where sources are at a higher altitude than the receptors with no intervening topography. Due to the presence of intervening topography to the east between the facility and potentially affected residences, and the reduced elevations to the south and south-west, it is considered that any drainage winds would be channelled south and south-west, away from sensitive receptors. Therefore, drainage winds have not been adopted in this assessment.

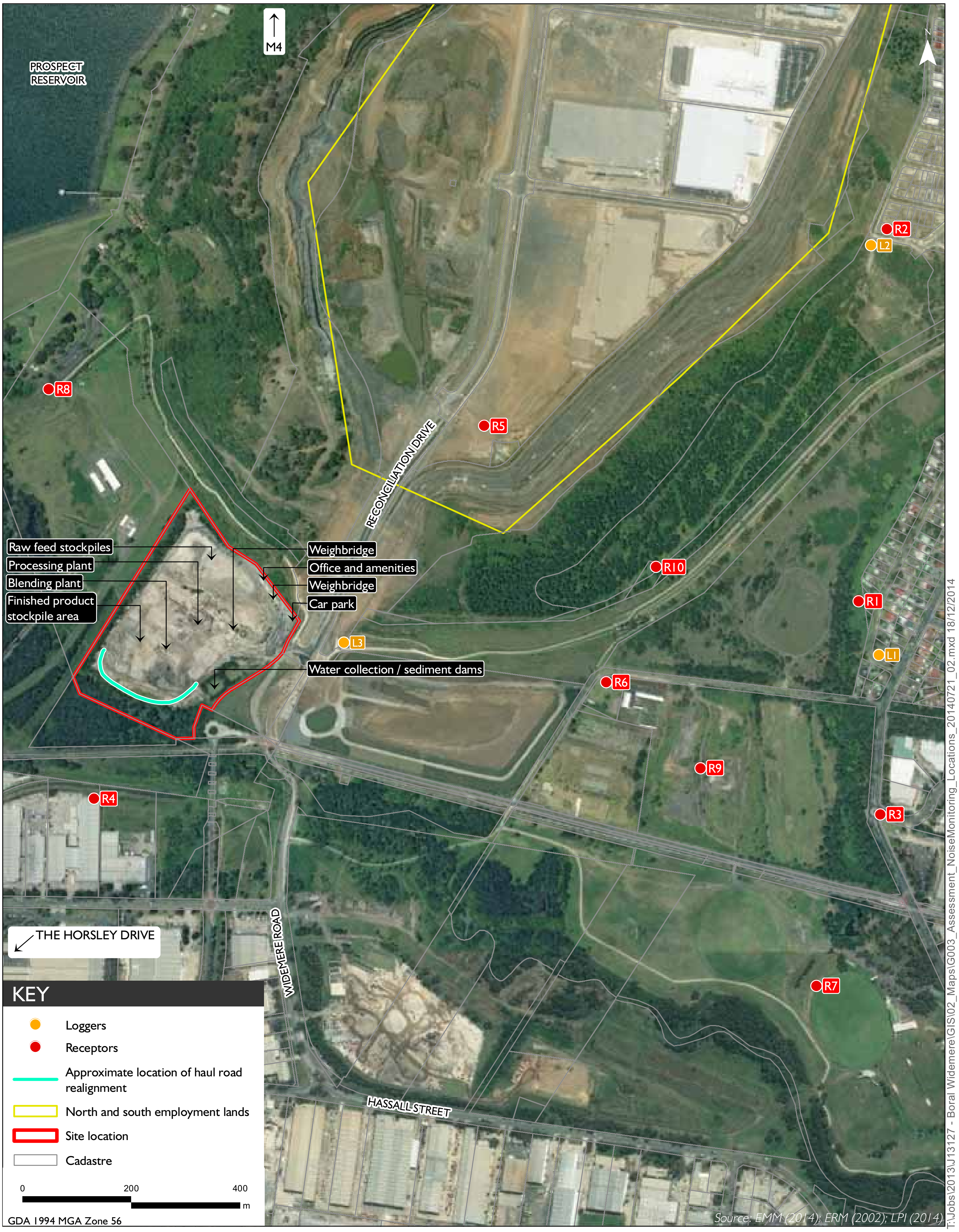
The meteorological conditions adopted in the modelling for this assessment are presented in Table 3.4.

Table 3.4 Modelled meteorological conditions

Period	Calm	Maximum impact winds (3 m/s source to receptor)	Inversion (F class)[1]
Day	✓	✓	n/a
Evening	✓	✓	n/a
Night	✓	✓	✓
Morning shoulder	✓	✓	✓

Notes: 1.Inversion conditions only applicable to night time and morning shoulder periods.

The noise predictions adopting the meteorological conditions presented in Table 3.4 reflect the maximum worst case levels from the facility. The predicted noise levels should therefore be considered conservative.



EMM

Assessment locations and noise monitoring locations

Noise Impact Assessment

Figure 3.1

4 Noise criteria

4.1 Operational noise

Industrial sites in NSW are regulated by the Department of Planning and Environment (DP&E) and the NSW EPA and usually have a licence and/or approval conditions stipulating noise limits. These limits are operational noise criteria applied at sensitive receptors derived in accordance with the INP methodology or are noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation. Noise from current operations at the facility is regulated by the facility's environment protection licence (EPL), which specifies operational noise limits.

The INP (EPA 2000) has been adopted for this assessment. With respect to the criteria, the policy states:

> '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.'

Assessment criteria depend on the existing amenity of areas potentially affected by a proposed development. Assessment criteria for sensitive receptors near industry are based on the following objectives:

- protection of the community from excessive intrusive noise; and
- preservation of amenity for specific land uses.

To ensure these objectives are met, the EPA provides two separate criteria: intrusiveness criteria and amenity criteria. A fundamental difference between the intrusiveness and the amenity criteria is the period they relate to:

- intrusiveness criteria — apply over 15 minutes in any period; and
- amenity criteria — apply to the entire assessment period (day, evening or night).

The facility will operate during all assessment periods, with limited operations during night time periods.

4.1.1 Intrusiveness

The intrusiveness criteria require that $L_{eq(15\text{-}min)}$ noise levels from a newly introduced source during the day, evening and/or night do not exceed the RBL by more than 5 dB. This is expressed as:

$L_{eq(15\text{-}min)} \leq RBL + 5$

Where $L_{eq(15\text{-}min)}$ is the L_{eq} noise level from the source (ie site), measured over a 15 minute period. Where the noise contains annoying characteristics (eg tonal, low frequency etc), adjustments as per the INP apply to the level of noise produced by the source.

Table 4.1 presents the base intrusive criteria for the site. The derivation of morning shoulder RBLs is presented in Section 3.1.1.

Table 4.1 Base intrusive criteria

Location[2]	Period[1]	RBL, dB(A)	Intrusive criteria dB(A), $L_{eq(15\text{-}min)}$
R1, R10 (L1)	Day	43	48
	Evening	42	47
	Night	39	44
	Morning shoulder	41	46
R2 (L2)	Day	37	42
	Evening	37	42
	Night	35	40
	Morning shoulder	36	41

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; morning shoulder: 6 am to 7 am; night is the remaining periods.

2. Receptors R3 to R9 have not been included as part of the intrusive assessment. Non residential receptors are assessed using amenity criteria which are discussed in the following section.

4.1.2 Amenity

Amenity assessments are based on noise criteria specific to the land use. The criteria relate only to industrial noise and exclude offsite road or rail noise.

Residential receptors potentially affected by the facility are classified by the suburban amenity category (EPA 2000). The base corresponding amenity criteria, or acceptable noise levels (ANLs), for all assessment locations are given in Table 4.2.

Table 4.2 Base amenity criteria

Receptor	Indicative area	Time period	Recommended noise level dB(A), $L_{eq,period}$	
			Acceptable	Maximum
Residential	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
Active recreation	All	When in use	55	60
Industrial	All	When in use	70	75

Source: INP (EPA 2000).

Where measured existing industrial noise approaches base amenity criteria, it needs to be demonstrated that noise from new industries will not significantly contribute to existing ambient industrial noise. This is achieved by the application of modifications to the ANLs from Table 4.2. These modifications from Table 2.2 of the INP are presented in Table 4.3 and are applicable to the project.

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

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

Notes: 1. ANL = recommended acceptable L_{eq} noise level for the specific receiver, area and time of day from Table 4.2.

4.1.3 Project specific noise levels

In accordance with the INP application notes, where operations occur for only a part of an assessment period, PSNLs are determined for that operational period only. Specifically, the INP application notes state that 'existing industrial noise should be used in conjunction with the appropriate ANL to establish the applicable amenity criteria'. Table 4.4 presents a summary of proposed site operations over a typical 24 hour period.

Table 4.4 Summary of proposed site operations

Period	Operations	Deliveries	Product processing (loader only)
Day	✓	✓	✓
Evening	✓	✓	✓
Night	-	✓	✓[1]
Morning shoulder	✓	✓	✓

Notes: 1. Product processing during night time period occurs from 10 pm to midnight only, with deliveries occurring throughout the entire night period.

In this instance, the facility will comprise of full operations and all plant operating during the day, evening and morning shoulder (6 am to 7 am) periods. Deliveries will occur until midnight, with product processing (loader only) from 10 pm to midnight (night). Therefore, these operations have been assessed against the night assessment period.

To account for full operations for the morning shoulder period, analysis of the existing hourly industrial contribution has been determined for the morning shoulder period and used as a basis for establishing the morning shoulder amenity criteria in accordance with the INP application notes.

The project-specific noise level (PSNL) is the stricter of the calculated intrusive or amenity criteria. The PSNLs for all periods are highlighted in Table 4.5. The existing level of industrial noise at residential assessment locations was estimated from unattended logger data, and it was generally assumed average total L_{eq} noise captured by the logger was attributable to industrial sources. The residential assessment locations are located in close proximity to industrial estates and this method provides a conservative assessment of existing industrial noise levels. Existing industrial noise contributions at most recreational areas (east of the site) were conservatively assumed to be the same level as at R10 (ie 52 dB(A)). The exception is R8 which is located west of the site and further removed from industrial sites. For this and other non residential assessment locations, existing industrial noise contributions is estimated at less than 6 dB below ANLs. To that end, it is noted that industrial land uses are not sensitive receptors to noise.

It is also important to note that the subject site, being an existing operation, should not be unreasonably penalised compared to other existing industrial sites by virtue of the adjusted amenity criteria (which requires the existing operations to excluded). It is more equitable in such situations to demonstrate the ANL can be achieved with all industrial sites, and where it cannot be met, define the subject site's contribution as a percentage of total (other) industrial noise to understand its significance in the area. Furthermore, chapter 10 of the INP addresses 'applying the policy to existing industrial premises'.

Table 4.5 Project specific noise levels

Location	Period[1]	RBL, dB(A)	Intrusive criteria dB(A), $L_{eq(15\text{-}min)}$ (RBL+5)	Estimated existing industrial noise contribution dB(A), $L_{eq,period}$	Site specific amenity criteria dB(A), $L_{eq,period}$
R1. 71 Munro St Greystanes	Day	43	**48**	52	52[2]
	Evening	42	47	49	**39**[2]
	Night	39	44	47	**37**[2]
	Morning shoulder	41	46	51[3]	**41**[2]
R2. 146 Daruga Ave - Nelsons Ridge	Day	37	**42**	47	55
	Evening	37	42	44	**39**[2]
	Night	35	40	42	**32**[2]
	Morning shoulder	36	41	47[3]	**37**[2]
R3. Industrial area Greystanes	When in use	N/A	N/A	<64	**70**
R4. Industrial area - Davis Road	When in use	N/A	N/A	<64	**70**
R5. Southern Employment Lands	When in use	N/A	N/A	<64	**70**
R6. Hyland Road Youth Centre	When in use	N/A	N/A	**52**	**52**
R7. Gipps Road sporting complex	When in use	N/A	N/A	**52**	**52**

Table 4.5 Project specific noise levels

Location	Period[1]	RBL, dB(A)	Intrusive criteria dB(A), $L_{eq(15\text{-min})}$ (RBL+5)	Estimated existing industrial noise contribution dB(A), $L_{eq,period}$	Site specific amenity criteria dB(A), $L_{eq,period}$
R8. Lower Prospect Canal Reserve	When in use	N/A	N/A	<49	**55**
R9. Hyland Road Park	When in use	N/A	N/A	52	**52**
R10. Proposed high density residential	Day	43	**48**	52	52[2]
	Evening	42	47	49	**39**[2]
	Night	39	44	47	**37**[2]
	Morning shoulder	41	46	51[3]	**41**[2]

Note: *1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night is the remaining periods. Morning shoulder is the period 6 am to 7 am for the purposes of this assessment.*

2. Modification for existing industrial noise applied in accordance with section 2.2 of INP (EPA 2000) presented in Table 4.2.

3. Industrial contribution for morning shoulder period is log average of 32 and 40 lots of 15-min samples of logger 1 and logger 2 respectively.

4.2 Sleep disturbance criteria

The facility will operate during the night time and morning shoulder periods from 10 pm to 7 am and therefore requires an assessment of sleep disturbance in accordance with the INP (EPA 2000).

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 steady-state sources, such as engine noise from mobile plant and other pit equipment. However impact noise from sources such as a front end loader (FEL) loading trucks is intermittent (rather than continuous) in nature and, as such, needs to be assessed using the L_1 or L_{max} noise metrics.

Intermittent noise has the potential to disturb the sleep of nearby residents. The EPA provides guidance on assessing sleep disturbance for industrial sites. The EPA nominates that a screening criteria of background noise level (L_{90}) plus 15 dB shall apply to maximum noise level events from the site. The maximum noise events are to be calculated at one metre from the bedroom facade at the nearest residential properties. Where noise levels have been calculated above the screening criteria, additional analysis should be undertaken, referencing guidance on maximum noise levels and sleep disturbance listed in the RNP (EPA 2011).

The RNP states:

- maximum internal noise levels below 50 to 55 dB(A) are unlikely to wake sleeping occupants; and
- one or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to significantly affect the health and wellbeing of occupants.

It is commonly accepted by acoustic practitioners and regulatory bodies that a partially open window will reduce external noise levels by 10 dB(A). Therefore, external noise levels in the order of 60-65 dB(A) calculated at the facade of a residence are unlikely to cause sleep disturbance affects at worst case (ie with windows open). Similarly, the World Health Organisation (WHO 1999) suggest that levels below 45 dB(A) inside homes are unlikely to wake sleeping occupants.

If noise levels over the screening criteria were identified, more detailed analysis is required. This would consider factors such as the frequency and time of the events (between 10 pm and 7 am).

Table 4.6 provides the sleep disturbance criteria for residential receptors. In accordance with the RNP, sleep disturbance has been assessed in terms of night time period RBLs. The descriptors L_{max} and L_1 may be considered interchangeably which is accepted by EPA.

Table 4.6 Sleep disturbance criteria – residential receptors (night period)

Receptor	Night period RBL (dB(A))	Sleep disturbance criteria dB(A), L_{max} Night period (10 pm to 7 am)
R1, R10	39	54
R2	35	50

4.3 Construction noise criteria

Construction activities will be limited to the realignment of the southern internal road. Activities will be completed over a period of approximately five working days. Construction activities will occur concurrently with operational activities and will therefore be assessed against operational noise criteria as per contemporary assessment methodology.

For reference purposes, the ICNG (DECCW 2009) provides the following definition of standard construction hours for activities where the noise is audible at residential premises:

- Monday to Friday 7 am - 6 pm;
- Saturday 8 am - 1 pm; and
- No construction work is to take place on Sundays or public holidays.

Based on information provided by Boral, the construction activities will be completed Monday to Friday from 6 am to 6 pm. The corresponding criteria for out of hours construction activities (for the period 6 am to 7 am) would be identical to the operational criteria for this period.

4.4 Cumulative noise criteria

To limit continuing increases in industrial noise within a particular area, ambient industrial noise should not exceed the levels specified in Table 2.1 of the INP. There are multiple existing industrial sources surrounding the facility, including the Greystanes Estate SEL to the north and various commercial and industrial land uses to the south. The noise contribution of these sources has been estimated from the unattended monitoring data (refer to Section 3.1.1).

The relevant cumulative noise criteria are reproduced in Table 4.7.

Table 4.7 Cumulative noise criteria

Receptor	Indicative area	Time period[1]	Recommended noise level dB(A), $L_{eq,period}$	
			Acceptable	Maximum
Residential	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
Active recreation	All	When in use	55	60
Industrial	All	When in use	70	75

Source: INP (EPA 2000).

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night is the remaining periods.

4.5 Road noise criteria

The principle guidance for assessing the impact of road traffic noise on receptors is the RNP (EPA 2011). Road trucks will be used to transport material to and from the site via Widemere Road (southbound) and Reconciliation Road (northbound). No residential dwellings are located adjacent to the northbound route. The nearest potentially affected residences located along the southbound route are situated in Hassall Street and Gipps Road.

Hassall Street and Gipps Road are classified as arterial and sub-arterial roads in accordance with the RNP. Table 4.8 presents the road noise assessment criteria reproduced from Table 3 of the RNP.

Table 4.8 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.	$L_{eq(15\text{-}hr)}$ 60 (external)	$L_{eq(9\text{-}hr)}$ 55 (external)

Source: RNP (EPA 2011).

Additionally, the RNP (EPA 2011) 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.

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receptors must be considered. Receptors experiencing increases in total traffic noise levels above those presented in Table 4.9 should be considered for mitigation.

Table 4.9 Relative increase criteria for residential land uses

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

4.6 Vibration criteria

No significant vibration generating equipment items have been identified from the proposal. Also, buffer distances would mitigate potential ground vibration generated by plant and equipment. To that end, existing sensitive receivers (eg residences) are located over 1 km to the east of the site (ie Munro Street Greystanes), with possible future residences of Nelsons Ridge approximately 700 m from site. Plant and equipment at the site will not generate ground vibration levels perceptible at such distances. For example, crushing and screening plant include isolation mounts to reduce vibration transmitted to surrounding structures and to the ground. Other large plant include front end loaders, excavators and road trucks which are not major sources of vibration that could be perceptible off site.

Notwithstanding, the following vibration criteria are provided for reference.

4.6.1 Human comfort – Assessing vibration a technical guideline

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

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

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the guideline provides examples of the three vibration types and has been reproduced in Table 4.10.

Table 4.10 Examples of types of vibration (from Table 2.1 of the guideline)

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

i Continuous vibration

Appendix C of the guideline outlines acceptable criteria for human exposure to continuous vibration (1-80Hz). The criteria are dependent on both the time of activity (usually daytime or night-time) and the occupied place being assessed. Table 4.11 reproduces the preferred and maximum criteria relating to measured peak velocity.

Table 4.11 Criteria for exposure to continuous vibration

Place	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Critical working Areas (e.g. hospital operating theatres, precision laboratories)	Day or night-time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night-time	0.20	0.40
Offices	Day or night-time	0.56	1.1
Workshops	Day or night-time	1.1	2.2

Notes: *1. RMS velocity (mm/s) and vibration velocity value (dB re 10^{-9} mm/s).*

2. Values given for most critical frequency >8 Hz assuming sinusoidal motion.

ii Intermittent vibration

Intermittent vibration (as defined in *Section 2.1* of the guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time.

Intermittent vibration is representative of activities such as impact hammering, rolling or general excavation work (such as an excavator tracking).

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

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

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

The acceptable VDV for intermittent vibration are reproduced in Table 4.12.

Table 4.12 Acceptable vibration dose values for intermittent vibration

Location	Daytime		Night-time	
	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$
Critical Areas	0.10	0.20	0.10	0.20
Residences	0.20	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: 1. Daytime is 7 am to 10 pm and night-time is 10 pm to 7 am.

2. These criteria are indicative only, and there may be a need to assess intermittent values against continuous or impulsive criteria for critical areas.

There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Adverse comment or complaints may be expected if vibration values approach the maximum values. The Guideline states that activities should be designed to meet the preferred values where an area is not already exposed to vibration.

4.6.2 Structural vibration criteria – DIN4150

For structural vibration, measurements should be assessed at the foundation of a building structure. In the absence of a relevant Australian Standard, the German Standard *DIN 4150 - Part 3: 1999* provides the strictest guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally recognised to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, or maximum levels measured in (x) or (y) horizontal directions, in the plane of the uppermost floor), are summarised in Table 4.13 and shown graphically in Figure 4.1 in the case of foundation levels. For residential and commercial type structures, the standard recommends safe limits as low as 5 mm/s and 20 mm/s respectively. These limits increase with frequency values above 10 Hz. The operational frequency of construction plant typically ranges between 10 Hz to 30 Hz, and hence according to DIN4150, the safe vibration criteria range for dwellings is 5 to 15 mm/s. For reinforced commercial type buildings the limit is as low as 20 mm/s, while for heritage or sensitive structures the lower limit is 3 mm/s.

Table 4.13 Structural damage guideline values of vibration velocity – DIN4150

Line*	Type of Structure	Vibration velocity in mm/s			
		At foundation at a frequency of			Plane of floor of uppermost storey
		1Hz to 10Hz	10Hz to 50 Hz	50Hz to 100Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design.	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use.	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order).	3	3 to 8	8 to 10	8

Notes: *1. " Line* " refers to curves in Figure 1 of DIN4150.*
2. For frequencies above 100Hz the higher values in the 50Hz to 100Hz column should be used.

These levels are safe limits, for which damage due to vibration effects is unlikely to occur. Damage is defined in DIN 4150 to include even minor non-structural effects such as superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls.

Should such damage be observed without vibration levels exceeding the "safe limits" then it is likely to be attributable to other causes. DIN 4150 also states that when vibration levels higher than the "safe limits" are present, it does not necessarily follow that damage will occur.

As indicated by the criteria in Figure 4.1, high frequency vibration has less potential to cause damage than lower frequencies. Furthermore, the point source nature of vibration from plant causes the vibratory disturbances to arrive at different parts of nearby large structures in an out-of-phase manner, thereby reducing its potential to excite in-phase motion of the low order modes of vibration in such structures.

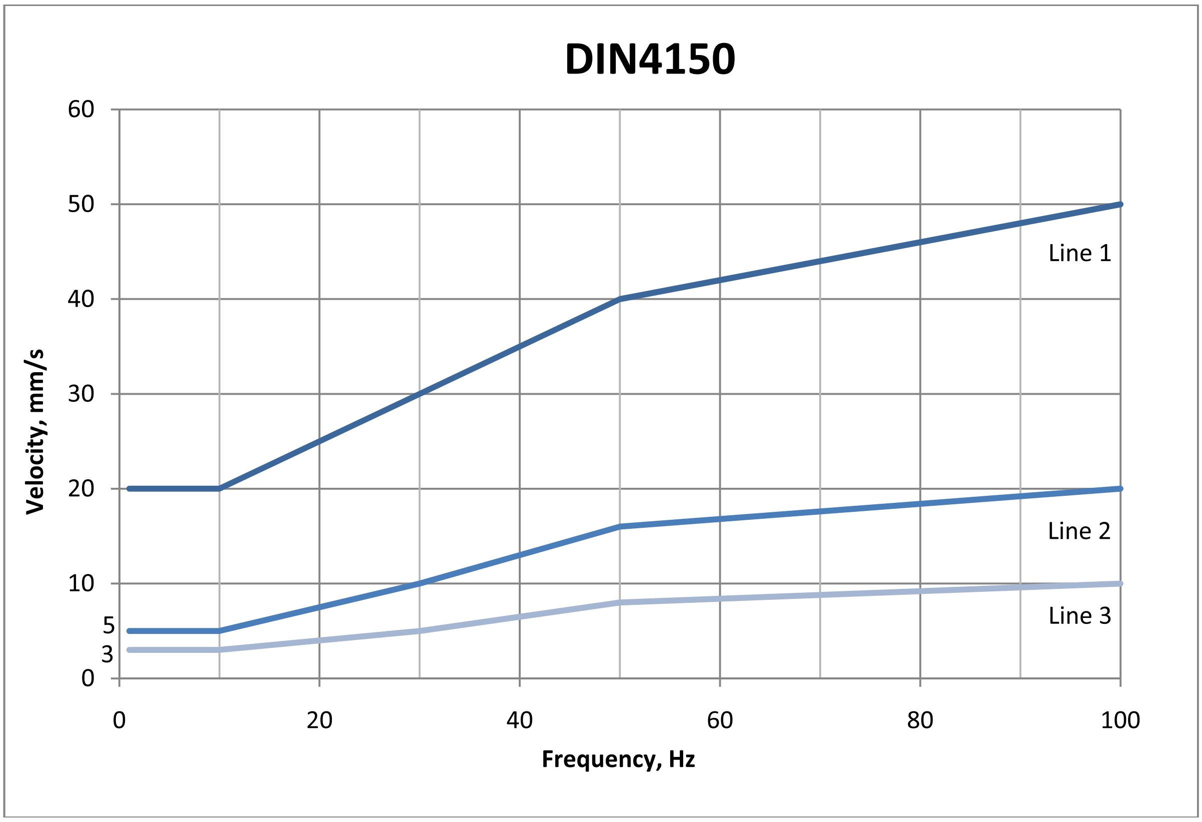


Figure 4.1 DIN4150 Structural vibration safe limits for buildings

5 Noise modelling methodology and parameters

5.1 Introduction

This section presents the methods and base parameters used to model noise emissions from the facility, including the effect of worst case meteorological conditions.

Noise modelling was based on three-dimensional digitised ground contours of the surrounding topography, the internal site layout, buildings and stockpile areas at the facility. The equipment was placed at representative locations and heights, representing realistic operating scenarios for the facility based on data provided by Boral.

Noise predictions were carried out using Brüel and Kjær Predictor Version 8.14 noise prediction software. 'Predictor' calculates total noise levels at receivers from the concurrent operation of multiple noise sources. The model considers factors such as:

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

5.2 Operational noise

The site plans used to determine plant location and operating parameters (such as equipment utilisation) were supplied by Boral. These represent indicative delivery and despatch operations at the facility. The noise model was configured to predict the total L_{eq} noise levels from the facility's operations. Noise emissions from all sources that contribute to the total noise level from the proposed facility operations were assessed. The noise model incorporates bunds and stockpiles as included in site plans provided by Boral.

The model has assumed simultaneous operation of all plant and equipment. In practice, such operating scenarios would only occur on occasion, therefore the noise predictions are considered to be conservative.

The modelling was completed for daytime, evening, night and morning shoulder periods for maximum impact meteorological scenarios presented in Table 3.4.

5.2.1 Noise sources

Table 5.1 summarises the operational noise sources and associated indicative sound power levels for the facility. Appendix C provides indicative plant make and model details, and total single octave sound power levels obtained from EMM's database of measurements. To that end, each source's spectra was reviewed against the INP's tonal test and shown to pass. Similarly, the INP's low frequency test (applied at source) shows most sources pass, with the exception of the blending plant. However, this source has comparatively significantly lower emission levels than other sources (eg crushers and screens). The total spectra of all plant together passes both the tonal and low frequency INP tests and hence no penalty is applicable.

Figure 3.1 shows the location of modelled plant and equipment. Corrections have been applied to the 980H loader to account for partial utilisation during the night time period (10 pm to midnight).

Table 5.1 Indicative operations plant and equipment sound power levels

Item	Number	Lw, $L_{eq(15\text{-}min)}$, dB(A)	Operational period			
			Day	Evening	Night	Morning shoulder
980H Loader	1	108	✓	✓	✓	✓
980H Loader	2	108	✓	✓	-	✓
972 Loader	1	110	✓	-	-	✓
Telehandler	1	106	✓	✓	-	✓
Powerscreen	1	111	✓	-	-	✓
Excavator 227	1	105	✓	✓	-	✓
Excavator 226	1	105	✓	✓	-	✓
Freightliner	1	115	✓	-	-	✓
Jaw crusher	1	116	✓	✓	-	✓
Impact crusher	1	112	✓	✓	-	✓
Primary screen	1	115	✓	✓	-	✓
Secondary screen	1	111	✓	✓	-	✓
Screen 3	1	107	✓	✓	-	✓
Blending plant (Stab Plant)	1	105	✓	-	-	✓
Trucks (empty)	(refer to Table 5.2)	105	✓	✓	✓	✓
Trucks (full)	(refer to Table 5.2)	95	✓	✓	✓	✓

Notes: 1. Traffic movements on site are classified as operational sources.

A summary of truck movements to and from the facility is presented in Table 5.2, based on the traffic impact assessment undertaken for the proposal by EMM. Additionally, it is anticipated that approximately 25 trucks will be onsite in any one hour during the day period (6 am to 6 pm), with three trucks present during any hour during the evening and night period (6 pm to 6 am).

Table 5.2 Future facility traffic movements – typical (average) day

Activity	Truck movements	Percentage (%)
Imports	364 (182 trucks)	59
Exports	248 (124 trucks)	41
Total	612 (306 trucks)	100

Note: Traffic movements on site are classified as operational sources.

5.3 Sleep disturbance assessment

People asleep in their homes may be disturbed by intermittent on site noises, such as reversing alarms or heavy vehicles. Typical noise levels from the loudest of these events are presented in Table 5.3. Levels were obtained from measurements undertaken by EMM on similar projects.

Table 5.3 Maximum noise from intermittent sources

Noise source	Measured L_{max} noise level, dB(A)
Road truck trailer impact	120
Reverse alarm	105–115 (with maximum modifying factor adjustment)

Table 5.3 indicates that the highest maximum noise levels received would likely result from road truck trailer impacts. The maximum (at source) sound power level of these is typically 120 dB(A) L_{max}. Maximum noise levels at each residential assessment location were calculated assuming worst case meteorological conditions (ie 3 m/s source to receptor winds). Where sleep disturbance noise levels are below relevant criteria for worst case conditions, levels would comply for all other meteorological conditions. The assessment is representative of the night period of 10 pm to 7 am.

Predicted L_{max} noise levels were based on the worst case plant locations during operations. Predictions were based on a single event, rather than the simultaneous operation of a number of plant items, due to of the low probability of more than one maximum noise event occurring concurrently.

5.4 Construction noise assessment

The construction fleet modelled for this assessment is presented in Table 5.4. This fleet was provided by Boral, with sound power levels obtained from EMM's database of measurements. Construction plant was modelled in conjunction with the operational noise fleet to reflect simultaneous construction and operational noise.

The construction assessment was completed adopting maximum impact meteorological conditions (ie 3 m/s source to receptor winds). Where construction noise levels are below relevant criteria for these conditions, levels would comply for all other meteorological conditions. This assessment was completed for daytime and morning shoulder periods (6 am to 6 pm).

Table 5.4 Indicative construction plant and equipment sound power levels

Item	Number	Lw, $L_{eq(15\text{-}min)}$, dB(A)
Grader	1	104
Front-end loader	1	116
Bobcat	1	100
Asphalt paver	1	119
Roller	1	114

5.5 Cumulative noise assessment

The cumulative assessment was completed in accordance with the INP, and considered the $L_{eq(period)}$ noise levels from existing industrial noise sources and the modelled worst case impacts from the facility.

Cumulative impacts were assessed based on estimated existing industrial noise levels (refer to Section 3.1.1) and the worst case model predictions for each assessment location. The impacts were assessed with reference to relevant amenity criteria in the INP (see Table 4.7).

6 Noise impact assessment results

6.1 Operational noise modelling results

The predicted noise levels for the facility for day, evening, night and morning shoulder operations for the modelled meteorological conditions are presented in Table 6.1. Predicted $L_{eq(15\text{-}min)}$ noise levels have been assessed against the PSNLs (refer to Table 4.5). Predictions assessed against $L_{eq,period}$ criteria should be considered conservative as the criteria apply over the entire assessment period as opposed to the modelled 15-minute period.

It should be noted that only the maximum prevailing wind is presented for any period. Where predicted noise levels are below relevant criteria for these conditions, levels would comply for all other meteorological conditions.

The modelling results show that noise emissions are predicted to be below the PSNLs at all assessment locations for all periods.

Figures 6.1 presents the overall maximum impact noise contours for maximum winds to the residential assessment locations during the daytime period.

Table 6.1 Predicted facility operational noise levels $L_{eq(15\text{-}min)}$, dB(A)

Assessment location	Period[1]	Calm[2]	Maximum impact winds (3 m/s)[3]	Inversion[4,5]	PSNL
R1 (L1)	Day	37	39	n/a	48 $L_{eq(15\text{-}min)}$
	Evening	35	38	n/a	39 $L_{eq,period}$
	Night	<30	<30	<30	37 $L_{eq,period}$
	Morning shoulder	37	39	39	41 $L_{eq,period}$
R2 (L2)	Day	32	35	n/a	42 $L_{eq(15\text{-}min)}$
	Evening	31	34	n/a	39 $L_{eq,period}$
	Night	<30	<30	<30	32 $L_{eq,period}$
	Morning shoulder	32	35	35	37 $L_{eq,period}$
R3	Day	37	40	n/a	70 $L_{eq,period}$
	Evening	35	38	n/a	70 $L_{eq,period}$
	Night	<30	<30	<30	70 $L_{eq,period}$
	Morning shoulder	37	40	40	70 $L_{eq,period}$
R4	Day	51	54	n/a	70 $L_{eq,period}$
	Evening	49	51	n/a	70 $L_{eq,period}$
	Night	<30	31	31	70 $L_{eq,period}$
	Morning shoulder	51	54	54	70 $L_{eq,period}$
R5	Day	42	45	n/a	70 $L_{eq,period}$
	Evening	40	43	n/a	70 $L_{eq,period}$
	Night	<30	<30	<30	70 $L_{eq,period}$
	Morning shoulder	42	45	45	70 $L_{eq,period}$

Table 6.1 Predicted facility operational noise levels $L_{eq(15\text{-}min)}$, dB(A)

Assessment location	Period[1]	Calm[2]	Maximum impact winds (3 m/s)[3]	Inversion[4,5]	PSNL
R6	Day	42	45	n/a	52 $L_{eq,period}$
	Evening	41	44	n/a	52 $L_{eq,period}$
	Night	<30	<30	<30	52 $L_{eq,period}$
	Morning shoulder	42	45	45	52 $L_{eq,period}$
R7	Day	37	40	n/a	52 $L_{eq,period}$
	Evening	35	38	n/a	52 $L_{eq,period}$
	Night	<30	<30	<30	52 $L_{eq,period}$
	Morning shoulder	37	40	40	52 $L_{eq,period}$
R8	Day	48	51	n/a	55 $L_{eq,period}$
	Evening	47	50	n/a	55 $L_{eq,period}$
	Night	<30	31	<30	55 $L_{eq,period}$
	Morning shoulder	48	51	51	55 $L_{eq,period}$
R9	Day	40	43	n/a	52 $L_{eq,period}$
	Evening	38	41	n/a	52 $L_{eq,period}$
	Night	<30	<30	31	52 $L_{eq,period}$
	Morning shoulder	40	43	43	52 $L_{eq,period}$
R10 (L1)	Day	36	39	n/a	48 $L_{eq(15\text{-}min)}$
	Evening	34	37	n/a	39 $L_{eq,period}$
	Night	<30	<30	<30	37 $L_{eq,period}$
	Morning shoulder	36	39	39	41 $L_{eq,period}$

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; morning shoulder: 6 am to 7 am; night is the remaining periods.

2. Calm: no winds or temperature gradient (refer to section 3.2.1).

3. Max prevailing wind: maximum prevailing winds noise level predicted at each assessment location.

4. Inversion: F class inversion.

5. Inversion conditions occur during night and morning shoulder periods only.

6.2 Sleep disturbance assessment

The predicted L_{max} noise levels associated with the facility at the nearest residential assessment locations are presented in Table 6.2 for maximum impact meteorological conditions. Predictions have been made for the night time (10 pm to 6 am) period in accordance with the INP (EPA 2000).

Noise modelling demonstrates that L_{max} noise levels associated with the site would be below the relevant sleep disturbance criteria at all residential assessment locations for all meteorological conditions.

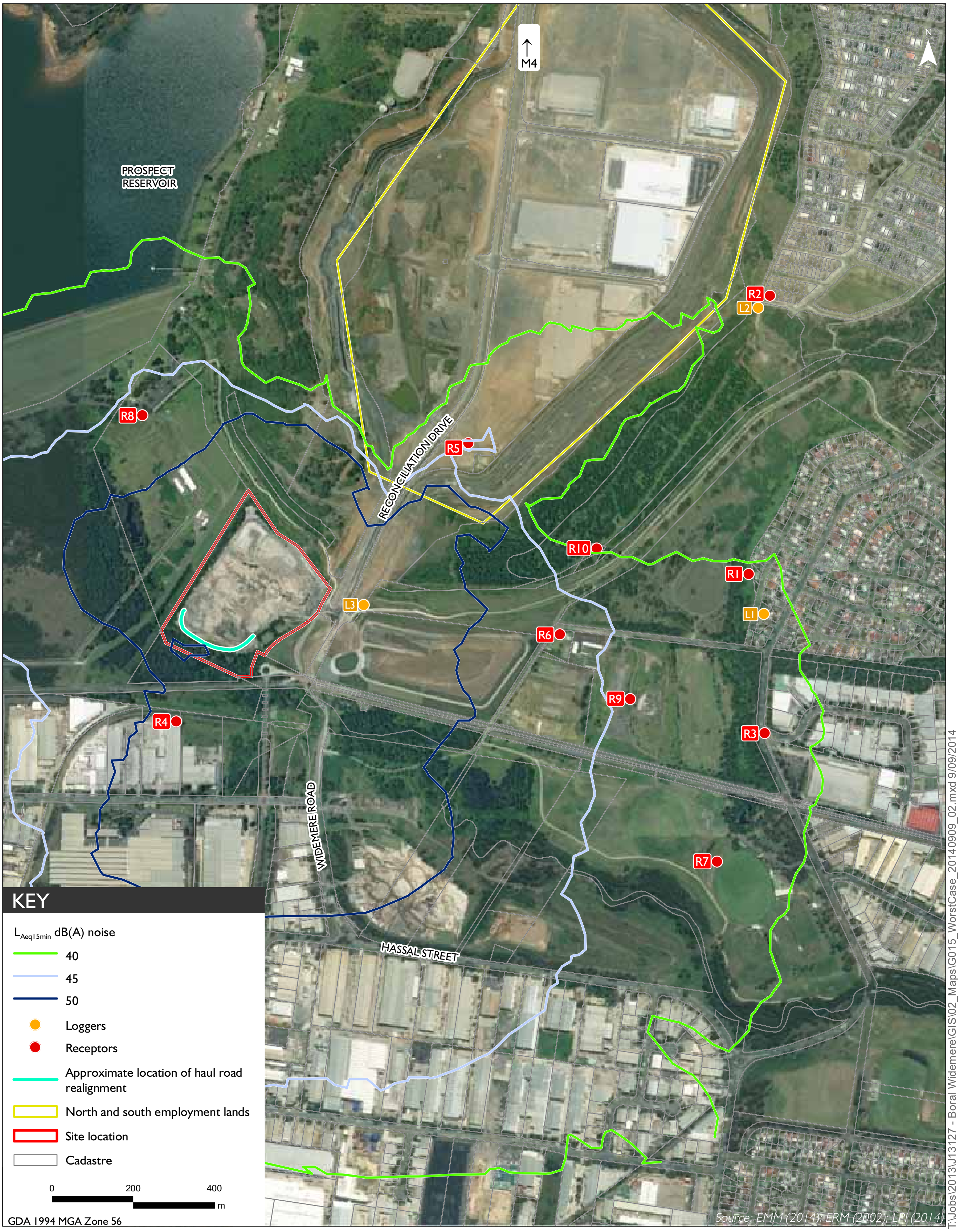
Table 6.2 Predicted L_{max} noise levels at residential assessment locations- night, dB(A)

Assessment location	Calm[1]	Max prevailing wind[2]	Inversion[3]	L_{max} criteria
R1	35	38	38	54
R2	24	27	27	50
R10	33	36	36	54

Notes: 1. Calm: no winds or temperature gradient (refer to section 3.2.1).

2. Max prevailing wind: maximum prevailing winds noise level at each assessment location.

3. Inversion: F class inversion.



EMM

Maximum impact winds to residential receptors

Noise Assessment

Figure 6.1

6.3 Construction noise assessment

Noise associated with the construction activities has been assessed against operational criteria (ie background + 5 dB(A)) since construction will coincide with operational activities. The noise model was configured to predict the total L_{eq} noise levels from all construction activities in conjunction with operational site noise. It is anticipated that construction will be limited to five days and only to realignment of the southern haul road.

Noise modelling demonstrates that construction noise levels associated with the facility would be below the relevant construction noise criteria at all residential assessment locations during worst case meteorological conditions.

Table 6.3 Predicted construction noise levels, dB(A)

Assessment location	Predicted noise levels		Criteria
	Calm[1]	Max prevailing wind[2]	
R1	40	43	48
R2	37	40	42
R3	40	43	70
R4	56	58	70
R5	45	48	70
R6	45	48	55
R7	40	43	55
R8	51	53	55
R9	43	46	55
R10	42	44	48

Notes: *1. Calm: no winds or temperature gradient (refer to section 3.2.1).*

2. Max prevailing wind: maximum prevailing winds noise level at each assessment location.

3. Operational criteria adopted as construction simultaneous with operational noise.

6.4 Cumulative noise assessment

Cumulative noise predictions have been completed based on modelled worst case noise levels from the facility in conjunction with estimated existing industrial noise (refer to section 3.1.1). The highest measurements for day, evening and night periods have been compared to worst case model predictions to provide a conservative estimate of cumulative noise levels.

The $L_{eq,period}$ level is derived by applying a correction factor of -3 dB(A) to modelled $L_{eq(15\text{-}min)}$ intrusive noise levels; this is a commonly accepted approach by acoustic practitioners and is considered conservative in EMM's experience. This correction factor has been applied to day and evening period predictions only, while night time predictions have been modelled to account for operating durations discussed in Section 6.1. Table 6.4 presents the results of the cumulative noise assessment at residential assessment locations. It should be noted that the existing industrial noise contribution excludes the subject site.

Table 6.4 Predicted cumulative noise levels at residential assessment locations during worst case conditions $L_{eq(period)}$, dB(A)

Assessment location	Period[1]	Measured existing industrial contribution dB(A)	Modelled worst case facility contribution dB(A)	Future total cumulative contribution dB(A)	Cumulative criteria, dB(A)
		$L_{eq,period}$	$L_{eq,period}$	$L_{eq,period}$	$L_{eq,period}$
R1 (L1)	Day	45	36	46	55
	Evening	45	35	45	45
	Night	**42**	<30	**42**	40
R2 (L2)	Day	41	32	42	55
	Evening	41	31	41	45
	Night	38	<30	38	40
R10 (L1)	Day	45	36	46	55
	Evening	45	34	45	45
	Night	**42**	<30	**42**	40

The cumulative noise result comparison identifies that the proposed facility's predicted noise contribution will have negligible impacts at residences. Levels are predicted to increase by up to 1 dB(A) from 'existing' (without site) cumulative industrial noise at assessment locations R1, R2 and R10 for day period only. It is noted that existing industrial noise levels exceed the night time cumulative noise residential criteria at R1 and R10, however these levels are unaffected by the facility's operations.

Table 6.5 presents the results of the cumulative noise assessment at non-residential assessment locations. Criteria for these assessment locations apply when in use, and existing industrial contributions were estimated at either less than 6 dB below ANLs (R3 to R5 and R8) or 52 dB(A) based on R10 as discussed in Section 4.1.3. As for Table 6.4, estimated 'existing' industrial contribution excludes the current site operations.

Table 6.5 Predicted cumulative noise levels at non-residential assessment locations during worst case conditions $L_{eq(period)}$, dB(A)

Assessment location	Period[1]	Estimated existing industrial contribution dB(A)	Modelled worst case facility contribution dB(A)	Future total cumulative contribution dB(A)	Cumulative criteria, dB(A)
		$L_{eq,period}$	$L_{eq,period}$	$L_{eq,period}$	$L_{eq,period}$
R3	When in use	<64	37	<64	70
R4	When in use	<64	51	<64	70
R5	When in use	<64	42	<64	70
R6	When in use	52	42	52	55
R7	When in use	52	37	52	55
R8	When in use	<49	48	<52	55
R9	When in use	52	40	52	55

Cumulative noise levels at industrial and recreational assessment locations including the proposed facility will remain below the relevant criteria.

6.5 Road traffic noise

6.5.1 Operational road traffic noise

Traffic travelling to and from the facility travels northbound on Reconciliation Drive via the M4 Motorway, Prospect Highway and Great Western Highway, and southbound on Reconciliation Drive via Hassall Street and Gipps Road to the Horsley Drive and Cumberland Highway. It is noted there are no residential assessment locations along the northbound route. The nearest potentially affected residences are located on Hassall Street (south of Reconciliation Drive) along the southbound route.

The US Environment Protection Agency's method was used to predict the L_{eq} noise levels from traffic travelling along Hassall Street at adjacent residences. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively low traffic flows are encountered.

The assessment was completed based on data for operational traffic movements. Estimates of existing and future traffic noise levels were made using traffic volumes from the traffic impact assessment for the proposal (EMM 2014). Based on this report for movements south of Reconciliation Drive (in the direction of Hassall Road), the existing daily traffic volumes are in the order of 8,350 movements per day, which is consistent with the findings of a historical traffic assessment for the facility (*Construction Materials Recycling Facility EIS* (ERM 2002)). These volumes include the current site-related traffic volumes. The traffic impact assessment noted that the split of facility-related truck movements was in the order of 70% northbound and 30% southbound, with light vehicle movements in the order of 70% southbound and 30% northbound. A summary of site-related truck volumes is presented in Table 6.6.

Table 6.6 Average daily truck volumes

Truck movements	Current operations			Proposed operations			Increase
	Imported waste	Exported product	Total	Imported waste	Exported product	Total	
Average trucks/day	124	110	234	182	124	306	**72**
Average movements/day	248	220	468	364	248	612	**144**

Traffic noise calculations are presented in Table 6.7 for the closest residences on Hassall Road, which are set back approximately 15 m from the road. For the purpose of this assessment traffic volumes distributions of 85% and 15% have been assumed over the day and night time assessment periods, which is industry-accepted practice.

Table 6.7 Road traffic noise levels at residences on Hassall Road

Distance to nearest privately owned residences (m)	Calculated existing traffic noise	Calculated additional site traffic noise	Combined (existing + site) traffic noise	Assessment criteria	Difference (existing and combined)
Day[1] $L_{eq(15\text{-}hr)}$, dB(A)					
15	69.0	50.0	69	60	<1.0
Night $L_{eq(9\text{-}hr)}$, dB(A)					
15	63.0	50.0	63	55	<1.0

Notes: 1. Day period: 7 am to 10 pm, night period: 10 pm to 7 am as per the RNP (2011).

2. Distances were measured to the nearest identified residential dwellings via Google Earth.

The results in Table 6.7 demonstrate that road traffic noise increases associated with the proposal will be negligible (less than 1 dB). Existing traffic noise exceeds criteria at the nearest residences on Hassall Road. Given this, the RNP requires that future traffic noise levels satisfy the allowable increase criteria of not more than 2dB. This is achieved.

6.5.2 Construction road traffic noise

A review of construction road traffic noise has been completed for the asphalt laying which will occur over one day only. All other construction resources will be sourced onsite and will not generate offsite traffic movements.

A total of ten staff will be required for asphalt laying which will be negligible compared to existing traffic levels, therefore construction road traffic has not been considered further.

7 Conclusion

EMM has completed a noise assessment for the proposal, which comprises a production capacity increase at the facility.

Based on the modelling results, the noise emissions from the proposed modification would satisfy the PSNLs at all assessment locations.

Potential sleep disturbance impacts from operational maximum noise level events have been assessed and are expected to satisfy the relevant criteria at all assessment locations.

The cumulative noise assessment identified that the facility contributes to total industrial noise by up to 1 dB at the most affected residential assessment locations during the day period. It is noted that existing industrial noise levels exceed the night time cumulative noise criteria, however these levels are unaffected by the proposed facility operations. Cumulative noise levels including the proposed facility will remain below relevant criteria at industrial and recreational assessment locations.

The road traffic noise associated with the Widemere Recycling facility's operations is expected to comply with relevant RNP criteria. Construction road traffic noise impacts were considered to be negligible due to the short duration and relatively minimal requirement for external materials during the construction phase.

References

HLA August 2005, *Statement of Environmental Effects to support Modification Application, Boral Recycling, Widemere Road Wetherill Park NSW.*

ERM 2002, *Construction Materials Recycling Facility Environment Impact Statement.*

NSW Department of Environment and Climate Change (DECC) 2009 *Interim Construction Noise Guideline*.

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

NSW Environmental Protection Authority (EPA) 2011, *Road Noise Policy*.

NSW Government's Environmental Assessment Report (EAR) *Major Project Assessment – Greystanes Southern Employment Lands* (MP06_0181)(July 2007).

Appendix A

Glossary of acoustic terms

Table A.1 Glossary of acoustic terms

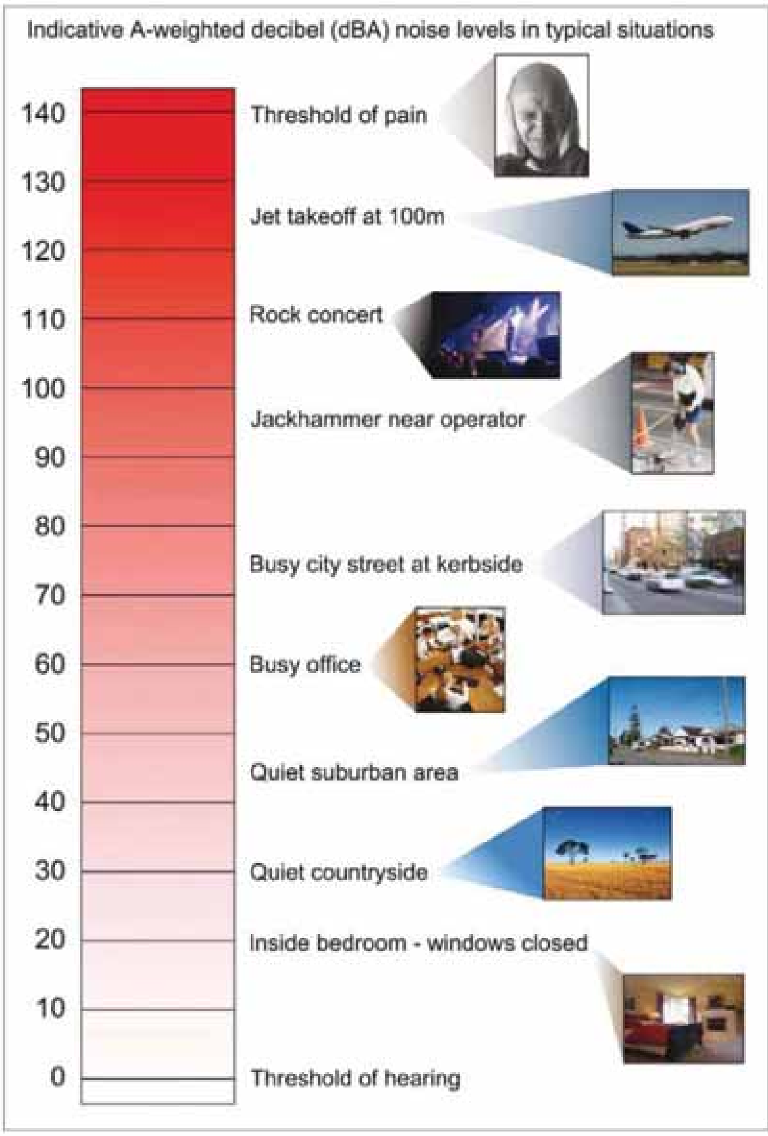
Term	Description
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{90} statistical noise levels.
dB(A)	Noise is measured in units called decibels (dB). 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.
EP&A Act	*Environmental and Planning Assessment Act 1979* (NSW)
ICNG	Interim Construction Noise Guideline.
INP	Industrial Noise Policy.
L_1	The noise level exceeded for 1% of the time.
L_{10}	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{eq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The $L_{eq(15min)}$ descriptor refers to an L_{eq} 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.
PSNL	The project-specific noise levels (PSNL) are criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive criteria or amenity criteria.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
RNP	Road Noise Policy
Sound power level (Lw)	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.

It is useful to have an appreciation of decibels, the unit of noise measurement. Table A.2 gives an indication as to what an average person perceives about changes in noise level.

Table A.2 Perceived change in noise

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

Examples of common noise levels are provided in Figure A.1.



Source: RTA Environmental Noise Management Manual (RTA, 2001)

Figure A.1 Common noise levels

Appendix B

Noise logging data

Table B.1 Summary data Logger 1 - Munro St Greystanes

Date	ABL Day	ABL Evening	ABL Night	Leq 11hr Day	Leq 4hr Evening	Leq 9hr Night
Friday, 02-05-14	0	40	34	0	47.4	43.2
Saturday, 03-05-14	43	39	36.5	51.6	47.1	43.3
Sunday, 04-05-14	0	40	39	0	47.2	47.4
Monday, 05-05-14	41	43	39	50.7	48.9	49.2
Tuesday, 06-05-14	43	43	41.5	55.6	48.3	47.7
Wednesday, 07-05-14	44	44.5	41	51.4	52.2	47.1
Thursday, 08-05-14	44.5	43	38	51.5	48.5	47.1
Friday, 09-05-14	40.5	40	37.5	51.2	48.9	44.1
Saturday, 10-05-14	0	0	0	0	0	0
Summary Values						
RBL	**43**	**42**	**39**			
Leq				**52**	**49**	**47**

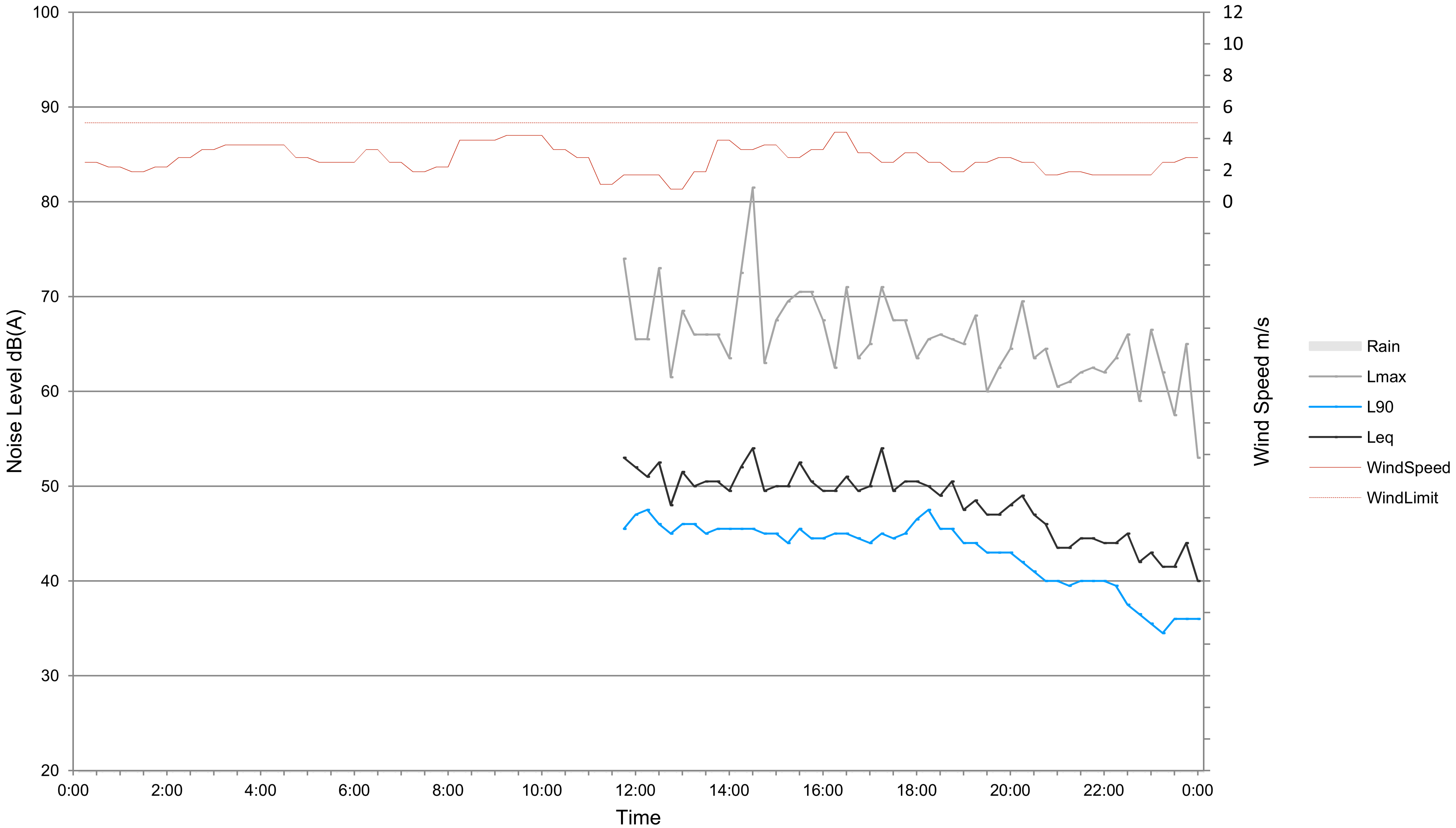
Notes: '0' indicates periods with too few valid samples due to weather or logger operation.

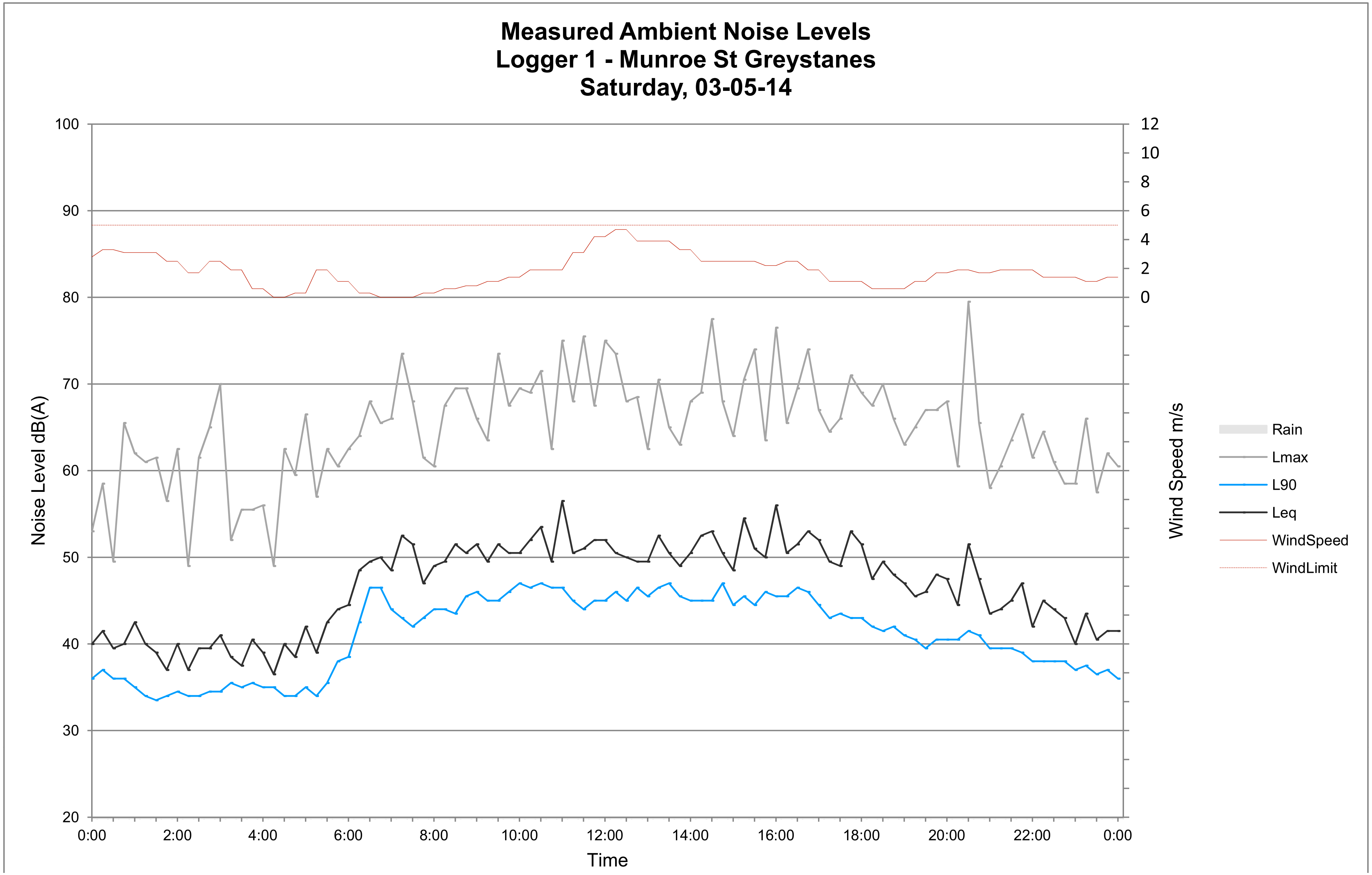
Table B.2 Summary values Logger 2 - Pemulwuy

Date	ABL Day	ABL Evening	ABL Night	Leq 11hr Day	Leq 4hr Evening	Leq 9hr Night
Friday, 02-05-14	0	35.4	29.3	0	41.7	44.1
Saturday, 03-05-14	37.5	36.7	34.5	48.9	46.3	46.6
Sunday, 04-05-14	0	33.3	33.5	0	45.8	44.6
Monday, 05-05-14	33.9	37.1	35	45.8	42.6	43.3
Tuesday, 06-05-14	37.4	37.4	37.7	47.6	42.8	42.8
Wednesday, 07-05-14	39.4	40.5	37.6	46.1	45.8	43.2
Thursday, 08-05-14	41.2	39.2	37.2	46.6	43.7	43.6
Friday, 09-05-14	34.7	37.4	33	47.8	45.9	39.7
Saturday, 10-05-14	35.1	34.4	33.2	46.8	41.5	40.9
Sunday, 11-05-14	34.4	36.6	35.2	46.7	42	42.6
Monday, 12-05-14	40.3	0	0	46.6	0	0
Tuesday, 13-05-14	0	0	0	0	0	0
Summary Values						
RBL	**37**	**37**	**35**			
Leq				**47**	**44**	**44**

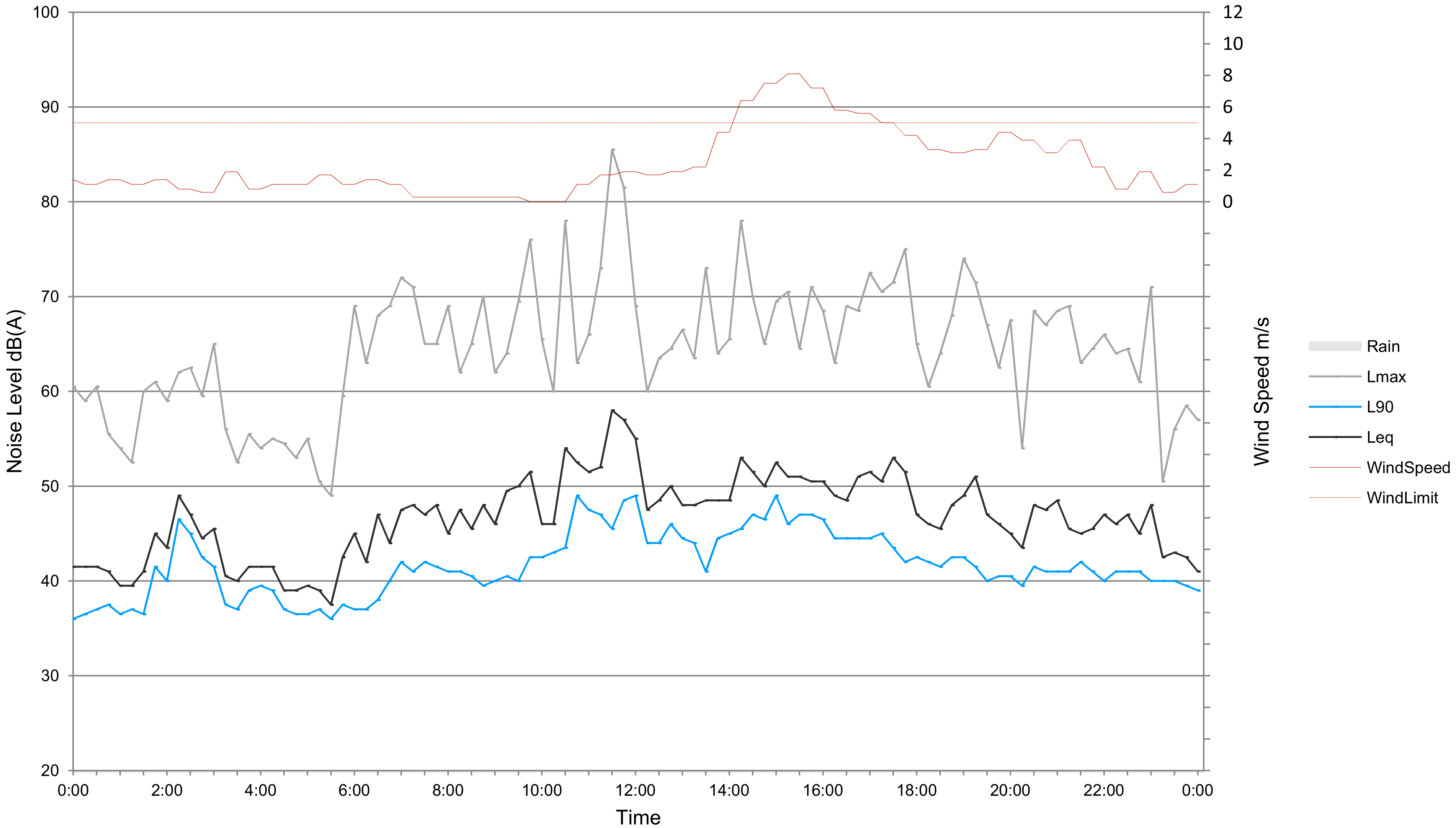
Notes: '0' indicates periods with too few valid samples due to weather or logger operation.

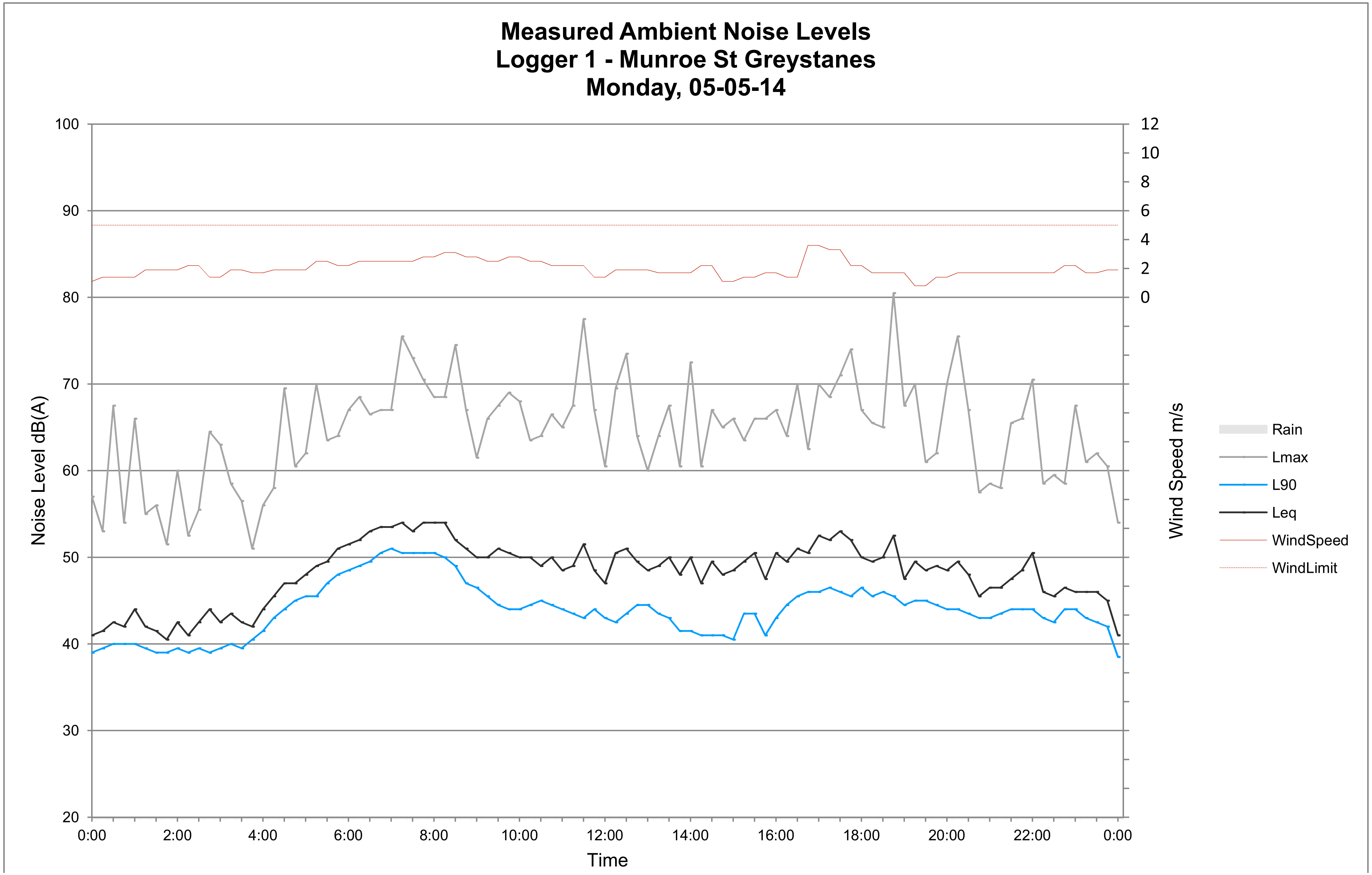
Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Friday, 02-05-14




Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Saturday, 03-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
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
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Sunday, 04-05-14





Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Monday, 05-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
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
Time
Rain
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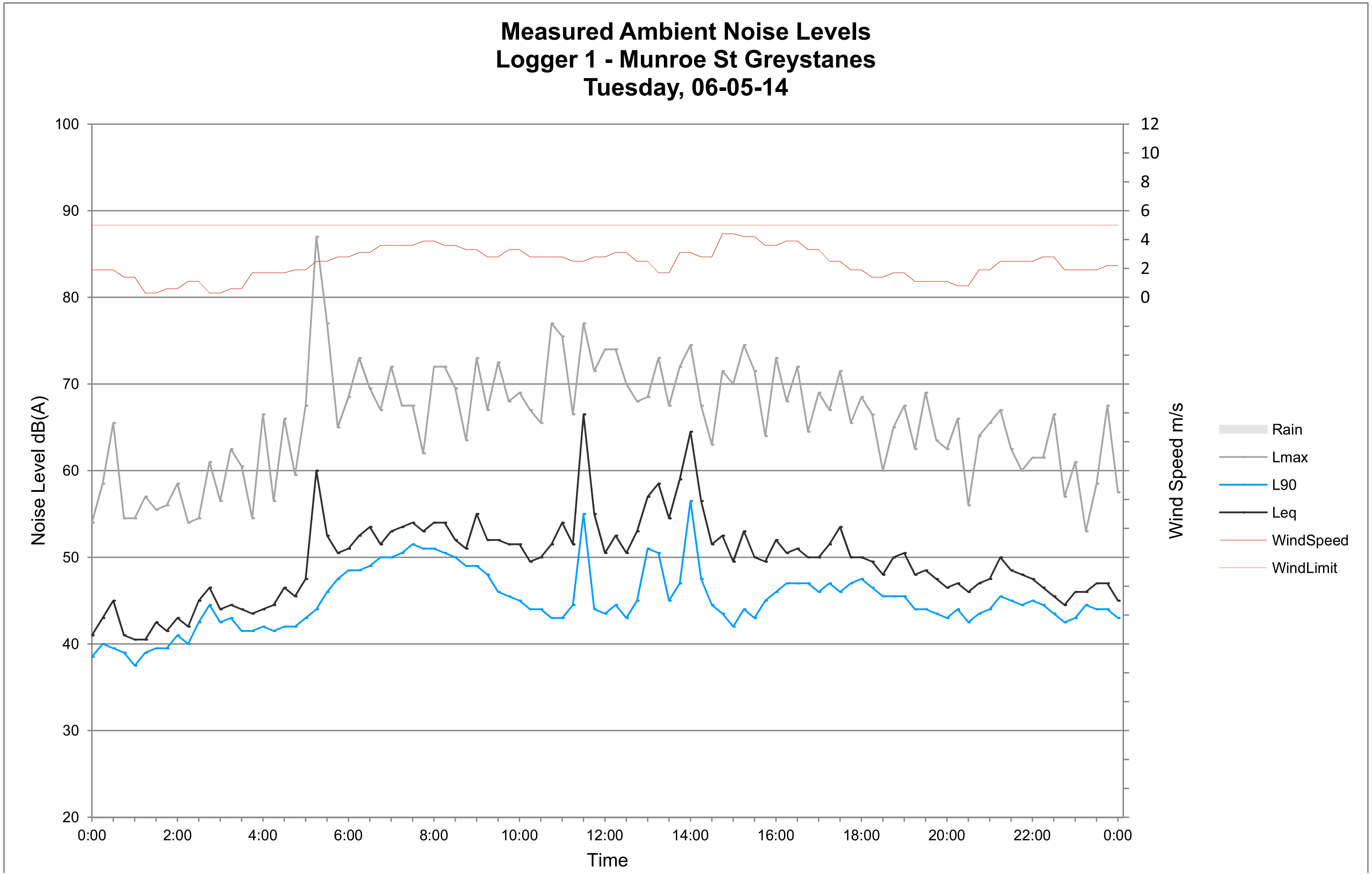
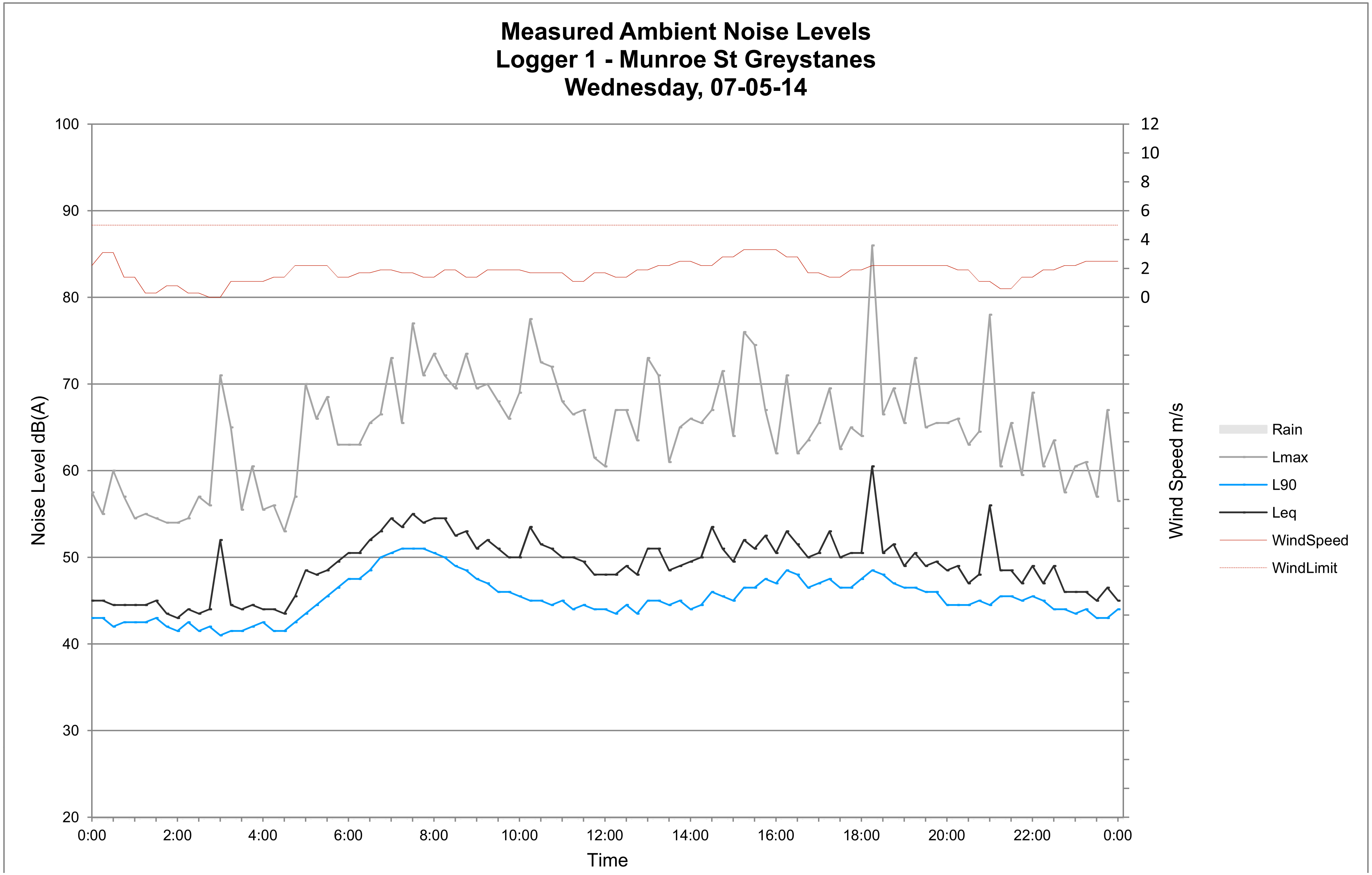
L90
Leq
WindSpeed
WindLimit

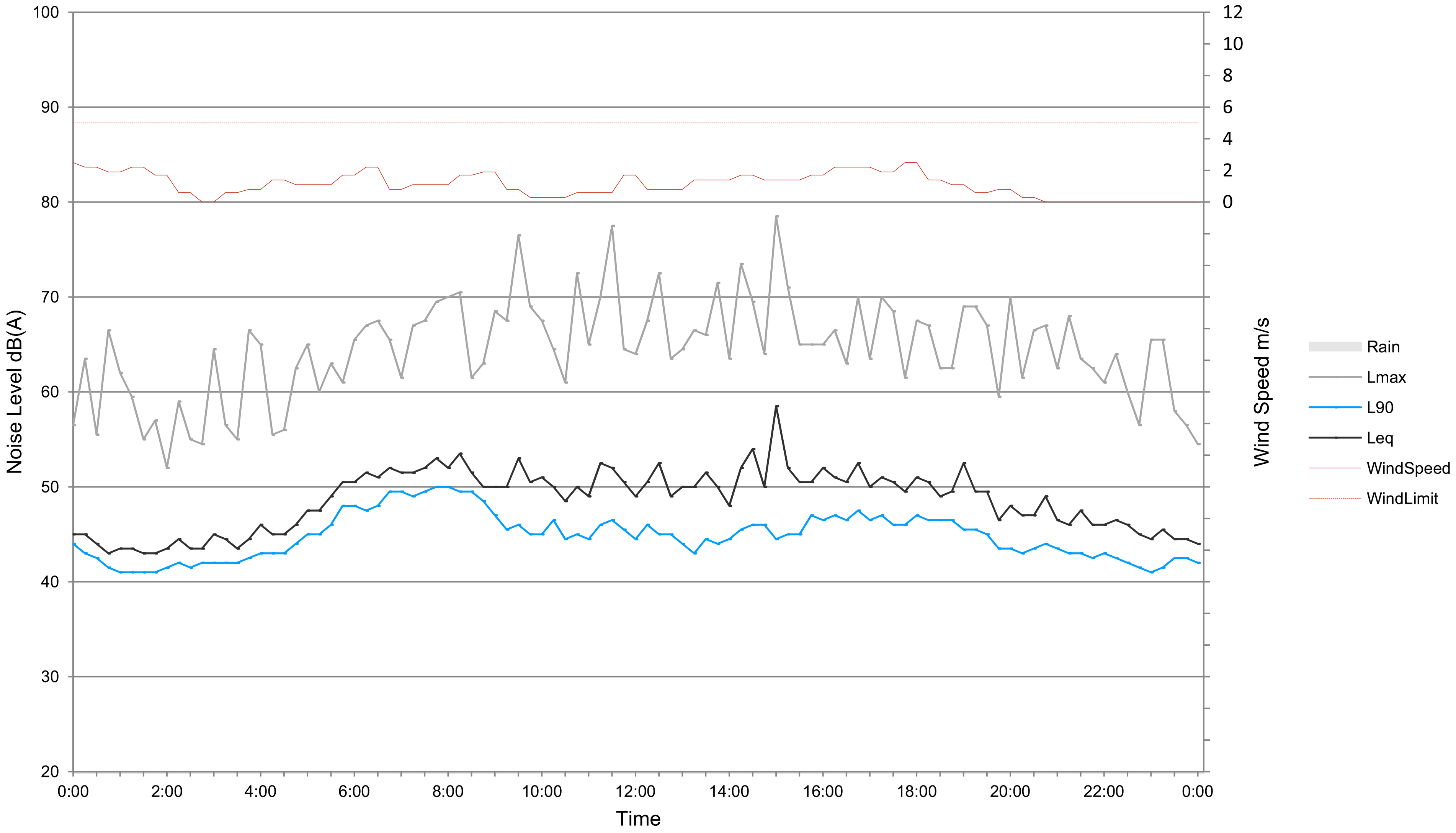


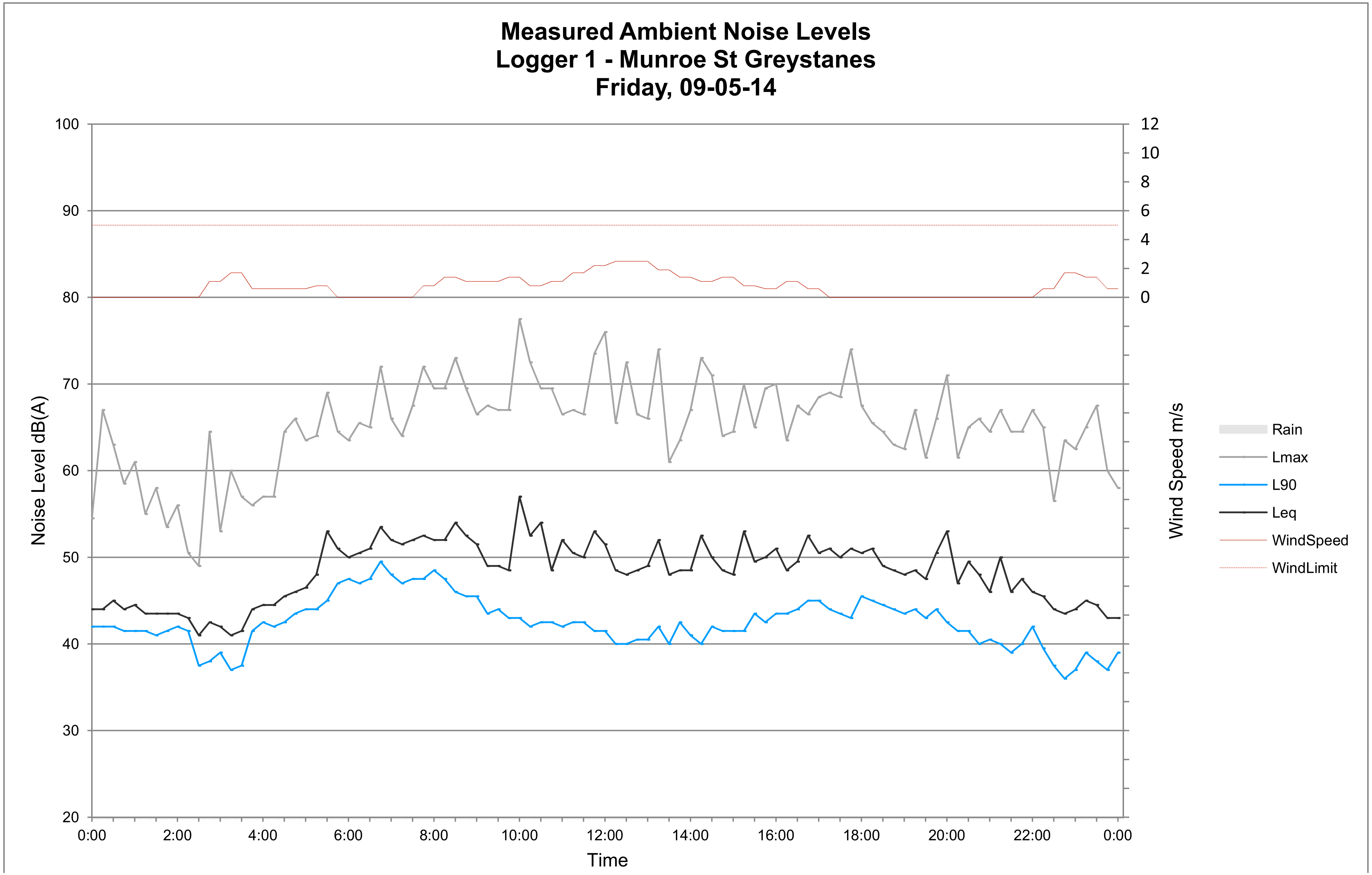
Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Tuesday, 06-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time
12
10
8
6
4
2
0
Wind Speed m/s
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

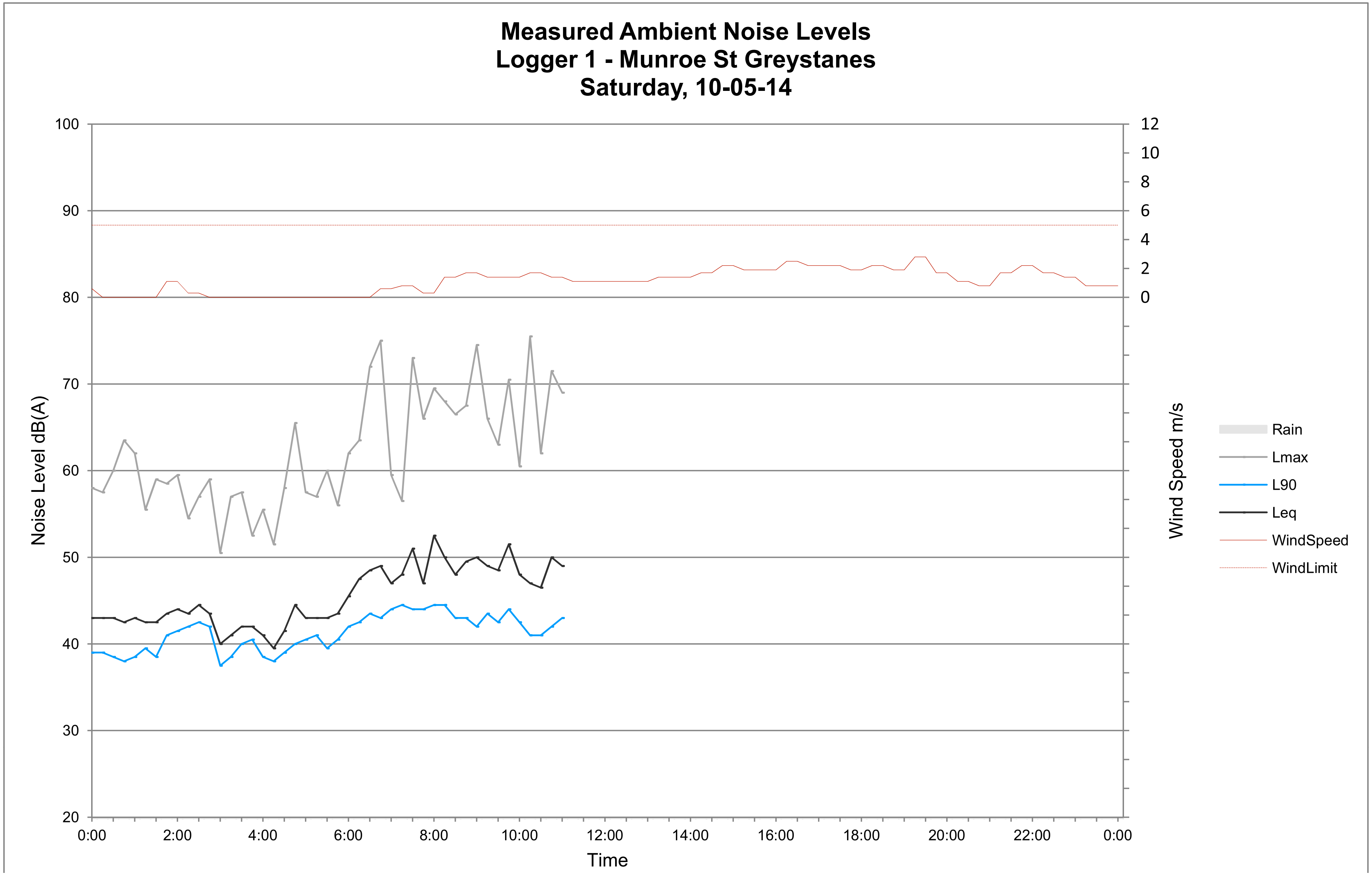


Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Wednesday, 07-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Thursday, 08-05-14




Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Friday, 09-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
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
Time
12
10
8
6
4
2
0
Wind Speed m/s
Rain
Lmax
L90
Leq
WindSpeed
WindLimit


Measured Ambient Noise Levels
Logger 1 - Munroe St Greystanes
Saturday, 10-05-14
Noise Level dB(A)
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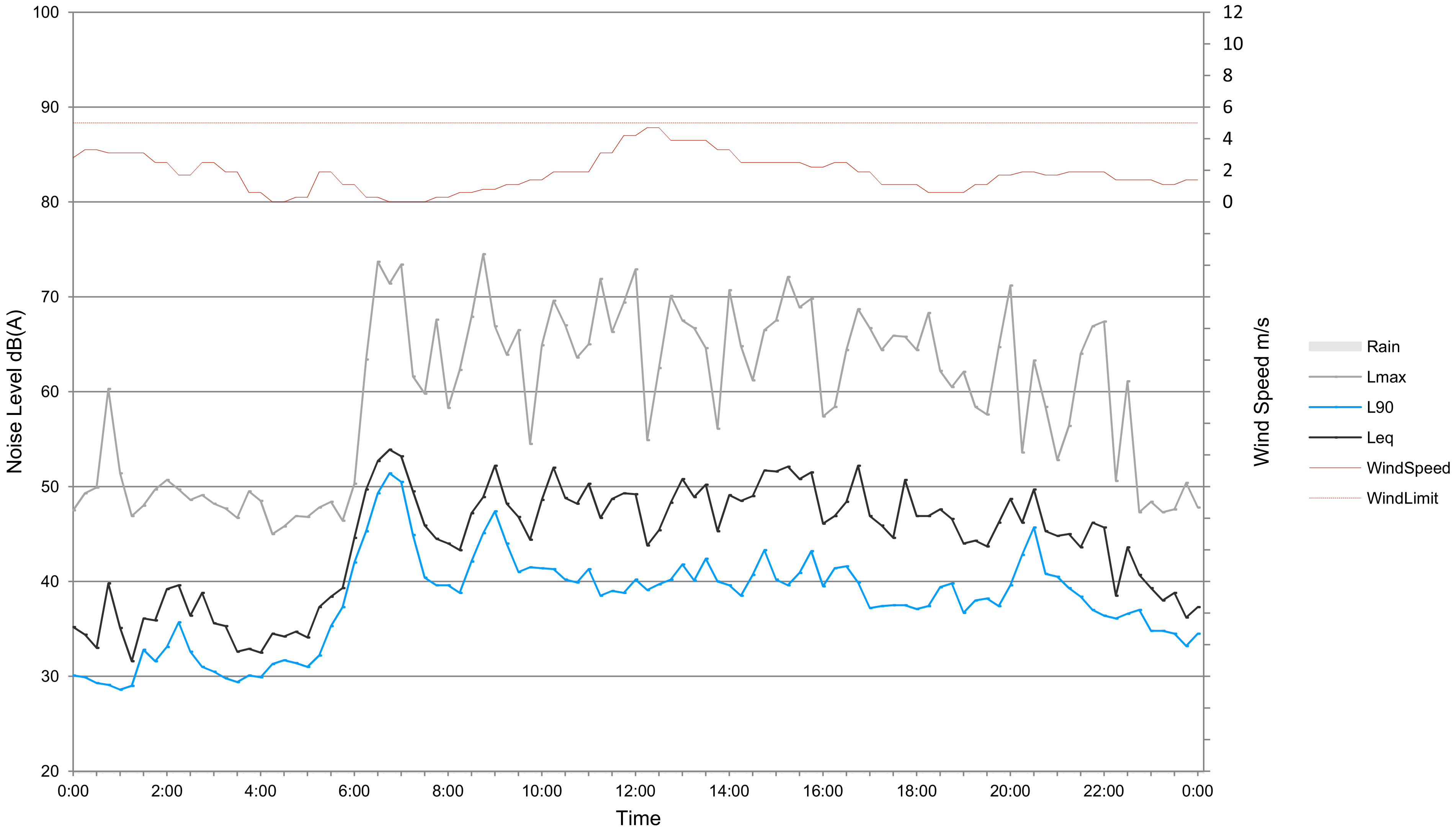
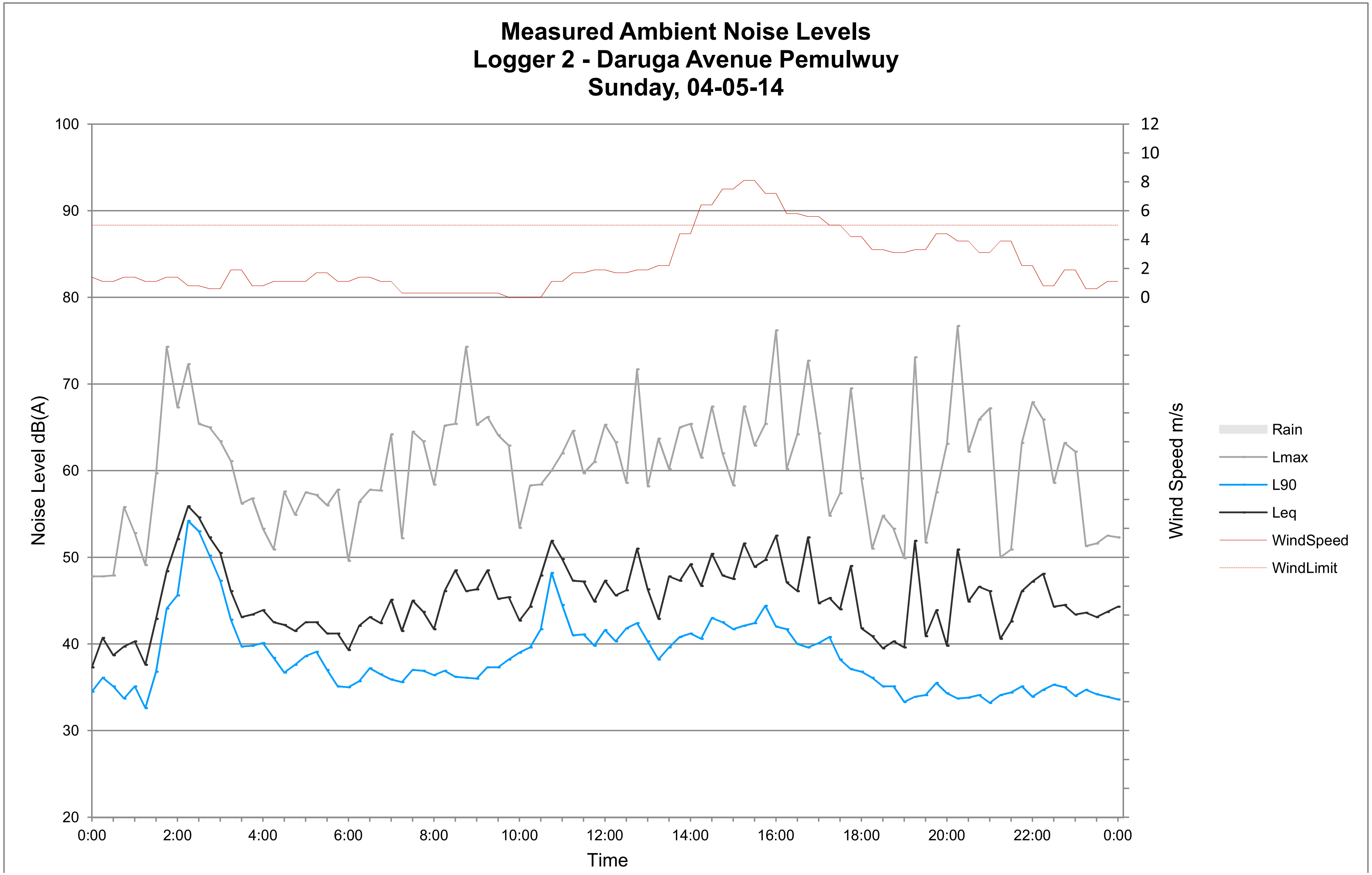
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
Wind Speed m/s
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Saturday, 03-05-14




Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Sunday, 04-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
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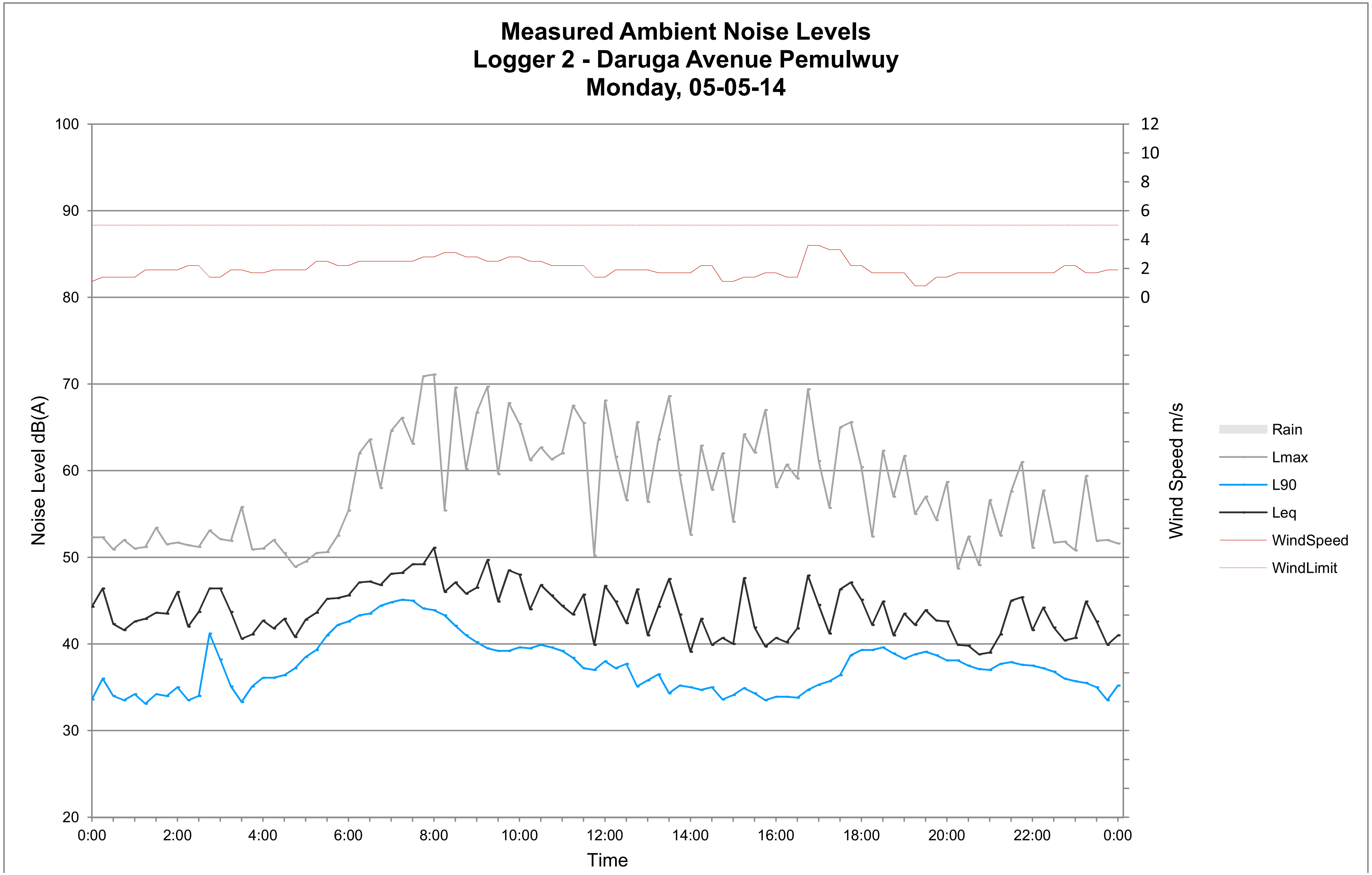
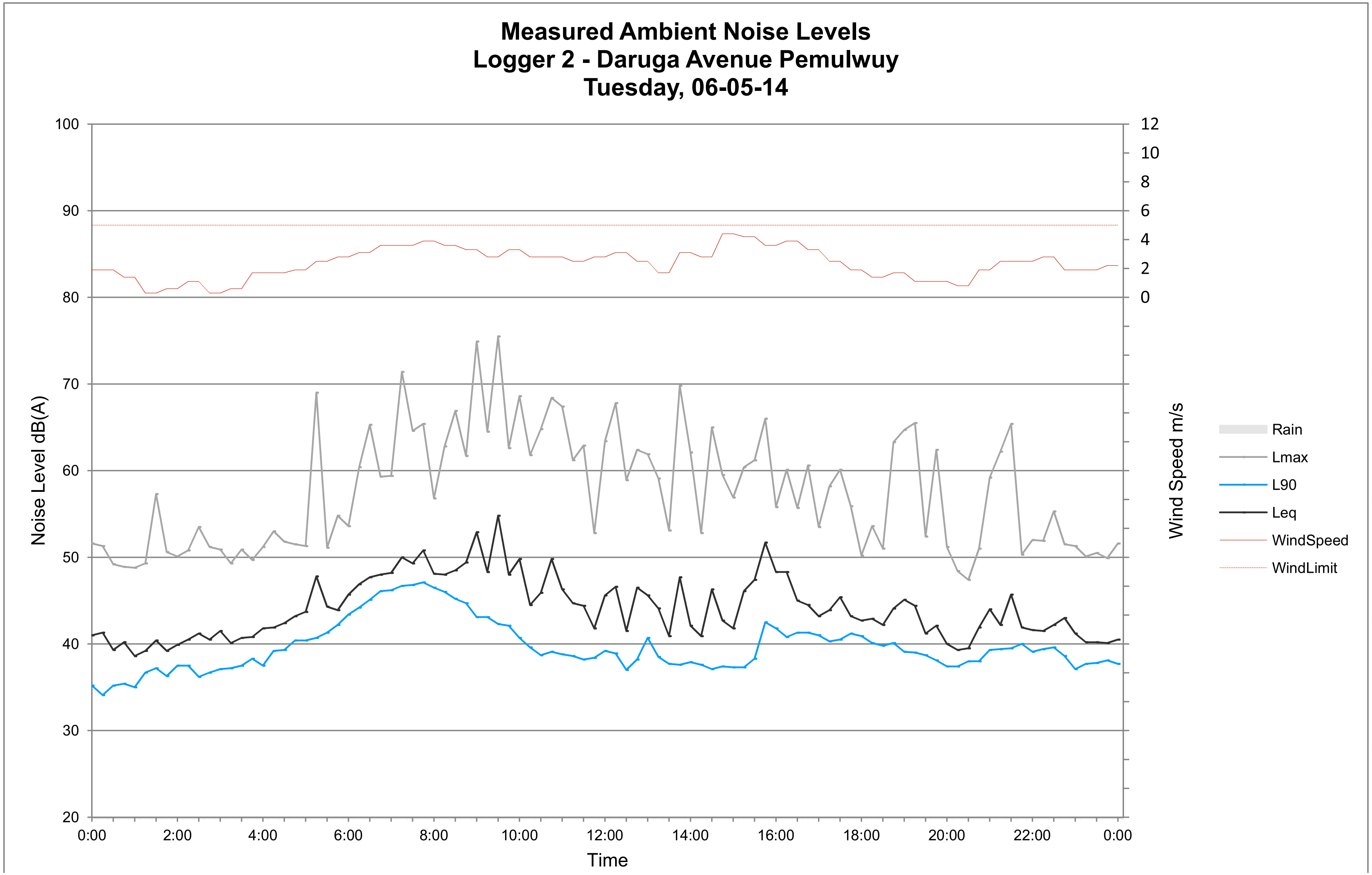
L90
Leq
WindSpeed
WindLimit



Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Monday, 05-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
Wind Speed m/s
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
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit



Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Tuesday, 06-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
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18:00
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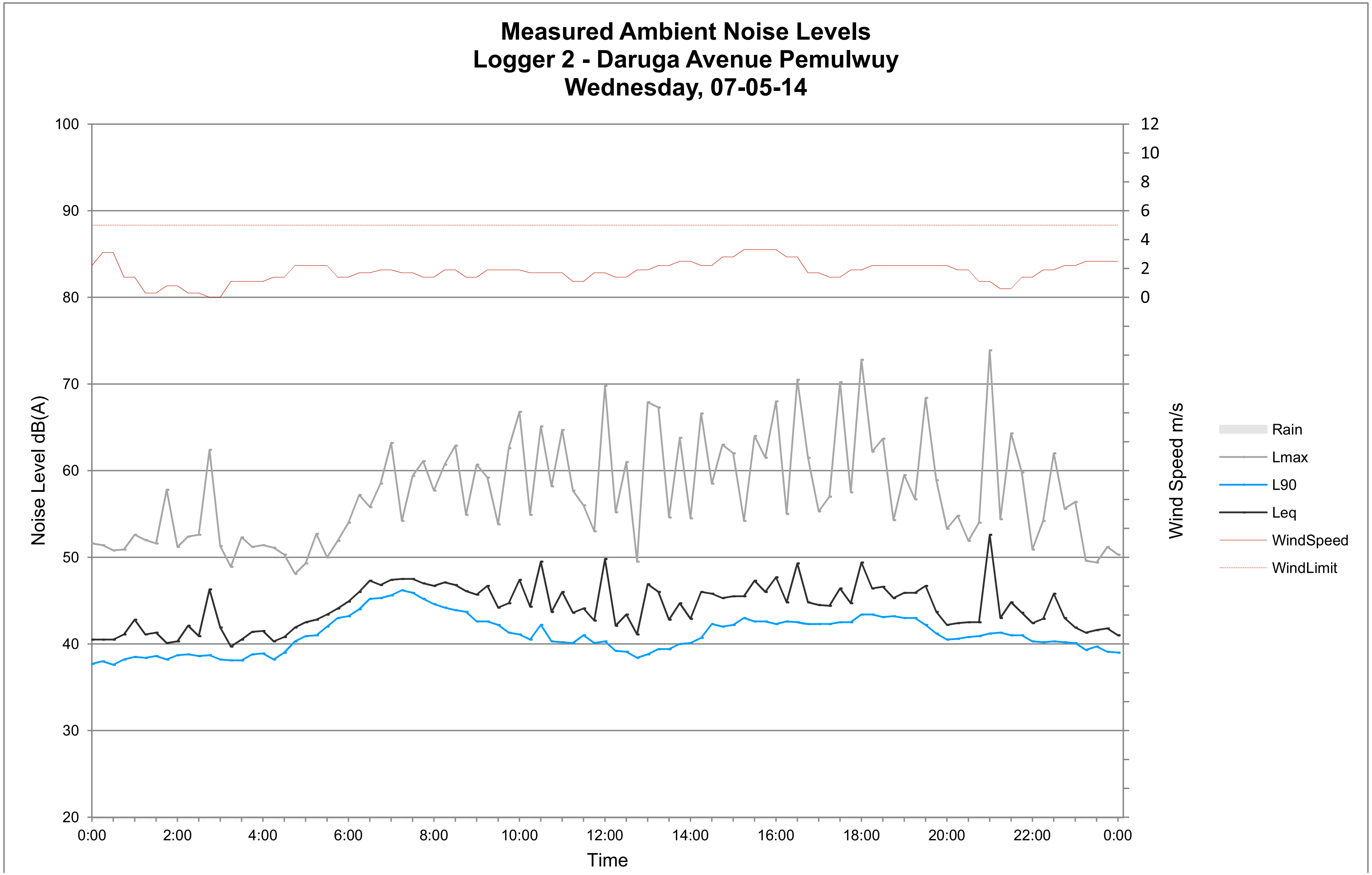
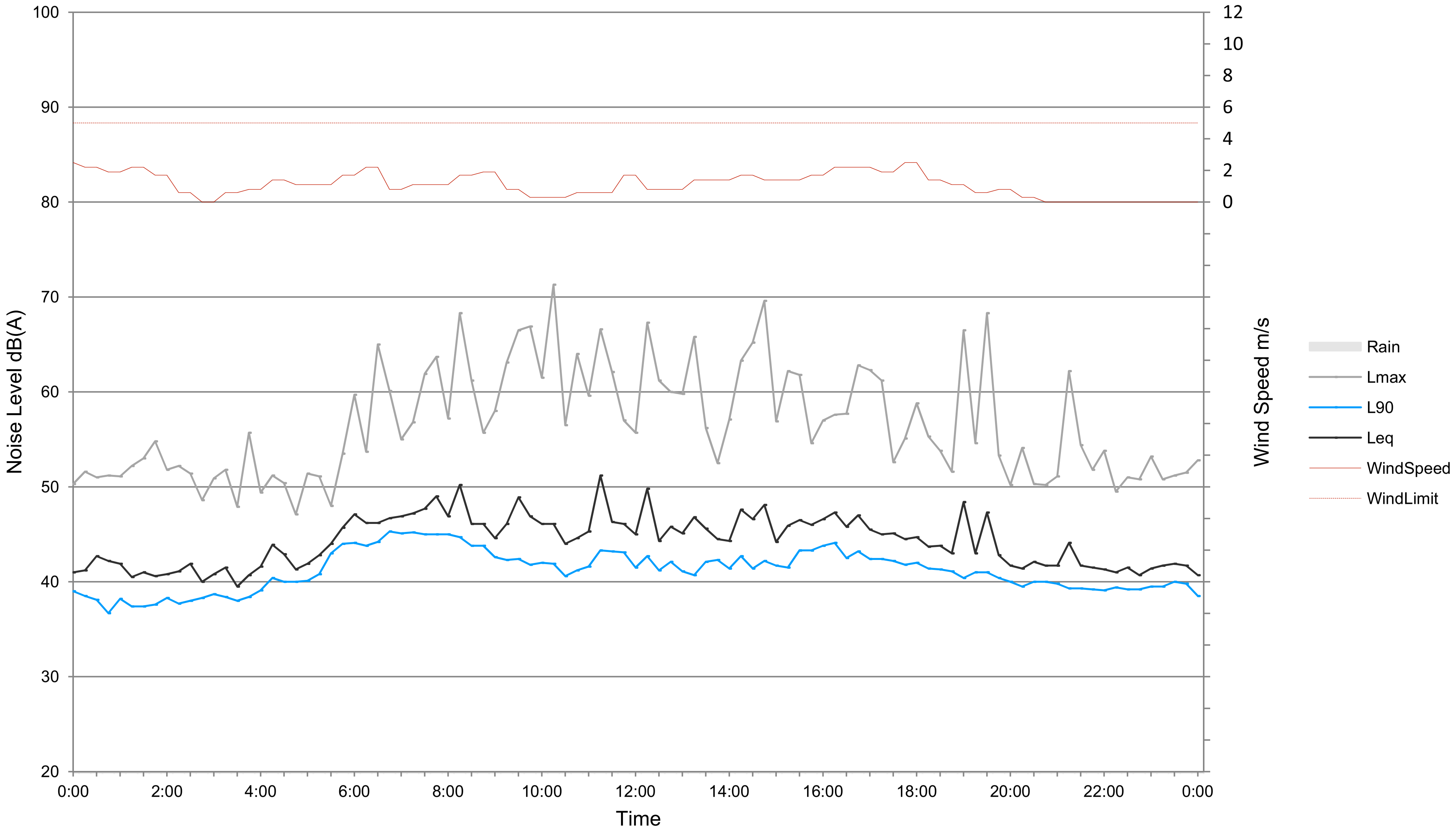
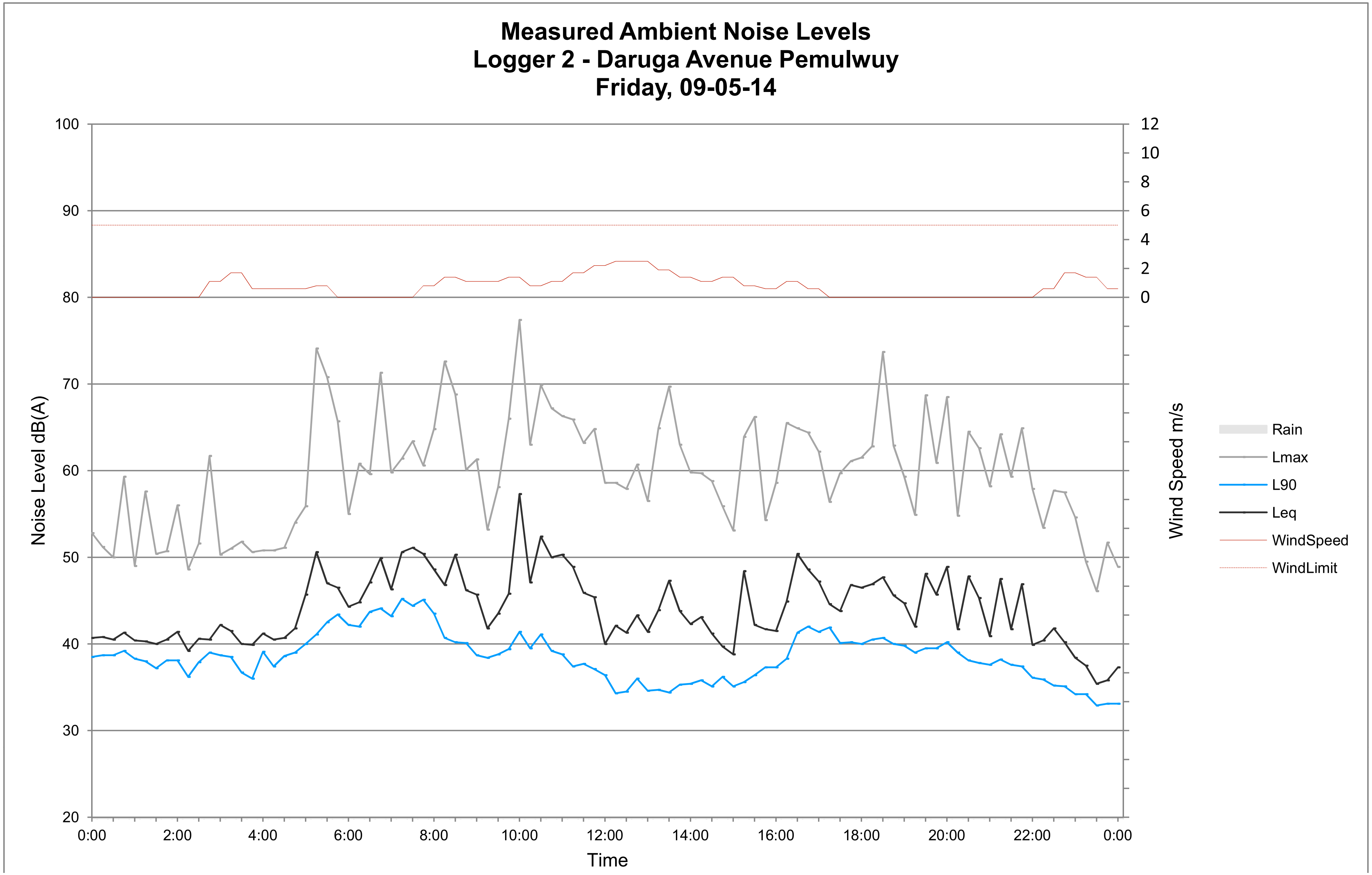
22:00
0:00
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit



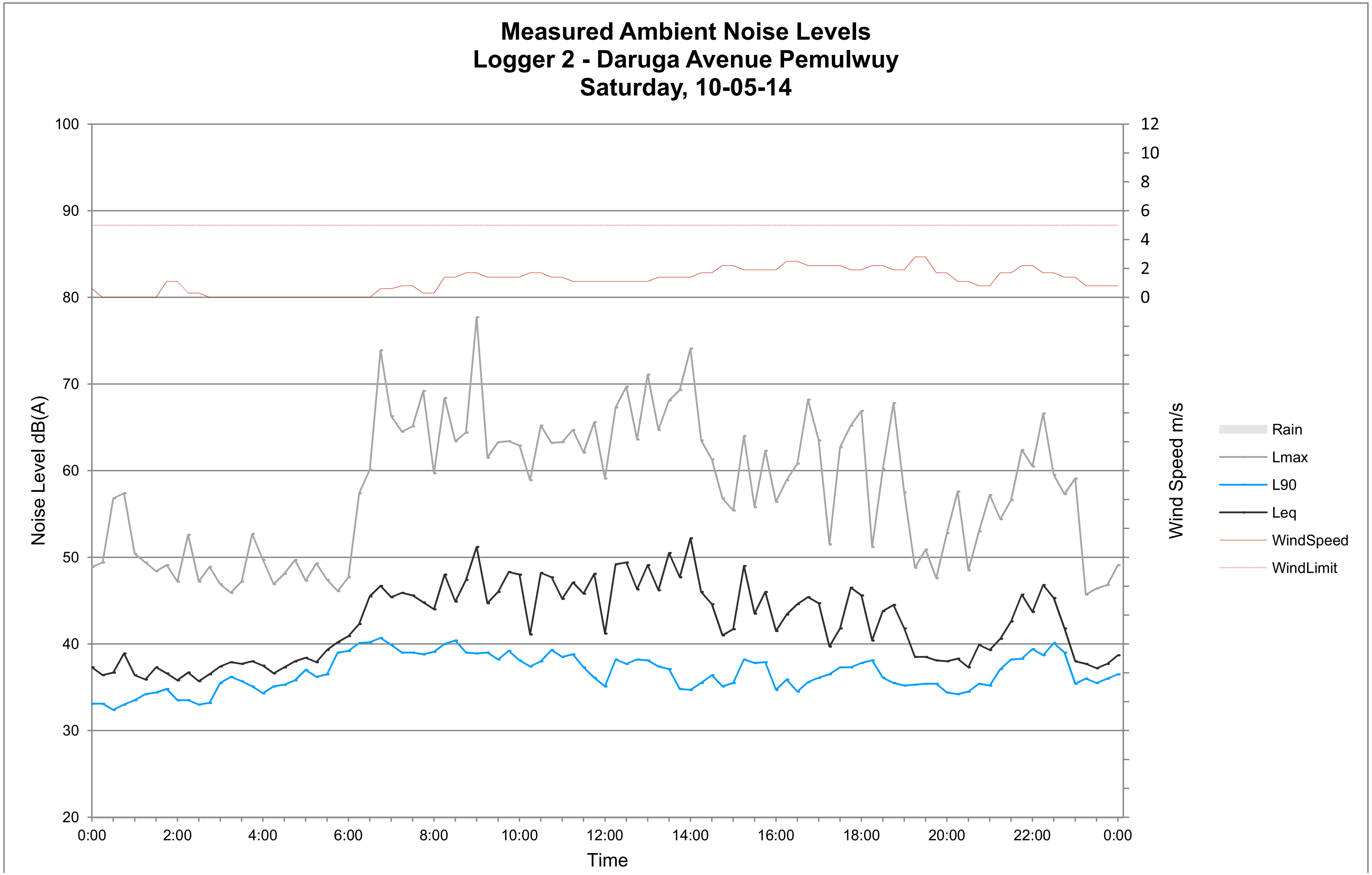
Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Wednesday, 07-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

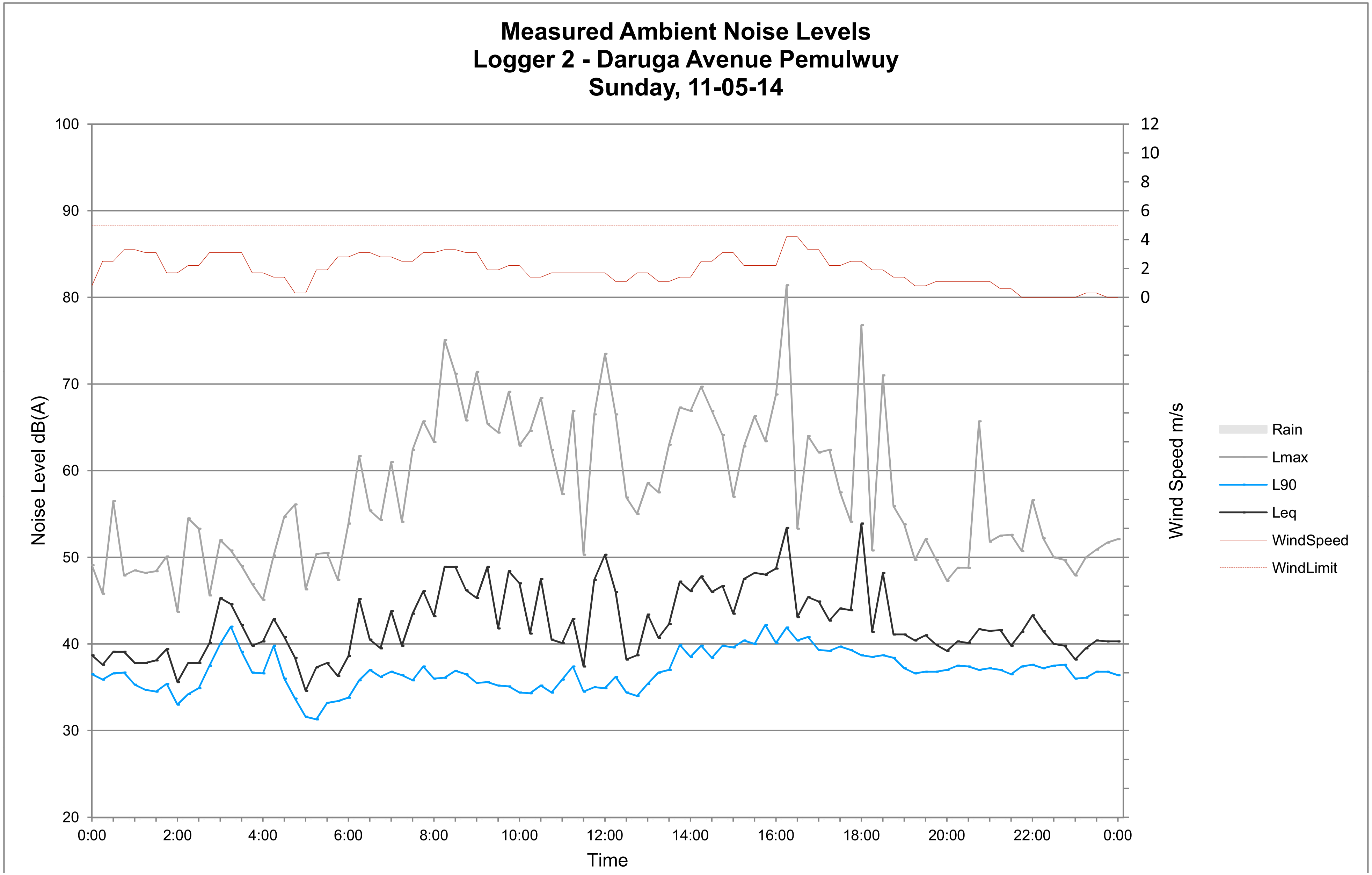
Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Thursday, 08-05-14





Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Friday, 09-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
Wind Speed m/s
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
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit


Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Saturday, 10-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
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
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit


Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Sunday, 11-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
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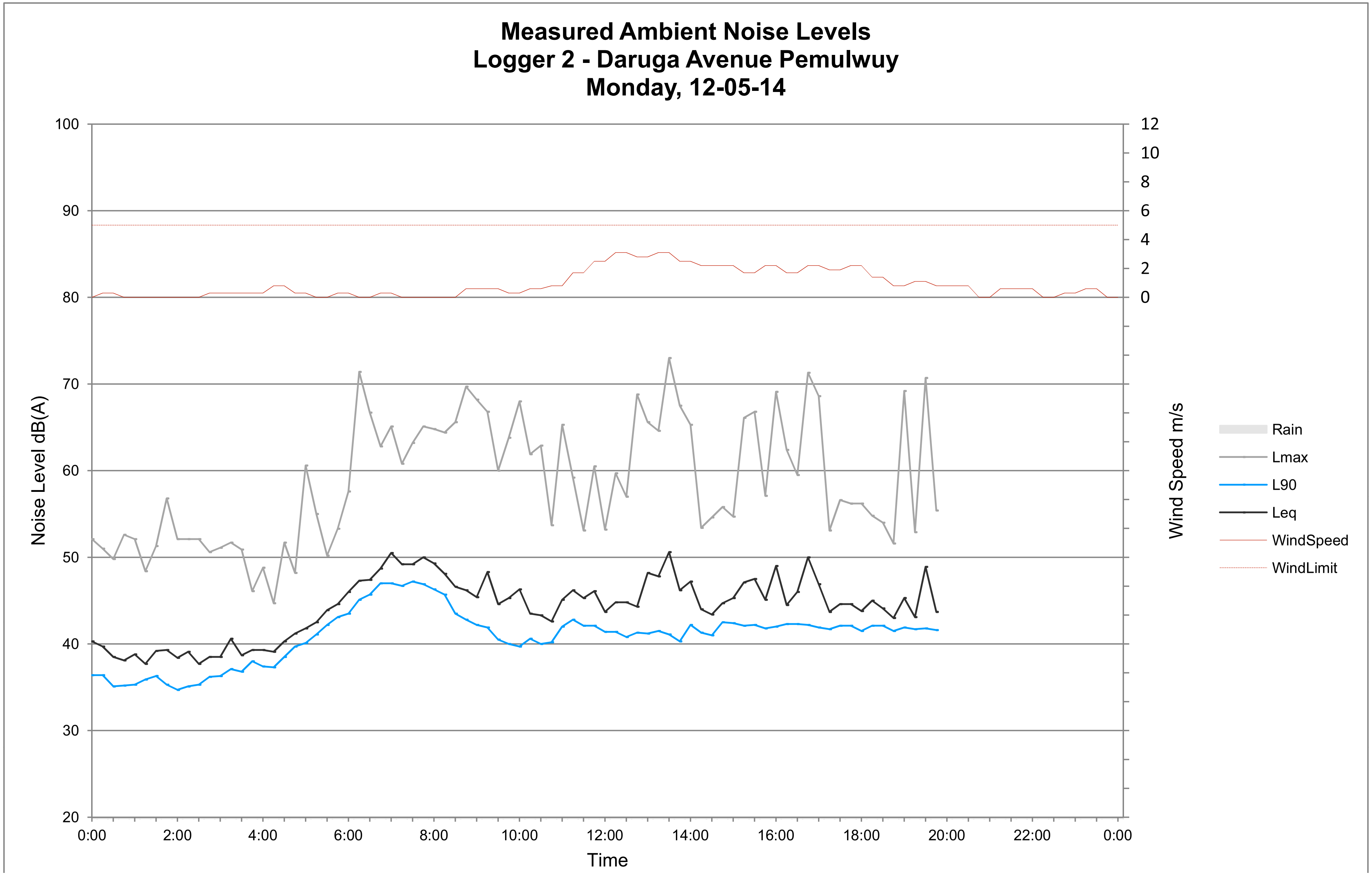
18:00
20:00
22:00
0:00
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit



Measured Ambient Noise Levels
Logger 2 - Daruga Avenue Pemulwuy
Monday, 12-05-14
Noise Level dB(A)
100
90
80
70
60
50
40
30
20
Wind Speed m/s
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
Time
Rain
Lmax
L90
Leq
WindSpeed
WindLimit

Appendix C

Sound power levels

Table C.1 **Operational plant items and Leq(15-min) dB(A) sound power level spectrum**

Noise Source	'A' Weighted frequency (Hz)									Total
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Blending plant	81	101	91	95	92	92	94	96	95	105
Jaw crusher	83	92	97	103	108	111	112	105	92	116
Impact crusher	79	88	93	99	104	107	108	101	88	112
Excavator	70	91	100	98	95	98	96	90	82	105
980H Loader	63	91	97	98	100	103	102	96	87	108
972 Loader	65	93	99	100	102	105	104	98	89	110
Power screen	68	78	86	93	103	107	106	100	90	111
Primary screen	-	77	87	94	104	106	107	101	-	111
Secondary screen	-	81	91	98	108	110	111	105	-	115
Tertiary screen	-	73	83	90	100	102	103	97	-	107
Telehandler	-	86	87	94	96	100	102	94	86	106
Freightliner	76	91	102	106	107	106	112	101	90	115
Trucks (empty)	45	69	80	89	90	90	86	81	72	97
Trucks (full)	63	80	89	95	102	99	97	89	80	105

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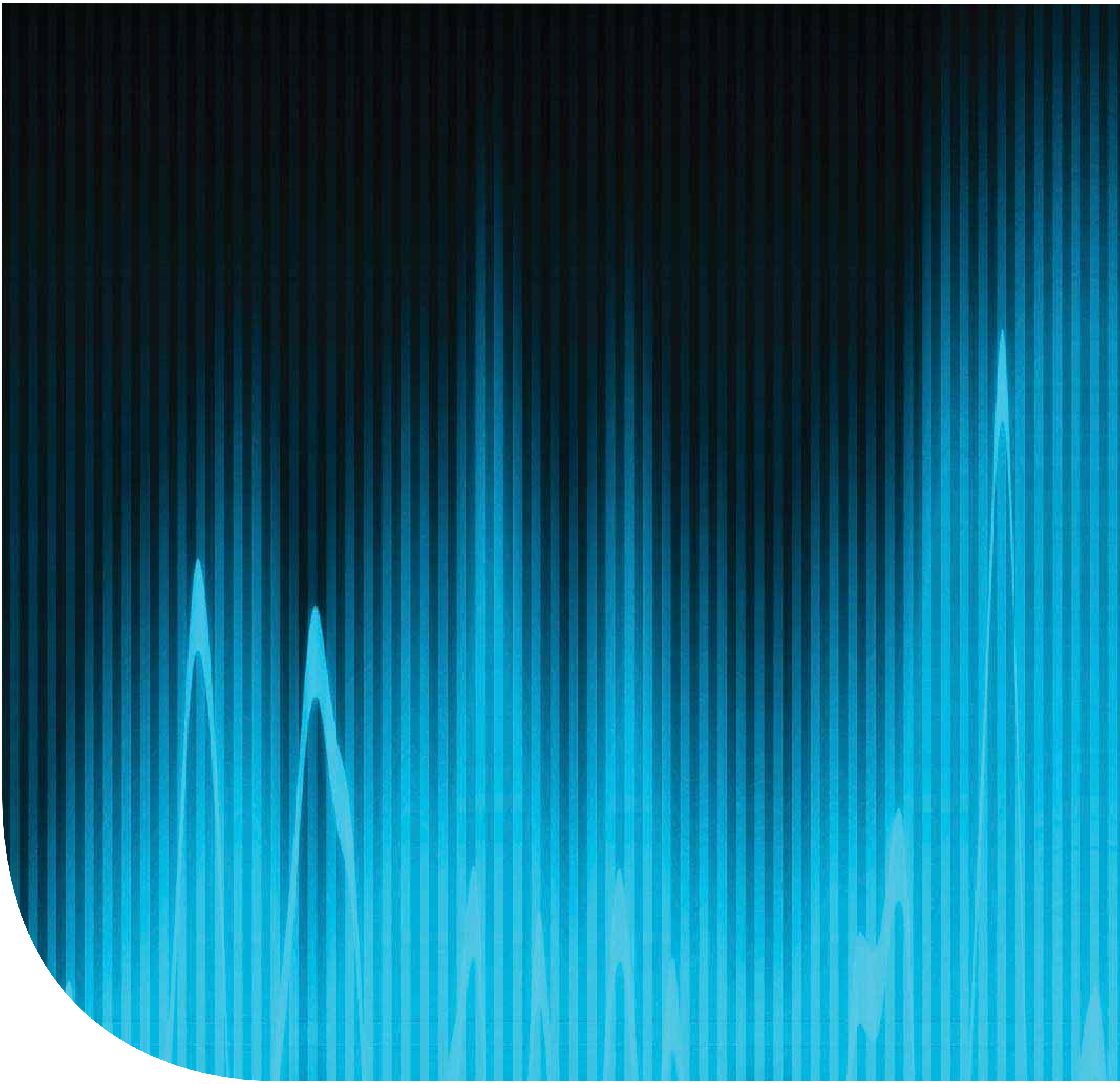

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Appendix E

Surface water assessment

global environmental solutions

Boral Property Group

Surface Water Assessment

Widemere Recycling Facility

Report Number 610.14050

28 May 2015

Boral Recycling Pty Ltd
Clunies Ross Street
Prospect
NSW 2148

Version: Revision 2

Boral Property Group

Surface Water Assessment

Widemere Recycling Facility

PREPARED BY:

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
610.14050	Revision 2	28 May 2015	Will Legg	Adam Marshall	Adam Marshall
610.14050	Revision 1	26 May 2015	Will Legg	Adam Marshall	Adam Marshall
610.14050	Revision 0	18 December 2014	Will Legg	Andrew Behrens	Andrew Behrens

Executive Summary

SLR Consulting (SLR) was commissioned by EMGA Mitchell McLennan (EMM) on behalf of Boral Recycling Pty Limited (Boral) to undertake a Surface Water Assessment for the proposed production increase at the Widemere Recycling Facility (the facility). Boral proposes to increase annual processing and production of recycled materials from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the Proposal).

The Proposal is being assessed as State Significant Development (SSD) under Part 4.1 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). Accordingly, this Surface Water Assessment has been prepared to support an environmental impact statement (EIS) and development application (DA) for the Proposal.

The facility is located on Widemere Road (Lot 4001 DP1173524), south east of the Prospect Reservoir, in Wetherill Park, NSW.

The Proposal includes the following principal components and activities:

- increase processing capacity to 1,000,000 tpa;
- addition of new waste streams to the list of permitted wastes received at the facility;
- realignment of the southern portion of the perimeter haul road and associated changes to the Site layout; and
- minor change to the operating hours of the facility.

The Site footprint will remain unchanged, however a small disturbed and pervious area will be developed for the realignment of the perimeter haul road.

This report has been prepared to fulfil the requirements detailed in the Secretary's Environmental Assessment Requirements relating to surface water issued by the NSW Department of Planning and Environment.

MITIGATION, MANAGEMENT AND MONITORING MEASURES

It is recommended that additional flood storage be provided within the southern portion of the perimeter haul road to attenuate the predicted slight increase in peak flood flow rate as a result of the Proposal. Hydrological modelling indicates that a total of 102 m^3 of flood storage is required to ensure there is no increase in peak flood flows during a 100 year ARI event.

The retention storage zone within the basins (equivalent to a 90^{th} percentile, 5 day rainfall event) will be increased to 2764 KL to account for the proposed development. The basin has sufficient additional capacity for sediment settlement and sediment storage.

Existing surface water, sediment and spill management and monitoring measures will continue to be implemented onsite.

It is recommended that Boral investigates potential opportunities for increasing stormwater storage onsite and/or identifying offsite stormwater sources to supplement site water demand and reduce potable water use onsite.

Executive Summary

It is recommended that a 12 month monitoring program be performed to assess the risk posed by potential contaminants of concern associated with raw waste stockpiles. Any additional management measures should be selected based upon the findings of this monitoring program. Subject to the findings of the initial monitoring program, it is recommended that monitoring of any identified contaminants of concern be continued on an annual basis so that appropriate reactive management can be undertaken if elevated contaminant levels are identified.

RESIDUAL IMPACTS

Offsite Flooding

The proposed additional flood storage will ensure that the Proposal will not increase peak flood flow rates in Prospect Creek.

Onsite Flooding

The creation of a flood storage area may lead to some additional ponding of water across the southern portion of the perimeter haul road onsite for short periods during flood events. The maximum flood depth of 310 mm will not impact on truck movements around the perimeter haul road.

Erosion Impacts

The provision of additional flood storage will maintain existing peak flow discharge rates from the Site during flood events. Therefore the residual impact to bank erosion in Prospect Creek is considered to be negligible during flood events.

Stormwater Quality

The existing sediment basins which collect stormwater runoff from the Site are predicted to overflow on slightly more occasions as a result of the Proposal. The associated increase in pollutant loads being discharged to Prospect Creek as a result of the overflows is considered to be minor. The impact to water quality and ecology within Prospect Creek is therefore considered to be negligible.

Potable Water Usage

The water balance predicts a minor increase in water demand for dust suppression, associated with the increased stockpile area. However, it is likely to be largely offset by the additional water available for reuse as a result of the small increase in hardstand area onsite.

Impacts to local water resources as a result of the Proposal are therefore considered to be negligible.

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APPENDICES

1 INTRODUCTION

1.1 Background

Boral Recycling Pty Ltd ('Boral') proposes to increase annual processing and production of recycled materials from 750,000 tonnes per annum (tpa) to 1,000,000 tpa (the Proposal).

The Proposal is being assessed as State Significant Development (SSD) under Part 4.1 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). Accordingly, this Surface Water Assessment has been prepared to support an environmental impact statement (EIS) and development application (DA) for the Proposal.

The facility is located on Widemere Road (Lot 4001 DP1173524), south east of the Prospect Reservoir, in Wetherill Park, NSW. The Site location is shown in **Figure 1**.

EMM was commissioned by Boral to prepare the EIS to accompany the development application. SLR Consulting Australia Pty Ltd (SLR) was subsequently engaged to prepare a Surface Water Assessment (SWA) as part of the EIS.

This report has been prepared to fulfil the requirements detailed in the Secretary's Environmental Assessment Requirements (EARs) relating to surface water issued by the NSW Department of Planning and Environment (DP&E) as detailed in **Section 2**.

1.2 Application Area

The Site covers an area of approximately 9.8 ha. Approximately 8 ha of the Site is currently developed. The existing layout of the Site, showing key facilities and infrastructure is presented in **Figure 2**.

The existing Waste Recycling facility has an approved surface water management system in place. Therefore, this SWA focuses on assessing the adequacy of the existing surface water management system in relation to the Proposal.

1.3 Overview of Proposal

- increase processing capacity to 1,000,000 tpa;
- addition of new waste streams to the list of permitted wastes received at the facility;
- realignment of the southern portion of the perimeter haul road and associated changes to the Site layout; and
- a minor change to the operating hours of the facility.

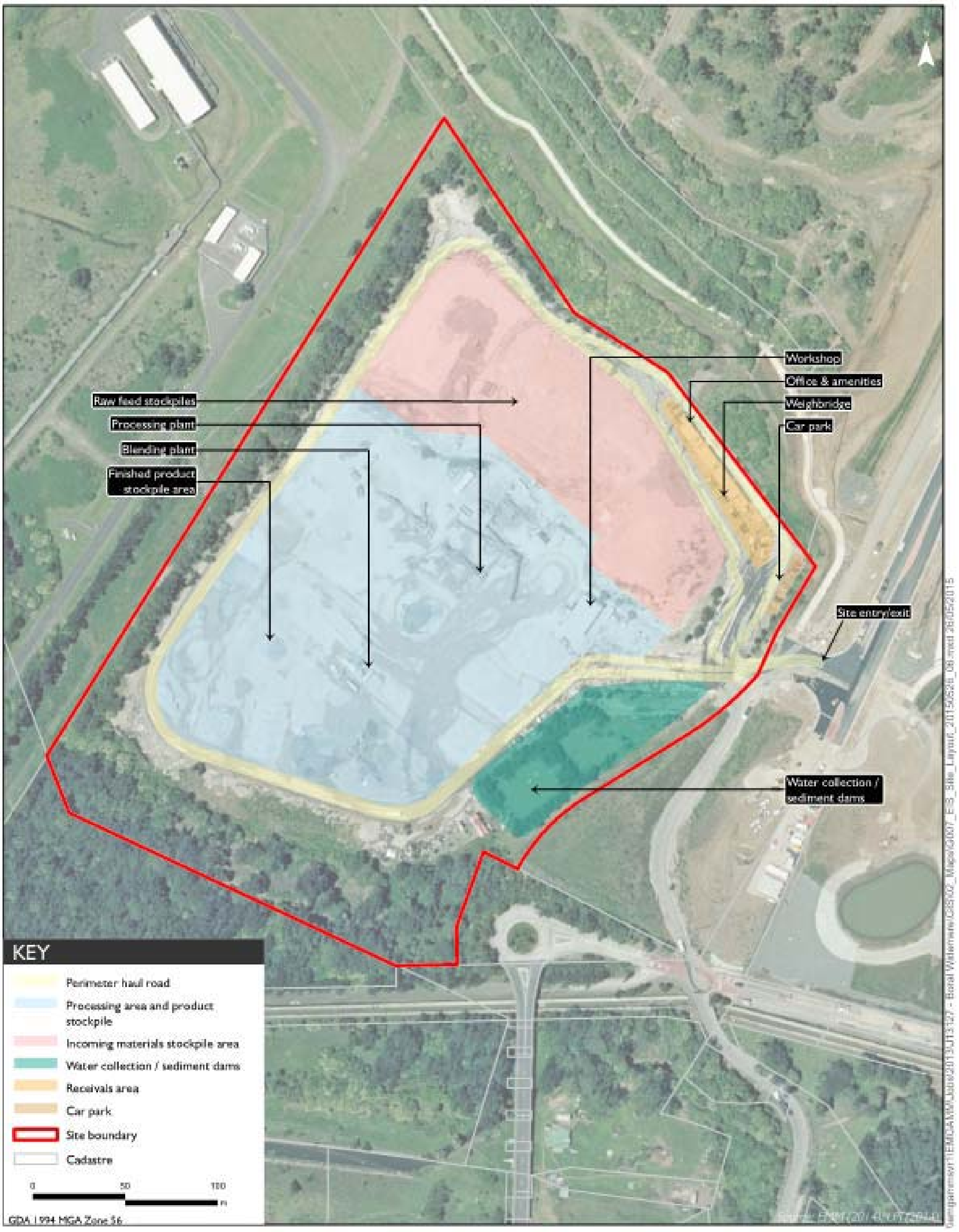
The Site footprint will remain unchanged, however a small disturbed and pervious area will be developed for the realignment of perimeter haul road.

The realignment of the perimeter haul road is outlined in **Figure 3**.

Figure 1 Regional Context

Source: Widemere Recycling Facility, Environmental Impact Assessment (EMM, 2014)

Figure 2   Site Layout – Current Operations



Source: Widemere Recycling Facility, Environmental Impact Assessment (EMM, 2014)

Figure 3 Changes to Alignment of the Perimeter Haul Road

Source: Widemere Recycling Facility, Environmental Impact Assessment (EMM, 2014)

1.4 About this Report

This SWA assesses the potential surface water impacts of the Proposal and recommends appropriate mitigation and monitoring measures where required.

This SWA addresses the EARs in relation to surface water as detailed in **Section 2**.

The proposed scope of work for the SWA is outlined below:

- Site visit to gain an understanding of the hydrological regime onsite and to inspect the receiving watercourse(s);
- Detailed site water balance for two scenarios (existing and post development);
- Preparation of a Surface Water Assessment Report including:
  - **Section 2** lists the EARs, relevant policies and guidelines and licensing requirements;
  - **Section 3** identifies legislative water quality objectives, flow objectives and environmental values for the receiving watercourses;
  - **Section 4** presents relevant data including meteorological (rainfall events), surface water quality, catchment characteristics, surface water management measures, surface water features and surrounding land uses;
  - **Section 5** describes the Site water demands and presents the findings of the water balance modelling;
  - **Section 6** outlines the performance of the surface water management system in terms of water quality;
  - **Section 7** outlines the performance of the surface water management system in terms of water quantity;
  - **Section 8** details the potential hydrological impacts as a result of the Proposal, provides a qualitative assessment of flooding issues onsite, an assessment of potential impacts on the quality and quantity of existing surface water resources and potential impacts on riparian corridors and recommends appropriate mitigation measures;
  - **Section 9** presents the conclusions of the surface water assessment.

2 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The EARs for the Proposal and other requirements identified by government agencies are listed in **Table 1**.

Table 1 EARs

Government Agency	Paraphrased Requirement	Relevant section of this report
	SURFACE WATER - EARs	
Department of Planning and Environment (17/6/14)	- a detailed water balance;	**5**
	- description of the water demands and a breakdown of water supplies including any water licensing requirements; - description of the measures to minimise water use;	**3** and **5**
	- description of the construction erosion and sediment controls; - a description of the surface and stormwater management system, including on site detention, and measures to treat or reuse water;	**6** and **Appendix A – Figure A2**
	- an assessment of potential surface and groundwater impacts associated with the development, including impacts to flooding, Prospect Creek;	**8**
	- details of impact mitigation, management and monitoring measures.	**8**
	SURFACE WATER – EPA REQUIREMENTS	
NSW Environment Protection agency (2/6/2014)	Outline the production process including: - the water management system including all potential sources of water pollution, Proposals for re-use, treatment etc, emission levels of any wastewater discharged, discharge points, summary of options explored to avoid a discharge, reduce its frequency or reduce its impacts, and rationale for selection of option to discharge.	**4, 5 and 6**
	Outline the construction works including erosion and sediment control measures.	**6**
	Provide details of the project that are essential for predicting and assessing impacts to waters: a) including the quantity and physio-chemical properties of all potential water pollutants and the risks they pose to the environment and human health, including the risks they pose to Water Quality Objectives in the ambient waters (as defined on www.environment.nsw.gov.au/ieo , using technical criteria derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC 2000) b) the management of discharges with potential for water impacts c) drainage works and associated infrastructure; land-forming and excavations; working capacity of structures; and water resource requirements of the Proposal.	**4 and 6**
	Outline site layout, demonstrating efforts to avoid proximity to water resources (especially for activities with significant potential impacts eg effluent ponds) and showing potential areas of modification of contours, drainage etc.	**1** and **5**
	Outline how total water cycle considerations are to be addressed showing total water balances for the development (with the objective of minimising demands and impacts on water resources).	**5**
	Include water requirements (quantity, quality and source(s))	**3, 5** and **6**
	Include proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.	**5**
	Describe the catchment including proximity of the development to any waterways and provide an assessment of their sensitivity/significance from a public health, ecological and/or economic perspective. The Water Quality and River Flow Objectives on the website: www.environment.nsw.gov.au/ieo	**3** and **4**

Government Agency	Paraphrased Requirement	Relevant section of this report
	should be used to identify the agreed environmental values and human uses for any affected waterways. This will help with the description of the local and regional area.	
	Describe existing surface and groundwater quality – an assessment needs to be undertaken for any water resource likely to be affected by the Proposal and for all conditions (e.g. a wet weather sampling program is needed if runoff events may cause impacts).	**4**
	Provide site drainage details and surface runoff yield.	**6**
	State the ambient Water Quality and River Flow Objectives for the receiving waters. These refer to the community's agreed environmental values and human uses endorsed by the Government as goals for the ambient waters. These environmental values are published on the website: www.environment.nsw.gov.au/ieo . The EA should state the environmental values listed for the catchment and waterway type relevant to your Proposal. NB: A consolidated and approved list of environmental values are not available for groundwater resources. Where groundwater may be affected the EA should identify appropriate groundwater environmental values and justify the choice.	**3**
	State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC 2000 Guidelines for Fresh and Marine Water Quality (http://www.deh.gov.au/water/quality/nwqms/volume1.html)(Note that, as at 2004, the NSW Water Quality Objectives booklets and website contain technical criteria derived from the 1992 version of the ANZECC Guidelines. The Water Quality Objectives remain as Government Policy, reflecting the community's environmental values and long-term goals, but the technical criteria are replaced by the more recent ANZECC 2000 Guidelines).	**4**
	State any locally specific objectives, criteria or targets, which have been endorsed by the government e.g. the Healthy Rivers Commission Inquiries (www.hrc.nsw.gov.au) or the NSW Salinity Strategy (DLWC, 2000) (www.dlwc.nsw.gov.au/care/salinity/#Strategy).	**3**
	Where site specific studies are proposed to revise the trigger values supporting the ambient Water Quality and River Flow Objectives, and the results are to be used for regulatory purposes (e.g. to assess whether a licensed discharge impacts on water quality objectives), then prior agreement from the EPA on the approach and study design must be obtained.	NA
	Describe the state of the receiving waters and relate this to the relevant Water Quality and River Flow Objectives (i.e. are Water Quality and River Flow Objectives being achieved?). Issues to include in the description of the receiving waters could include: a) lake or estuary flushing characteristics b) specific human uses (e.g. exact location of drinking water offtake) c) sensitive ecosystems or species conservation values d) a description of the condition of the local catchment e.g. erosion levels, soils, vegetation cover, etc f) historic river flow data where available for the catchment.	**4**
	No Proposal should breach clause 120 of the Protection of the Environment Operations Act 1997 (i.e. pollution of waters is prohibited unless undertaken in accordance with relevant regulations). Identify and estimate the quantity of all pollutants that may be introduced into the water cycle by source and discharge point including residual discharges after mitigation measures are implemented. Include a rationale, along with relevant calculations, supporting the prediction of the discharges. Describe the effects and significance of any pollutant loads on the receiving environment. This should include impacts of residual discharges through	**4** and **8**

Government Agency	Paraphrased Requirement	Relevant section of this report
	modelling, monitoring or both, depending on the scale of the Proposal. Determine changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, wetland hydrologic regimes). Describe water quality impacts resulting from changes to hydrologic flow regimes (such as nutrient enrichment or turbidity resulting from changes in frequency and magnitude of stream flow). Identify potential impacts associated with geomorphological activities with potential to increase surface water and sediment runoff or to reduce surface runoff and sediment transport. Also consider possible impacts such as bed lowering, bank lowering, instream siltation, floodplain erosion and floodplain siltation.	
	The significance of the impacts listed above should be predicted. When doing this it is important to predict the ambient water quality and river flow outcomes associated with the Proposal and to demonstrate whether these are acceptable in terms of achieving protection of the Water Quality and River Flow Objectives. In particular the following questions should be answered: a) will the Proposal protect Water Quality and River Flow Objectives where they are currently achieved in the ambient waters; and b) will the Proposal contribute towards the achievement of Water Quality and River Flow Objectives over time, where they are not currently achieved in the ambient waters.	**8**
	Consult with the EPA as soon as possible if a mixing zone is proposed (a mixing zone could exist where effluent is discharged into a receiving water body, where the quality of the water being discharged does not immediately meet water quality objectives. The mixing zone could result in dilution, assimilation and decay of the effluent to allow water quality objectives to be met further downstream, at the edge of the mixing zone. The EPA will advise the proponent under what conditions a mixing zone will and will not be acceptable, as well as the information and modelling requirements for assessment.	NA
	Where a licensed discharge is proposed, provide the rationale as to why it cannot be avoided through application of a reasonable level of performance, using available technology, management practice and industry guidelines.	**4, 5** and **6**
	Where a licensed discharge is proposed, provide the rationale as to why it represents the best environmental outcome and what measures can be taken to reduce its environmental impact.	**5** and **6**
	Outline stormwater management to control pollutants at the source and contain them within the Site. Also describe measures for maintaining and monitoring any stormwater controls.	**4** and **6** and **Appendix A – Figure A2**
	Outline erosion and sediment control measures directed at minimising disturbance of land, minimising water flow through the Site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.	**6** and **Appendix A – Figure A2**
	Describe waste water treatment measures that are appropriate to the type and volume of waste water and are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the Site; reusing/recycling waste water; and treating any unavoidable discharge from the Site to meet specified water quality requirements.	**4** and **6**
	Outline pollution control measures relating to storage of materials, possibility of accidental spills (eg preparation of contingency plans), appropriate disposal methods, and generation of leachate.	**9**
	Describe hydrological impact mitigation measures including: a) site selection (avoiding sites prone to flooding and waterlogging, actively	**7, 8** and **9**

Government Agency	Paraphrased Requirement	Relevant section of this report
	eroding or affected by deposition) b) minimising runoff c) minimising reductions or modifications to flow regimes	
	Describe geomorphological impact mitigation measures including: a) site selection b) erosion and sediment controls c) minimising instream works d) treating existing accelerated erosion and deposition e) monitoring program.	**8** and **9**
	SURFACE WATER – OFFICE OF WATER REQUIREMENTS	
NSW Office of Water (10/6/2014)	Details of water proposed to be taken (including through inflow and seepage) from each surface water source as defined by the relevant water sharing plan	**5** and **6**
	Assessment of any water licensing requirements (including those for ongoing water take following completion of the project)	**4**
	Identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.	**5**
	Assessment of impacts on surface water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land and measures proposed to reduce and mitigate these impacts.	**8**
	Proposed surface water monitoring activities and methodologies	**4**
	Full technical details and data of all surface and groundwater modelling.	**5**, **6**, **7** and **8**
	A detailed and consolidated site water balance	**5**
	Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts	**8**
	Consideration of relevant policies and guidelines.	**3**
	Scaled plans showing the location of: - watercourses and top of bank; - riparian corridor widths to be established along the creeks; - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed); - the Site boundary, the footprint of the Proposal in relation to the watercourses and riparian areas; and - proposed location of any asset protection zones; - location of the existing internal road alignment compared to the proposed realignment; - location of the additional stockpile area of recycled materials;	**Appendix A – Figure A1** and **Figure 3**
	Photographs of the watercourses	**Appendix A** and **Appendix B**
	A detailed description of all potential impacts on the watercourses/riparian land	**8**
	A description of the design features and measures to be incorporated to mitigate potential impacts;	**4**
	Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel	**4**

Government Agency	Paraphrased Requirement	Relevant section of this report
	and on adjacent floodplains.	
	Clarify whether the proposed road realignment will encroach into the riparian corridor width that needs to be provided along Prospect Creek.	**8**
	SURFACE WATER – FISHERIES NSW RECOMMENDATIONS	
	Prospect Creek has been mapped as being key fish habitat. The Department recommends that the project is designed to: Minimise impacts to the riparian zone of Prospect Creek; Minimise potential erosion and sedimentation impacts to the river during and following construction Maintain or improve any existing stormwater related impacts to Prospect Creek.	**4** and **8**
	SURFACE WATER - FAIRFIELD CITY COUNCIL REQUIREMENTS	
Fairfield City (3/6/2014)	Specific information demonstrating that there will be no net increase in stormwater run-off from the Site or increase in flood levels along Prospect Creek as a result of the development.	**8**
	Detailed modelling of the potential surface water impacts of the project paying particular attention to Prospect Creek and its associated riparian corridor	**8**
	A site water balance for the project including strategies to minimise water use.	**5**
	Details of erosion and sedimentation controls during construction and operation of the development.	**6**

3 RELEVANT LEGISLATION, POLICY AND GUIDELINES

3.1 Legislation

3.1.1 Water Management Act 2000 and Water Act 2012

The *Water Act 1912* and *Water Management Act 2000* (WM Act 2000) contain provisions for the licensing of water capture and use. If any dams are proposed as part of the water management infrastructure, consideration must be given to whether the storages onsite need to be licensed. If the storages are not within the harvestable right of the property, or are not specifically exempt storages, it is likely that they would need to be licensed.

The sediment basins onsite are licenced under the by facilities Environment Protection Licence 11815 and provide a pollution prevention function. Therefore the sediment basins are exempt from harvestable right calculations.

The Proposal is an SSD project and is therefore exempt from requiring water use approvals, water management works approvals and controlled activity approvals under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

No additional water management infrastructure is proposed to be constructed as part of this Proposal.

3.1.2 Water Sharing Plan

The Proposal is located within the area covered by the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011 (the Water Sharing Plan). This Plan aims to provide the water supply to approximately 70% of the NSW population and ensure healthy and enhanced water sources and water dependent ecosystems for equitable sharing among users.

As a means of achieving the objectives of the Water Sharing Plan, total daily extraction limits are in place to protect the water held under access licences for the purpose of providing water to the environment and protecting flow. Extraction limits and environmental flow protection rules are used to protect, preserve, maintain and enhance the region’s water. Planned environmental water provisions are in place to achieve this and relate to water that is committed by management plans for fundamental ecosystem health or other specified environmental purposes, and that cannot to the extent committed be taken or used for any other purpose. Adaptive environmental water conditions may be imposed on the whole or part of an access licence as another way to ensure the environmental water supply is protected.

The Site is located within the Prospect Creek Management Zone.

Rainfall runoff from the Site is collected in two sediment basins on the Site. Water from the sediment basins is reused onsite primarily for dust suppression and plant operations. Water use is discussed further in **Section 5**.

The Proposal does not involve extracting water from any other sources.

3.2 Policies and Guidelines

The following relevant policies and guidelines were considered as part of this SWA:

- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC, 2004);
- Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment;
- Managing Urban Stormwater: Soils & Construction (NSW Government, 2004);
- Managing Urban Stormwater: Treatment Techniques (NSW EPA, 1997); and

- Managing Urban Stormwater: Source Control (NSW EPA, 1998).

3.2.1 Managing Urban Stormwater: Soils and Construction

In NSW, the most relevant and comprehensive guidelines for the design of stormwater controls are contained within the Landcom document, 'Managing Urban Stormwater: Soils and Construction', Vol. 1, 4th ed. (Landcom, 2004) commonly known as the 'Blue Book'. The Blue Book is utilised as guidance for broader industries and contains prescriptive guidelines for what should be included in an Erosion and Sediment Control Plan (ESCP) and a Soil and Water Management Plan (SWMP).

The principles of surface water and sediment control, have been adopted when assessing the performance and suitability of the current water quality ponds onsite in relation to the Proposal.

The principles of erosion and sediment control have been adopted in developing the proposed management and mitigation measures in this SWA.

3.2.2 Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment;

The Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment (GMREP no.2) (NSW Government, 2008) is a State Environmental Planning Policy. The GMREP No.2 aims to protect the water quality of the Georges River and its tributaries and the environmental quality of the whole catchment. The objectives of the plan are to be achieved through coordinated land use planning and development control. The plan establishes the framework within which local, State and Federal agencies will consult so that there is a consistent approach to planning and development within the catchment.

The proposed surface water management associated with the Proposal should be consistent with the policy principles and objectives. The key aspect of this would be to demonstrate that there is no significant degradation of Prospect Creek as a result of the Proposal.

3.2.3 NSW Water Quality and River Flow Objectives

The existing sediment basins at the Site discharge to Prospect Creek (via a licensed discharge point). Prospect Creek is situated within a portion of the Georges River catchment which is defined by NSW EPA as 'uncontrolled streams and waterbodies'. The 'uncontrolled streams and waterbodies' flow patterns are largely natural but have been altered in some way (NSW EPA, 2014b).

The water quality objectives for uncontrolled streams within the Georges River catchment include protection of: aquatic ecosystems; visual amenity; secondary contact recreation; primary contact recreation; livestock water supply; irrigation water supply; homestead water supply; and aquatic foods.

The river flow objectives for uncontrolled streams within the Georges River catchment include: protect pools in dry times; protect natural low flows; maintain wetland and floodplain inundation; maintain natural flow variability; and minimise effects of weirs and other structures.

Trigger levels for each water quality objective are outlined in EPA (2014c). These targets and trigger levels have been considered in this SWA.

3.2.4 National Water Quality Management Strategy

The National Water Quality Management Strategy (NWQMS) provides a national approach to improving water quality in Australia's waterways. Development has progressed since 1992, with the Australian Government working in cooperation with state and territory governments to produce the Strategy. The Strategy incorporates a number of key guidelines concerning management and monitoring of water including the following:

- Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000); and
- Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000).

Direction for the application of the guidelines is provided in by the following document:

- Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC, 2006).

No changes to the existing Site water quality monitoring program are proposed, which includes sampling for total suspended solids, turbidity, pH and oil and grease daily during any controlled discharge from the sediment basins.

The ANZECC (2000) guidelines for protection of freshwater ecosystems have been considered in assessing the water quality impacts of current and future discharges to Prospect Creek.

3.2.5 NSW State Rivers and Estuaries Policy

The NSW State Rivers and Estuaries Policy, originally published in 1993, contains State-wide objectives for the protection and enhancement of watercourses. Though the institutional arrangements and legislation have changed since then, the overarching objectives remain valid. The overall objectives of the policy are “to manage the rivers and estuaries of NSW in ways which slow, halt or reverse the overall rate of degradation in their systems, ensure the long-term sustainability of their essential biophysical functions, and maintain the beneficial use of these resources” (NSW Water Resources Council, 1993).

The proposed surface water management associated with the Proposal should be consistent with the policy objectives. This SWA demonstrates there is no significant degradation of Prospect Creek as a result of the Proposal.

3.2.6 State Water Management Outcomes Plan (WM Act)

The WM Act includes the State Water Management Outcomes Plan, a statutory document which sets the overarching policy, targets and strategic outcomes of the WM Act. This document expired in 2007, however, the content of the document remains an important reference with regard to water management objectives for proposed developments.

3.2.7 Guidelines for Controlled Activities – Riparian Corridors (WM Act)

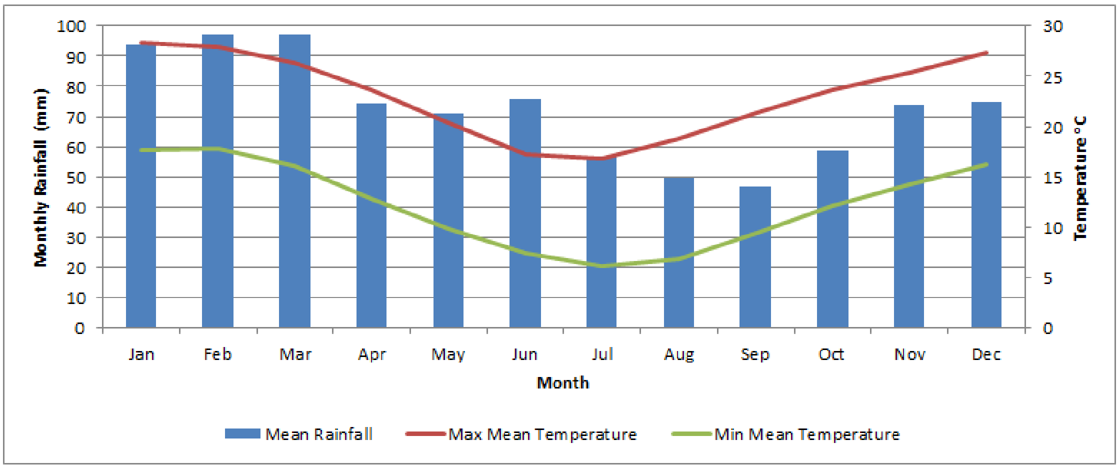
The WM Act includes guidelines for Controlled Activities – Riparian Corridors which outline the required buffer zones required to be maintained between watercourses and proposed developments including Core Riparian Zone, a Vegetated Buffer and an Asset Protection Zone. The required size of these buffer zones depends upon the conservation significance of the stream, with larger buffer zones required for more significant streams.

4 EXISTING SURFACE WATER ENVIRONMENT

4.1 Climate

A summary of the mean rainfall and temperature statistics for the local area, obtained from the Bureau of Meteorology climate station at Prospect Reservoir (Site Number 67019), is provided in **Figure 4** below.

Figure 4 Local Climate Statistics



4.2 Landform

Generally, the Site slopes in a south easterly direction towards Prospect Creek. The Site is generally elevated above the floodplain as illustrated by flood mapping provided by Fairfield City Council (**Appendix C**).

The southern and eastern fringes of the Site are slightly raised in order to prevent stormwater from flowing offsite. These bunds will not be modified by the Proposal.

4.3 Vegetation

Vegetation occurs within the northern, western and southern fringes of the Site and around the eastern edges of the existing sediment basins.

The vegetation within the southern fringes of the Site, associated with Prospect Creek, extends between Prospect Creek and the existing development footprint.

4.4 Riparian Corridor

SLR contacted the NSW Office of Water to confirm the stream order of Prospect Creek according to the Strahler System. A Water Regulation Officer advised (NSW OW, 2014) that Prospect Creek should be considered a second order creek adjacent to the Site.

Based upon the Guidelines for riparian corridors on waterfront land (NSW DPI, 2012) the vegetated riparian zone extends 20 m from the top of the highest bank on both sides of the watercourse. The riparian corridor width is shown in **Figure A1**.

4.5 Surrounding Land Uses

A former quarry is located to the north of the Site. This land has been redeveloped for industrial and commercial uses.

The Prospect Creek riparian corridor is situated to the south of the Site. The Wetherill Park industrial estate is located to the south of Prospect Creek.

Parklands are located between the western site boundary and Prospect Reservoir.

4.6 Surface Hydrology

The Site is located within the Prospect Creek Catchment, a sub-catchment of the Georges River, which covers an area of approximately 98 km^2. The Prospect Creek catchment is shown in **Figure 5** below.

Figure 5 Prospect Creek Catchment

Extract from: **http://www.fairfieldcity.nsw.gov.au/upload/bwztj47212/Facts_Figures_doc_creek.pdf**

Key features of the local catchment are shown in **Figure A1**.

Prospect Creek flows in a north easterly direction from Prospect Dam into a wetland area within Walder Park before flowing south westerly through the Site and approximately 50 m from the existing development footprint at its closest point, based upon topographical mapping and site observations. The approximate Prospect Creek flow path is shown in **Figure A1**.

Prospect Creek's catchment upstream of the Site is shown in **Figure A1**. The upstream catchment area is approximately 1.6km^2.

A drain which conveys stormwater from the Wetherill Park industrial estate, flows into Prospect Creek approximately 50 m downstream of the Site. A photograph is provided in **Figure A1** and in **Appendix A**.

Prospect Creek was inspected adjacent to the Site on 12/06/2014. The creek channel was observed to be narrow, approximately 4 m wide, at this location. A photograph is provided in **Figure A1** and in **Appendix A**.

4.6.1 Prospect Creek Flow Gauges

Flow is monitored at Prospect Creek immediately upstream of Warren Road, Smithfield (NSW Office of Water Gauge 213009). The flow monitoring location is approximately 3.5km south east of the Site. Given the distance downstream, flow monitoring data is considered to be unsuitable for analysing flows in Prospect Creek adjacent to the Site.

4.7 Licensed Discharge Points

The site has one licensed discharge point (LDP) registered under the existing Environment Protection Licence 11815 (EPL).

Stormwater is discharged to Prospect Creek via the current LDP, which is the outlet of the second sediment basin (Basin 2) as shown in **Figure A2**. The current LDP will be maintained for the Proposal.

4.8 Existing Surface Water Management

4.8.1 Surface Water Management

The facility operates under the Widemere Operational Environmental Management Plan (OEMP) (Boral 2010). The surface water management system comprises a network of open drains, swales and pipes that collect stormwater runoff from the Site, which is captured in two sediment basins (Basin 1 and 2). These basins have a combined volume of approximately 5160 m^3. The basins are hydraulically linked and have an outlet pipe of 800 mm that discharges into Prospect Creek. Discharges from the basins are licensed under the facility's EPL.

Stormwater generated within the western portion of the facility drains overland towards an open drain that runs on the outer perimeter of the southern haul road. The north-eastern portion of the Site drains to a grass swale which runs south-west between the Site entrance and the basins. Stormwater is piped from the open drain to an oil/grit separator prior to being discharged to the sediment basins. Stormwater flowing south from the vegetated land to the north/north-east of the facility is collected in a grass swale before being diverted away from the facility. Stormwater flows into Basin 1, which drains into Basin 2.

Water from Basin 2 is extracted for reuse for the following activities:

- dust suppression on internal roads;
- dust suppression on stockpiles and in crushing and screening areas of the plant; and
- wheel wash water.

A water cart is used to manage dust on internal roads. Water cannons are used on crushing and screening areas to manage dust generation by wind from raw feed stockpiles.

Water from the second basin is pumped to the wheel wash as well. Wastewater from the wheel wash is discharged via the oil/grit separator back to the first basin, thereby minimising water losses.

Potable mains water is used to meet any water deficit where insufficient water is available from the sediment basins.

4.8.2 Surface Water Treatment

Surface water is treated by a series of surface water management controls as detailed in Section **4.8.1**.

In addition, two flocculent products are used within the sediment basins onsite including EM 640 CT and Damclear flocculent block.

Information provided on the Material Safety Data Sheet for FLOPAM EM 640 CT, is provided below:

- The product is "*not readily biodegradable*".
- *"At natural pHs (>6) the polymer degrades, due to hydrolysis, to more than 70% in 28 days. The hydrolysis products are not harmful to aquatic organisms."*
- Fish LC50 toxicity levels (for 96 hour exposure) were reported to range between greater than 10 – 100 mg/L.
- Dephnid EC50 toxicity levels (for 48 hour exposure) were reported to be greater than 50 mg/L.
- *"Algal inhibition tests are not appropriate. The flocculating characteristics of the product interfere directly in the test medium preventing homogenous distribution which invalidates the test".*
- *"The effects of EM 640 CT product on aquatic organisms are rapidly and significantly mitigated by the presence of dissolved organic carbon in the aquatic environment."*

The Damclear flocculant block is reported to be "*non-toxic"* (Environmental Warehouse 2015) but no readily available information was found in terms of aquatic ecosystem exposure levels.

Flocculants are added at recommended quantities.

4.8.3 Existing Discharge Frequency and Volume

Water discharges from the Site are managed through the two sediment basins (Basins 1 and 2), shown in **Figure 2**. Water levels in the sediment basins are affected by site water demand, primarily for dust suppression.

Discharge of water from the LDP is permitted under the EPL when the 90^{th} percentile, 5 day rain event design storm is exceeded (i.e. greater than 45 millimetres rainfall over any consecutive five day period).

Water volumes in the basins are actively drawn down to ensure that no water is discharged from the LDP more frequently than the design storm.

Discharge volumes are subject to the EPL requirement to discharge up to a maximum of 100,000 L/day. Discharge occurs via a corrugated iron stormwater pipe that drains to Prospect Creek under gravity.

4.8.4 Existing Surface Water Quality Criteria

The protection of receiving water quality with respect to the Site operations is regulated under the existing EPL, if and when discharge occurs. The concentration of the pollutants discharged from the LDP must not exceed the respective concentration limits as specified in **Table 2** below.

Table 2 Pollutant Discharge Limits

Parameter	Maximum Allowable Discharge Concentration
Total Suspended Solids (TSS)	50 mg/L

Parameter	Maximum Allowable Discharge Concentration
pH	6.5 – 8.5
Turbidity	150 NTU
Oil and Grease	10 mg/L

4.9 Flooding

SLR contacted Fairfield City Council to obtain flood levels and flood risk details for the Site. The information supplied by Fairfield City Council is provided in **Appendix C** and summarised below.

The Site is identified as being partly within a High Flood Risk Precinct, partly within a Medium Flood Risk Precinct, partly within a Low Flood Risk Precinct as a result of overland flooding and partly not affected by local overland flooding.

The Site is identified as being partly within a High Flood Risk Precinct, partly within a Medium Flood Risk Precinct and partly within a Low Flood Risk Precinct as a result of main stream flooding and partly not affected by main stream flooding.

The flood risk precincts are defined as follows:

- High Flood Risk – This has been defined as the area of land below the 100 year Average Recurrence Interval (ARI) flood event that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties.
- Medium Flood Risk – This has been defined as land below the 100 year ARI flood event that is not within a High Flood Risk Precinct. This is land that is not subject to a high hydraulic hazard or where there are no significant evacuation difficulties.
- Low Flood Risk – This has been defined as all land within the floodplain (i.e. within the extent of the probably maximum flood) but not identified within either a High Flood Risk or a Medium Flood Risk Precinct. The Low Flood Risk Precinct is that area above the 100 year flood event.

Flood levels for the Probable Maximum Flood (PMF), 100 year ARI event and 20 year ARI event are provided in **Table 3**.

Table 3 Local Overland Flood Details

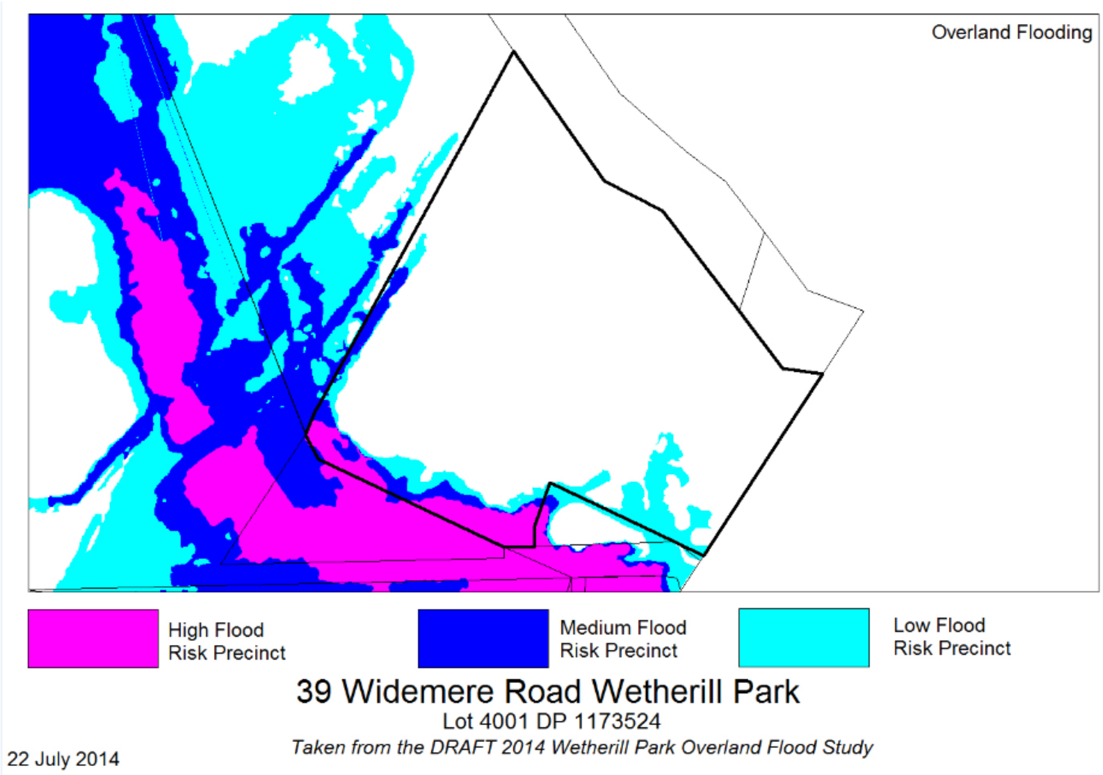
Flood Event	Overland Flood Level (mAHD)	Mainstream Flood Level (mAHD)
PMF	34.4 – 37.9	34.3
100 year ARI	32.8 – 33.5	32.8
20 year ARI	32.6 – 33.4	32.5

Fairfield Council's Overland flood map of the Site and its surrounds is shown in **Figure 6** below.

The development footprint is shown to be unaffected by overland flooding. Only the vegetated portion of the Site, adjacent to Prospect Creek and along the western boundary, is located within the overland flow flood risk precincts (high, medium and low).

Although no mapping was provided at the time of reporting, a comparison of mainstream flood levels with the Site elevations within the development footprint (refer to Figure A2 in **Appendix A**) indicates that the development footprint is unlikely to be affected by mainstream flooding.

Figure 6 Flood Mapping Provided by Fairfield Council



4.10 Background Water Quality in Prospect Creek

The Fairfield City Council Water Management Plan (Cardno, 2007), states that waterways within the Prospect Creek Catchment have been found to be significantly affected by pollutants, with low levels of dissolved oxygen and high levels of pH and nutrients typically being recorded. Nutrient levels were typically greater following storms where large quantities of industrial runoff enter the system (Cardno, 2007).

A drain which runs through the Wetherill Park Industrial Estate reaches its confluence with Prospect Creek approximately 50 m down gradient of the Site. Surface water quality in the creek is therefore likely to be heavily impacted by pollutants associated with industrial stormwater flows.

Boral currently do not monitor water quality within Prospect Creek as there is no safe access to the creek channel from the Site.

A summary of water quality data for Prospect Creek at Widemere Road, provided by Fairfield City Council, for May 2012 to May 2014, is presented below. The results show elevated concentrations of nutrients, pH and turbidity and low levels of dissolved oxygen in relation to ANZECC (2000) guideline criteria. This indicates that the Prospect Creek water quality adjacent to the Site is poor at present.

Table 4 Fairfield City Council Monitoring Data for Prospect Creek at Widemere Road

Parameter	Units	ANZECC 2000 criteria[1]	Minimum	Maximum	Mean
Dissolved Oxygen	mg/L	85 - 110	52.4	120.2	81.2
pH	pH units	6.5 – 8.0	7.2	9.22	8.2

Parameter	Units	ANZECC 2000 criteria[1]	Minimum	Maximum	Mean
Turbidity	NTU	6 - 50	7.4	391	63.0
Conductivity	uS/cm	125 – 2,200	255	1,650	967
Total Phosphorus	mg/L	0.05	0.02	0.52	0.12
Total Nitrogen	mg/L	0.5	0.6	6.9	1.54

Note 1 – ANZECC 2000 guideline trigger values for slightly disturbed ecosystems in lowland rivers in South East Australia

4.11 Waste Materials

The currently permitted wastes under EPL11815 include:

- Building and demolition waste;
- Asphalt waste;
- Virgin Excavated Natural Material (VENM);
- Plasterboard and ceramics;
- Cured concrete waste (washout) in solid form from concrete batching plant;
- Processed natural quarry product;
- Soil that meets thresholds for General Solid Waste in Table 1 of the waste classification guidelines;
- Garden waste as defined in the POEO Act;
- General or specific exempted waste; and
- Any waste that is below licensing thresholds in Schedule 1 of the POEO Act.

Permitted wastes under current operations would continue to be received by the facility. Approval is also sought to receive the following additional wastes:

- Excavated Natural Material (ENM);
- Tiles and masonry;
- Quarry products (greater than 20 mm); and
- Wet concrete batching plant stirrer waste.

4.12 Product

The facility generates two main products: aggregates and road base.

The volume of product produced under current operations is a combination of blended imported material with processed waste material.

The product produced per annum has increased from 644,000 tonnes in the period 2009-2010 to 744,000 tonnes in the period 2012-2013.

4.13 Other Waste Management

The facility generates limited volumes of other waste not recycled onsite. These types, volumes and management measures are detailed in **Table 5** below.

Table 5 Waste Management

Waste Material and description	Volume / weight per annum	Management method
Waste oil	4000 L	Waste oil is collected by a licenced waste oil recycler
Empty oil drums	20 drums	Oil drums are emptied of all residual oil. The drums are then crushed and placed into scrap metal bins for recycling
Cardboard	Unknown	Cardboard goes into General Solid Waste bins
Scrap Metal	4,200 tonnes	Scrap metal is placed in bins in the maintenance area and recycled by Sims metal
General Solid Waste (includes waste from administration offices and lunchroom)	50 tonnes to Veolia 720 tonnes to Blacktown Waste	Placed in wheelie bins that are collected by Veolia. The waste is also transferred to Blacktown Waste as General Solid Waste

5 WATER DEMAND, SUPPLY AND REUSE ASSESSMENT

5.1 Site Water Balance Model

The model used to represent the water balance for the facility is GoldSim Version 11.0.6 (GoldSim Technology Group LLC). This software is a graphical, object oriented system simulation software for completing either static or dynamic systems. Simulation, in this context, is defined as a process of creating a model of a system in order to identify and understand the factors that control the system performance or predict the future behaviour of the system.

The GoldSim water balance model (hereafter referred to as "the model") simulates daily changes in the volumes of the sediment basins in response to inflows (rainfall) and outflows (evaporation and usage). The model makes use of operating conditions relevant to site water storage management and captures as accurately as possible the Site's hydrologic cycle.

5.1.1 Surface Water Management System

The site's surface water management system is outlined in **Section 4.8** and conceptually presented in **Figure A2**.

5.1.2 Model Representation and Accuracy

The following simplifications were incorporated in the model to idealise the Sites water storage management system:

- The Site's sediment basins are hydraulically linked and as such the system was modelled as a singular basin;
- The basin geometry could not be confirmed and as such the stage-storage relationship was based on basins of similar size;
- No allowance was made for the effects of seepage or infiltration of groundwater;
- The allowance made for sedimentation within the basins was a constant reduction of the basin's volume rather than sediment build up over the course of the simulation period. This simplification is made due to the recycling facility not having a strict sediment removal schedule which could be modelled accurately. In practice, sediment removal is generally undertaken annually; and
- The total volume available for the storage of water in the sediment basins is 4130 m^3.

5.1.3 Rainfall Runoff

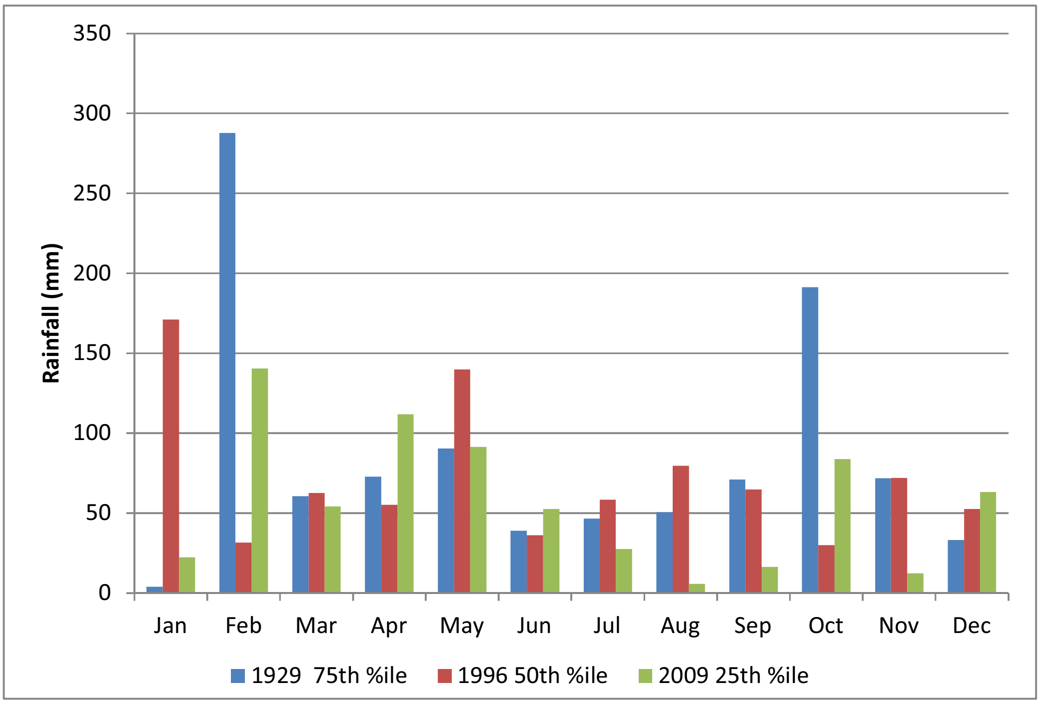
Rainfall data was collected from the Prospect Reservoir meteorological station (station number 067019) located approximately 1.5 km from the recycling facility. The Prospect Reservoir meteorological station has an extensive set of records ranging from 1887 to present, which is satisfactory for statistical analysis. From the data set, three years (2009, 1996 and 1929) were chosen to represent the 25^{th} (dry year), 50^{th} (median year) and 75^{th} (wet year) percentiles respectively. These values are summarised below in **Table 6**.

Table 6 Summary of Rainfall data input in to the Water Balance Model.

Rainfall Year	Annual Precipitation (mm)
25^{th} percentile (2009) - Dry Year	682.4
50^{th} percentile (1996) – Median Year	853.6
75^{th} percentile (1929) – Wet Year	1019.0

Further analysis of rainfall data reveals that "*Wet*" years are dictated by short episodes of intense rainfall over several days rather than a general increase spread over the course of the year. To visualise this concept, a monthly comparison of rainfall data from 2009 (25^{th} %ile – Dry Year), 1996 (50^{th} %ile – Median Year) and 1929 (75^{th} %ile – Wet Year) is shown below in **Figure 7**.

Figure 7 Comparison of monthly rainfall data



The hydraulic parameters used in the water balance model are initial rainfall loss and runoff coefficients. These parameters are used due to their link to the volumetric requirements of a daily time step water balance. These values have been conservatively estimated based on relevant guidelines and SLR's experience with similar water balance investigations. The hydraulic parameters which were used in the model are shown below in **Table 7**.

Table 7 Summary of hydraulic parameters

Parameter	Value
Hardstand Initial Volume Loss	5mm
Vegetated Initial Volume Loss	30mm
Hardstand Volumetric Runoff Coefficient	0.8
Vegetated Volumetric Runoff Coefficient	0.15

5.1.4 Additional Make-Up Water

The Site has access to a supplementary potable water supply in the event that no water is available for reuse in the sediment basins.

5.1.5 Evaporation

The primary source of water loss from the sediment basins is through evaporation. The raw mean daily evaporation rates by month are available from the Prospect Reservoir meteorological station. This data was adjusted by a pan co-efficient of 0.7 to account for differences in the measuring site conditions compared to the project site conditions. The adjusted mean daily evaporation rates from this meteorological station which were used in the model are shown in **Table 8** below.

Table 8 Summary of Mean Daily Class 'A' Pan Evaporation Rates from Prospect Reservoir

Month	Mean Daily Evaporation (mm)
January	3.85
February	3.29
March	2.73
April	2.1
May	1.4
June	1.12
July	1.19
August	1.75
September	2.52
October	3.08
November	3.43
December	3.99

5.1.6 Water Usage

Water from the sediment basins is used for a number of purposes at the Site. The recycling facility is proposed to operate 6 days per week with a relatively consistent daily water demand. The daily water use values used for input in the model have only recently been introduced into the Site's water operating procedures and as such the performance of the basin and revised operating procedure is being analysed to achieve optimization of the system.

The recent changes to the Site's operating procedures have been made in an attempt to maximise the reuse of harvested water. Optimizing the performance of the water management procedures may result in minor changes to the values used in the model however it is expected that the long term daily water usage will remain relatively consistent with the values used in the development of the model. The daily water usage values used in the model are shown in **Table 9**. These values have been obtained from information provided by Boral.

Table 9 Summary of Daily Water Usage

Water Demand	Daily Water Use (m^3)
Water cart (dust suppression)	200.00
Fixed Plant	17.50
Stab Plant	15.00
Sprinkler System (dust suppression)	3.75
Pugmill	0.39

5.1.7 Site Discharge

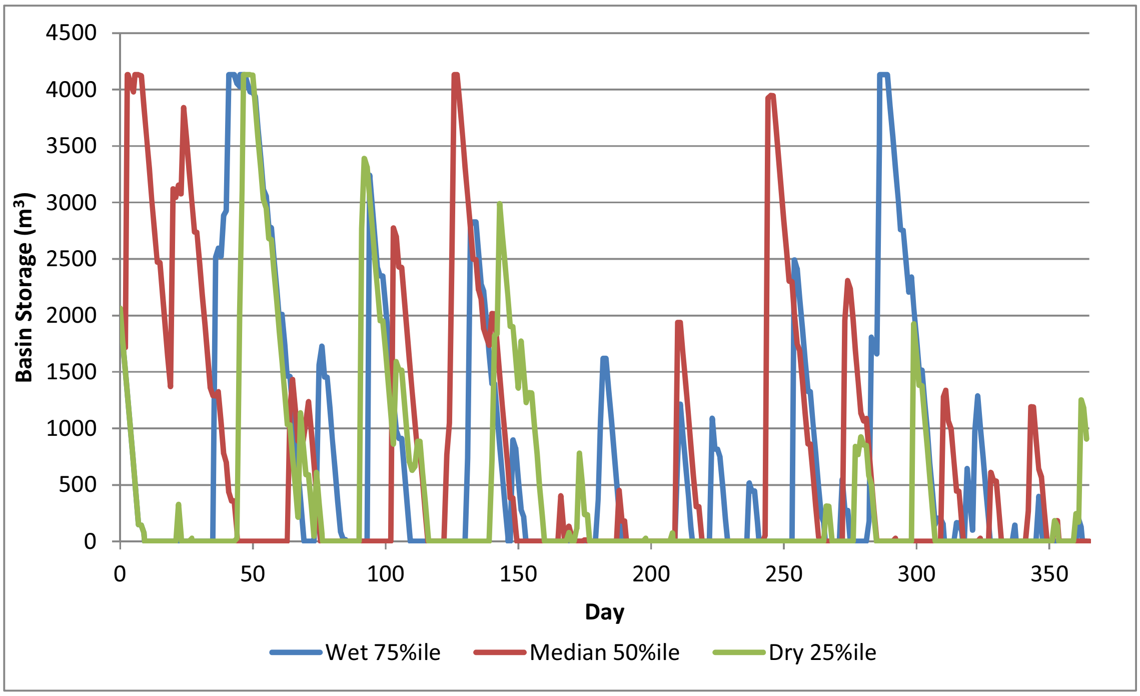
In the event that the sediment basins exceeds their functional capacity and breach the spillway, the excess water flows uncontrolled into Prospect Creek via an 800mm diameter gravity fed pipe outlet. Currently, the basins are actively drawn down to prevent discharges that are outside the requirements of the EPL.

In the model, this discharge is defined as overflow and is carefully tracked throughout the simulation.

5.2 Site Water Balance Results

The basin storage volumes under the proposed development for the rainfall years which the model simulated are provided in **Figure 8**.

Figure 8 Simulated Basin Storage Volume Results for the Proposed Development



The results of the model, as shown in **Figure 8**, are typical of the temperate climatic conditions experienced in the geographical setting of Western Sydney, whereby the rainfall experienced through the warmer months of the year is more intense than the winter months. **Figure 8** also highlights the simplistic nature of the model and its sensitivity to rainfall input. This sensitivity is exposed due to the dominant output demand (dust suppression) of the basin only taking place on days when rainfall does not occur. This can be reasoned as a significant contributing factor to the frequency of overflow events due to the minimal demands during several day rainfall events resulting in the rapid filling of the basin and subsequent discharge.

The overall results of the model for the existing development and the proposed development site which includes extension of the disturbance boundary to cover an additional 0.4 ha are summarised in **Table 10** below.

It is noted that, as the water demands input into the model have only recently been introduced into the Site's water operating procedures, the 'existing development' model scenario does not represent the water management practices which have historically operated onsite. Instead, the 'existing development' scenario provides a means of directly comparing the impact of the Proposal with how the Site would operate without the Proposal.

Table 10 Summary of Water Balance Results for the Existing and Proposed Development

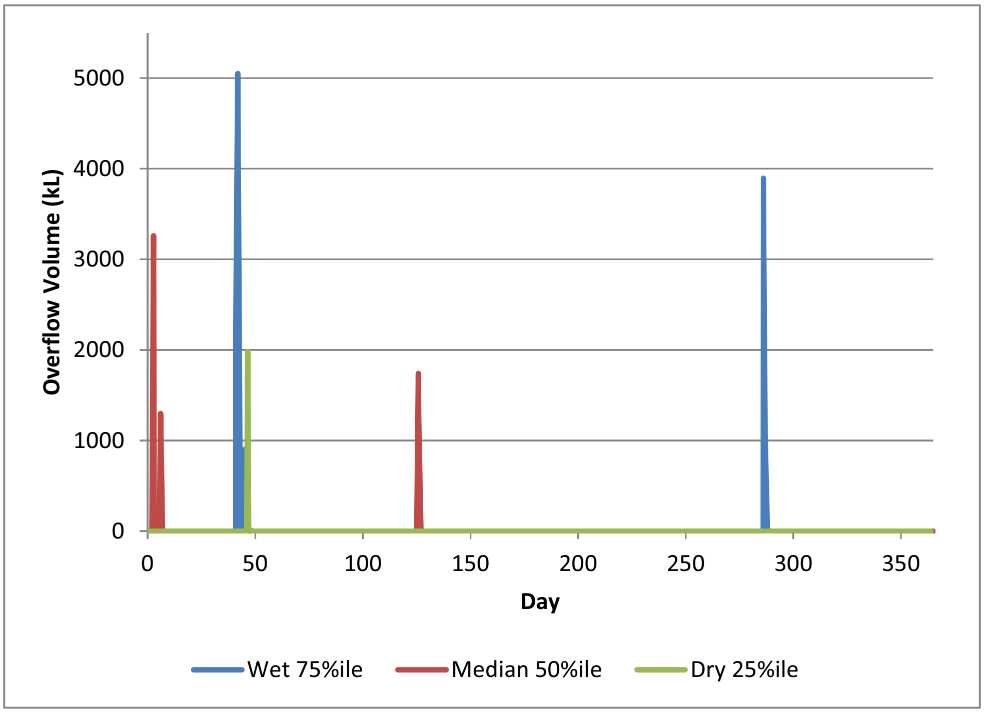
Year	Total Basin Inflow via Runoff (ML)	Total Basin Outputs [1] (ML)	Potable Supplementary Water usage (ML)	Number of days Basin is Empty	Number of Overflow Events	Annual Volume of Overflows (ML)	Number of overflows which met 100kL/day criteria	Number of overflows which met 45 mm over preceding 5 days criteria
Existing Development								
Dry (25th percentile)	21.79	73.24	51.85	240	3	0.76	2	3
Median (50th percentile)	31.52	74.25	42.52	197	4	3.14	0	4
Wet (75th percentile)	41.28	83.33	42.00	190	7	11.69	1	7
Proposed Development								
Dry (25th percentile)	22.75	73.48	51.11	237	3	0.99	2	3
Median (50th percentile)	32.88	74.71	41.47	193	5	3.66	0	5
Wet (75th percentile)	43.04	84.22	41.07	185	7	12.57	1	7

Note: Approximately all input water is extracted over the course of the year. Outputs exceed inputs due to the adopted initial basin water level condition.

Results in **Table 10** show that the Proposal will have a minimal effect on the frequency of predicted discharge events. The water balance model predicts that all overflows met the 45 mm rainfall depth over preceding 5 day EPL criteria for the three rainfall years analysed (i.e. dry, median and wet). However the water balance model predicts that the majority of overflows exceeded the 100 KL/day maximum discharge EPA criteria for the three years analysed.

The modelled overflow volumes are shown in **Figure 9**.

Figure 9 Daily overflow volumes



5.3 Water balance conclusions and recommendations

The results of the model show that the proposed water usage compares closely to the existing water usage patterns. The increase in hardstand area of the proposed development will slightly increase the volume of runoff which is able to be captured by the Site. The results of the model show that the slight increase in runoff volume will slightly reduce the amount of days in which the dam is empty. However, the increase in hardstand area (and associated runoff) also contributes to additional overflow volumes compared to the existing development scenario.

To alleviate the issues highlighted by the water balance model it is recommended that Boral investigates additional stormwater storage and/or water supply options to supplement water demand during dry periods when the basins are empty.

The water balance model predicts that the majority of overflows exceeded the 100 kL/day maximum discharge EPA criteria for all the three years analysed. This EPL criterion is therefore considered to be unachievable for the existing surface water management regime.

As suggested in **Section 5.1.3,** rainfall data reveals that “wet” years are dictated by short episodes of intense rainfall over several days rather than a general increase over the course of the year. This concept in combination with the simplification of the Site’s water system has a noteworthy effect on the reliability of the water balance model results. As such the results of this study reflect a simplified representation of the Site’s water management system. The model cannot take into account any procedures outside of the general operating assumptions which may be implemented on a temporary basis to alleviate issues such as the basin emptying or overflowing.

It is recommended that closer monitoring of the water levels in the basin is undertaken on a scheduled basis particularly after rain events and the data gathered from this process be utilised to optimise the Sites water management practices.

6 WATER QUALITY AND SEDIMENT MANAGEMENT ASSESSMENT

6.1 Surface Water Management

The facility's OEMP (Boral 2010) states that the sediment basin water is sampled and analysed prior to any discharge to Prospect Creek, unless it is necessary to regulate the volumes within the basins to ensure adequate capacity for a 90th percentile 5 day rainfall event, in which case, sampling is undertaken during discharge. Monitoring is also conducted on an irregular basis (approximately every one to two months) to assess the quality of water in the basins and determine if flocculation or active management is required.

Based on discussions with Boral and review of drainage calculations, we suggest that the OEMP be updated to reflect the following:

1. The primary and secondary sediment basins currently have a total volume that exceeds the volume of runoff generated by a 90th percentile, 5 day duration rainfall event plus additional capacity for sediment settlement (75th percentile, 5 day duration rainfall event) and sediment storage;

2. Water is extracted from the basins during dry periods to maximise the stormwater storage capacity.

3. Water quality sampling is undertaken during discharge via the LDP.

4. Discharge via the LDP is controlled via the capacity of an 800mm diameter gravity pipe.

5. Water quality in the basins is actively managed to ensure discharges meet water quality objectives in the EPL (Table 1).

A conceptual representation of the current stormwater management system is shown in **Figure A2**.

Stormwater generated within the western portion of the Site currently drains overland towards an open drain which runs on the outside of the southern portion of the perimeter haul road. The north eastern portion of the Site drains to a grass swale which runs south westerly between the Site entrance and the basins. Stormwater is piped from the open drain to an oil / grit separator prior to being discharged to Basin 1.

Stormwater flowing in a southerly direction from the vegetated land to the north / north east of the Site is collected in a grass swale before being diverted away from the Site.

6.2 Erosion and Sediment Controls

Sediment laden water is temporarily collected within two open sediment cleanout pits situated inline within the open drain adjacent to the roadway. A sand bag is also used to trap sediment up gradient of the piped outlet of the open drain up gradient of Basin 1 (refer to **Figure A2**). These measures intercept sediment before it reaches the sediment basins.

The sediment cleanout pits and open drain are regularly inspected and sediment is cleaned out as required and redistributed into the recycling process stockpiles as often as is necessary to manage water quality within the basins.

6.2.1 Adequacy of Existing Basins

Details of the sediment basin zones are provided in **Table 11**. The storage capacities have been adjusted to account for the proposed development.

The following parameters were adopted for calculating basin storage requirements:

- Hardstand Catchment – 7.59 ha;
- Vegetated Catchment – 0.47 ha;
- Hardstand volumetric runoff coefficient – 0.8;
- Vegetated volumetric runoff coefficient – 0.15; and
- 90th percentile 5 day rainfall depth – 45 mm (EPL 11815) 75%ile 5 day rainfall depth - 19.2 mm (Blue Book, NSW Government, 2004).

Table 11 Basin Capacity

Sediment Basin Zone	Design Criteria	Storage Volume
Total Basin	NA	5160 KL
Retention Storage	EPA criteria based upon 90th percentile 5 day rain event	2764 KL
Settlement Zone	75%ile 5 day rain event	1180 KL
Sediment Storage Zone	Assumed to be a minimum of 50% of Settlement Zone	590 KL
Excess storage	NA	626 KL

There is currently 626 KL of excess storage available for water retention and sediment storage. Therefore the current basin is considered to provide adequate capacity in terms of sedimentation treatment.

As well as sedimentation treatment the basins may also perform water quality treatment in the form of:

- Biological uptake of soluble pollutants predominantly by phytoplankton which may exist in the water column;
- Chemical adsorption of pollutant to fine suspended sediment which remains in water column; and
- UV disinfection of waterbody by sunlight.

6.2.2 Flocculation

Flocculants will tend to accumulate with the settled sediments at the bottom of the basins. During removal from the basin, sediments will be analysed for key contaminants and depending on the analysis results, either disposed of at an appropriate facility or reused within the production process onsite.

Although offsite discharge of flocculants may occur during high flow periods, when discharges to Prospect Creek occur, based upon the available toxicity information (refer to **Section 4.1.4**) and with consideration of likely dilution effects and low exposure periods, there is considered to be a low risk of potential adverse impacts to the downstream environment where flocculants are used at prescribed concentrations.

6.3 Chemical and Fuel Management

Refuelling is undertaken in a designated bunded area.

Chemicals, oil and lubricants are stored within the workshop. Details of management of waste materials are detailed in **Section 4.13**.

6.4 Water Quality Management in Basins

To ensure surface water is managed in accordance with relevant licences and approvals, procedures for basin management are detailed in the Site's OEMP.

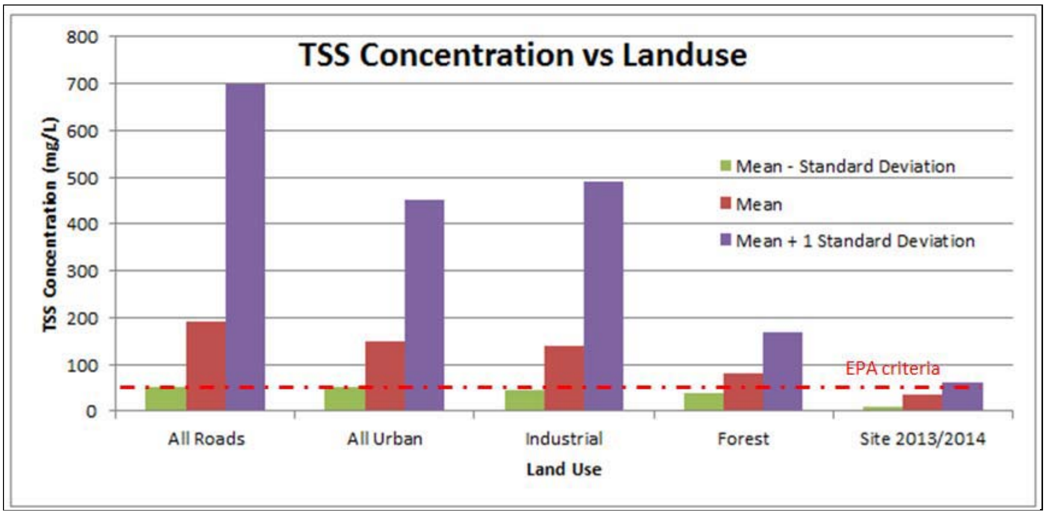
The water levels in the basins are currently monitored and adjusted to ensure adequate water is available in Basin 2 to be reused onsite. During prolonged periods of dry weather, water is pumped from Basin 1 into Basin 2 to ensure there is sufficient water to supply the water demand for dust suppression.

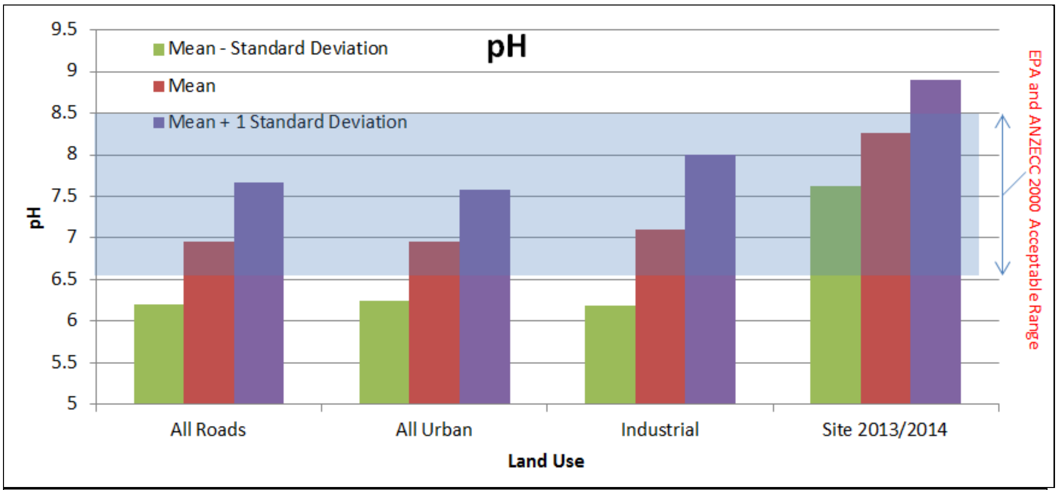
The water in Basin 2 is sampled and analysed for the key water quality criteria regularly (approximately once every 1 to 2 months). A flocculent is added where required, to improve the water quality in the basins by reducing the suspended solids. Discharges are dosed as required to ensure the pH is within the acceptable range (6.5-8.5).

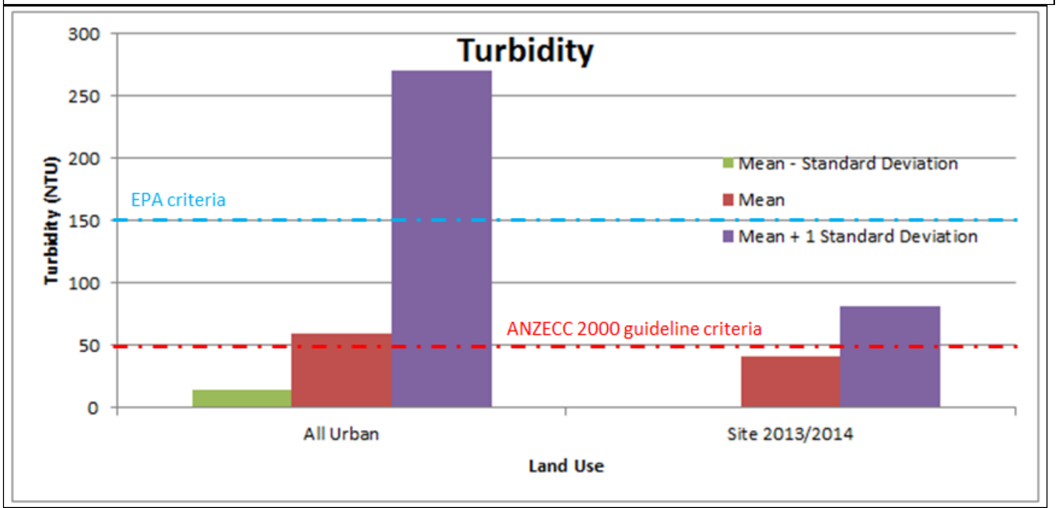
6.5 Water Quality Monitoring in Basins

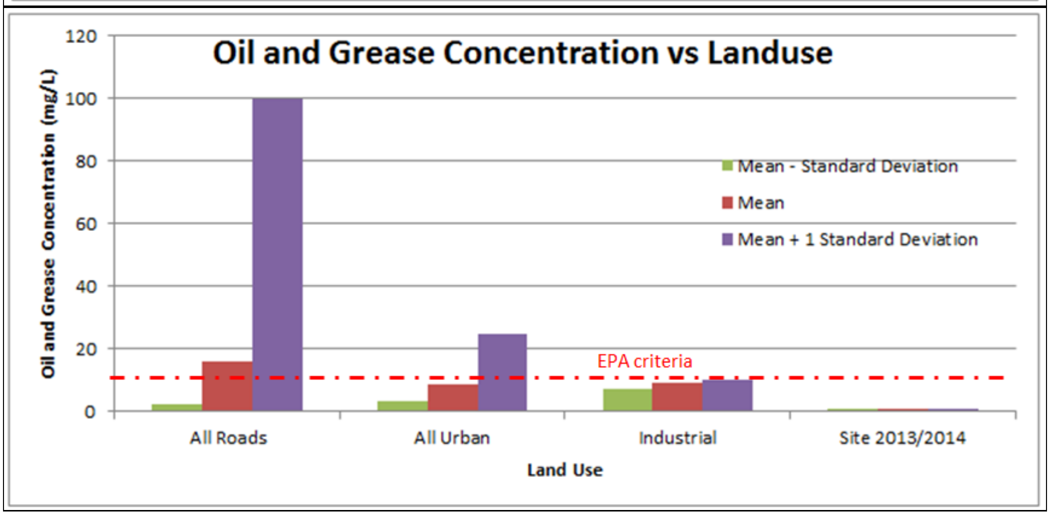
Basin and discharge water quality monitoring results for a 2 year period between February 2012 and March 2014 were provided to SLR. A total of 18 monitoring results were included in the dataset. SLR reviewed the water quality monitoring data in relation to the EPA's EPL assessment criteria (refer to Table 1), typical concentrations in stormwater from other land uses as documented in Australian Runoff Quality (EA, 2006) and ANZECC guidelines for protection of freshwater ecosystems in lowland rivers. The analysis is summarised in **Figure 10** below.

Figure 10 Water Quality Monitoring Results Summary




pH
Mean - Standard Deviation
Mean
Mean + 1 Standard Deviation
pH
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
All Roads
All Urban
Industrial
Site 2013/2014
Land Use
EPA and ANZECC 2000 Acceptable Range


Turbidity
Turbidity (NTU)
300
250
200
150
100
50
0
EPA criteria
ANZECC 2000 guideline criteria
Mean - Standard Deviation
Mean
Mean + 1 Standard Deviation
All Urban
Site 2013/2014
Land Use


Oil and Grease Concentration vs Landuse
Oil and Grease Concentration (mg/L)
120
100
80
60
40
20
0
EPA criteria
Mean - Standard Deviation
Mean
Mean + 1 Standard Deviation
All Roads
All Urban
Industrial
Site 2013/2014
Land Use

6.6 Frequency of Discharge

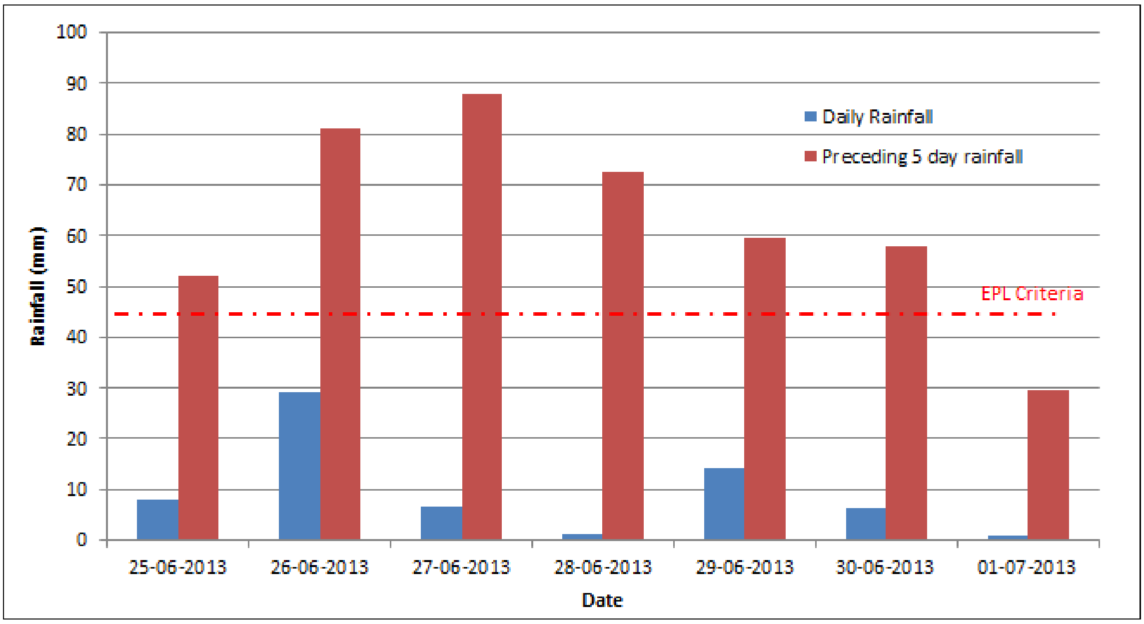
The EPL states that discharge of waters from the facility is permitted when the discharge occurs solely as a result of rainfall at the premises exceeding a total of 45 millimetres over any consecutive five day period.

Boral's records show that stormwater was discharged from Basin 2 six (6) times between February 2013 and February 2014 including the 25th, 26th, 27th, 28th, 29th of June 2013 and 1st July 2013. No discharge occurred on the 30th June 2013. The daily rainfall and preceding 5 days of rainfall during the discharge period is shown below in **Figure 11**. The rainfall exceeded 45 mm for the preceding 5 days on every day of discharge except 1st July 2013. The EPL discharge requirement was therefore met five out of the six days.

As no discharge occurred on the 30th June 2013 it is considered that a discharge on the 1st July 2013 may have been unavoidable as the basin was likely to have been close to full on the 30th June due to the preceding and the small amount of rainfall on the 1st July 2013 is likely to have led to an overflow.

It is therefore considered that the basin is predominantly performing in accordance with the EPL 45 mm, 5 day rainfall discharge requirement.

Figure 11 Daily Rainfall and 5 Day Running Totals of Rainfall on Recorded Days of Discharge Between 2013 and 2014



6.7 Discharge Quality

Water quality data was provided for daily discharges which occurred during the date range February 2013 to February 2014. All six discharge samples collected between February 2013 and February 2014 reported pollutant concentrations within the EPL acceptable criteria for pH, TSS, turbidity and oil and grease as shown in **Table 12** below.

Table 12 2013/2014 Discharge Quality

Parameter	EPA Criteria	Minimum Measured Concentration	Maximum Measured Concentration

Total Suspended Solids (TSS)	50 mg/L	32 mg/L	45 mg/L
pH	6.5 – 8.5	7.4	7.6
Turbidity	150 NTU	23 NTU	50 NTU
Oil and Grease	10 mg/L	<1 mg/L	<1 mg/L

The EPL water quality discharge criteria were therefore met during this period.

6.8 Discharge Volumes

The water balance modelling results (refer to **Section 5.2**) indicate that the EPL discharge volume criteria is likely to be exceeded during heavy rainfall events.

As detailed in **Table 11**, the basins have an approximate total volume of 5160 KL. The 100 KL/day discharge volume is equivalent to approximately 2mm depth of rainfall across the Site.

Assuming the basins are dry but 20% full of sediment (i.e. 4,130 KL of capacity available to retain runoff) the 100 KL/day discharge volume is likely to be exceeded for events in excess of approximately 72 mm rainfall depth which is equivalent to between a 20 and 50 year ARI 1 hour storm event or approximately a 1 in 10 year ARI 2 hour storm event (refer to Appendix D).

Less intense rainfall events which exceed 45 mm over 5 days may also lead to overflow discharges greater than 100 KL/day depending on antecedent conditions within the basin.

For example, assuming the basin only has the EPL required 2764 KL of retention storage capacity available at the commencement of rainfall (i.e. 90th percentile 5 day rainfall event storage – equivalent to 45 mm rainfall depth), the 100 KL/day discharge volume is likely to be exceeded for events in excess of approximately 47 mm rainfall depth. A 47 mm rainfall depth is equivalent to a 10 year ARI 1 hour storm event or between a 2 and 5 year ARI 2 hour storm event (refer to Appendix D).

It is noted that the water balance modelling undertaken as part of this assessment is also the first detailed water balance modelling undertaken for the Site since it has been fully operational.

The results indicate that, whilst the pollutant concentration criteria is being met, the pollutant loading to Prospect Creek could potentially be greater than expected due to the discharge volume criteria (100 KL/day) potentially being exceeded for heavy rainfall events.

Over a long period of time, the pollutant loading to Prospect Creek could potentially be significantly greater than expected under the EPL criteria.

SLR undertook an assessment of the potential impact to the downstream environment as a result of basin discharge volumes in exceedance of the EPL criteria, refer to **Section 6.8.1** below.

6.8.1 EPL discharge volume criteria exceedance impacts

Based upon the water balance modelling, an overflow volume (3.66 ML) for a 50 percentile year and adopting a conservative approach, by assuming a TSS concentration of 50 mg/L is discharged at all times, the TSS loading to Prospect Creek was estimated to be 183 kg for a 50 percentile rainfall year.

Monitoring results indicated that oil and grease concentrations were predominantly <1mg/L within the basin. Therefore, adopting an oil and grease concentration of 1 mg/L the predicted oil and grease loading to Prospect Creek was estimated to be 3.66 kg/year for a 50 percentile rainfall year.

In order to appreciate the acceptability of the predicted pollutant loads being discharged offsite, a two stage assessment was undertaken:

1. Review predicted loads in relation to maximum permissible pollutant loads for the last 10 years (based upon EPL criteria and rainfall data).

2. Review predicted loads for TSS in relation to TSS loading for various landuses of an equivalent catchment size (based upon continuous hydrological / pollutant load modelling).

Maximum permissible loads

SLR reviewed rainfall data for the last 10 years and estimated the maximum permitted loading of TSS for each year based upon the EPL criteria (maximum discharge of 100 KL/day on days where preceding 5 day rainfall depth exceeded 45 mm and maximum TSS concentration of 50 mg/L).

The results are shown in **Table 13** below.

Table 13 Permitted TSS Loading to Prospect Creek

Year	Number of days where the preceding 5 days exceeded 45 mm rainfall depth	Maximum Permitted Loading of TSS to Prospect Creek[1] (Kg / year)	Maximum Permitted Loading of Oil and Grease to Prospect Creek[2] (Kg/year)
2004	20	100	20
2005	18	90	18
2006 [3]	12	60	12
2007 [5]	36	180	36
2008 [4]	26	130	26
2009	16	80	16
2010	30	150	30
2011	27	135	27
2012	34	170	34
2013	30	150	30

[1] Based upon 50 mg/L concentration and 100 KL/day EPL discharge limit
[2] Based upon 10 mg/L concentration and 100 KL/day EPL discharge limit
[3] Minimum TSS loading year
[4] Average TSS loading year
[5] Maximum TSS loading year

The maximum permissible TSS annual load ranged between 60 kg/yr and 180 kg/yr. The predicted TSS load for the 50 percentile year (183 kg/year) is only slightly higher than the permissible loading range for the last 10 years. It is noted that the 50 percentile year TSS load was predicted using a conservative approach.

The maximum permissible oil and grease annual load ranged between 12 and 36 kg/yr. The predicted oil and grease load for the 50 percentile year (3.66 kg/year) is therefore much lower than the permissible loading range for the last 10 years.

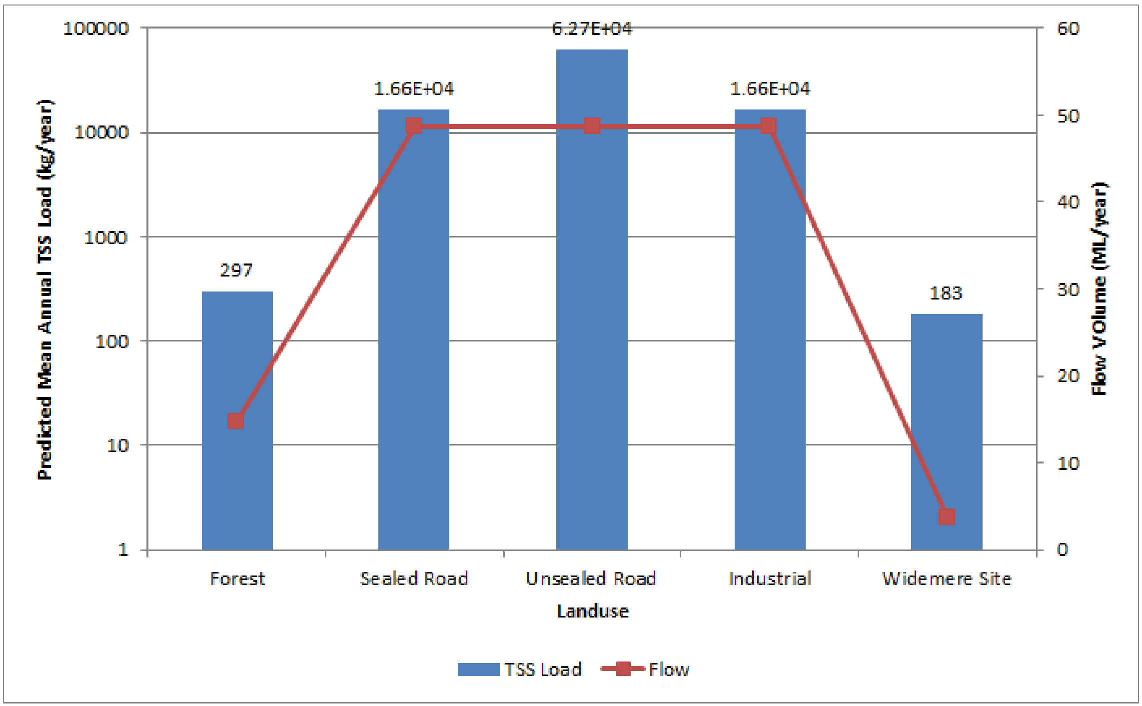
TSS loading from a forested catchment

MUSIC modelling software was used to quantify the significance of the predicted TSS loading to Prospect Creek. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) (ewater, 2009) provides the ability to simulate the quantity and quality of runoff from catchments. SLR used MUSIC to predict mean annual TSS loads from an equivalent catchment area for various landuses for comparison with the predicted mean annual TSS load from the facility.

MUSIC modelling parameters for soils and pollutants were selected based upon the Draft NSW MUSIC Modelling Guidelines (BMT WBM, 2010).

The results are presented in **Figure 12** below. The results indicate that the TSS loads being discharged offsite are relatively minor compared to other urban land uses and slightly less than that predicted for a fully forested catchment. This is primarily due to the higher mean annual runoff volumes than that predicted for the mean annual overflow volume from the sediment basins.

Figure 12 Comparison of Predicted TSS Loading to Prospect Creek from Basin with MUSIC Modelling Results for Other Landuses



6.8.2 Increasing basin capacity or volumetric discharge criteria

Water balance modelling and design storm runoff volume calculations were undertaken to assess whether, either increasing the basin capacity or volumetric discharge criteria may prevent the EPL discharge criteria from being exceeded. The results are summarised as follows:

- water balance modelling of the 75%ile rainfall year indicated that a 12,300 KL basin would be required to prevent the current criteria being exceeded for that period;
- increasing the basin volume by 10,000 KL to 15,160 KL will not prevent the discharge criteria being exceeded for rare and prolonged rainfall events (for example, the 10 year 72 hour rainfall event); and
- even increasing the volumetric discharge criteria from 100 KL/day to up to 10,000 KL/day will not prevent the discharge criteria being exceeded for rare and prolonged rainfall events (for example, the 10 year 72 hour rainfall event). Therefore it is considered that any volumetric limit set (within appropriate bounds) will eventually be exceeded for certain events.

The runoff volume calculations are provided in Appendix D.

6.8.3 Summary

The water balance predicts that the EPL discharge volume criteria may be exceeded during some heavy rainfall events. Local intensive rainfall patterns mean that even with significantly greater storage capacity, the Site would be unable to meet the 100 KL/day discharge limit on some occasions. However, the resultant pollutant loading from the Site to Prospect Creek is predicted to be relatively minor in comparison to modelled pollutant loading from other land uses including a forested catchment of equivalent catchment area. The mean annual discharge volume from the basin is also predicted to be lower than the modelled mean annual runoff volume from a forested catchment.

Based upon the assessment above and the water balance modelling (refer to **Section 5.1**) it is proposed that the discharge volume criteria be removed from the EPL for the following reasons:

- The EPL criteria for zero discharge, for events up to and including the 90th percentile 5 day rainfall event, will be maintained and is in effect a volumetric discharge criteria;
- operational procedures are in place and adhered to in relation to surface water reuse with surface water currently being reused as much as possible onsite;
- discussions with Fairfield Council indicate that by adhering to the EPL criteria to retain a 90th percentile 5 day rainfall depth (equivalent to approximately a 10 year ARI 1 hour event or between a 2 and 5 year ARI 2 hour storm event), the frequency and volume of discharge will not significantly impact Prospect Creek;
- existing practices are effectively managing sediment, pH and Oil and Grease pollutant concentrations within discharges to Prospect Creek;
- the basins provide sufficient retention storage and there is sufficient reuse demand to limit the annual discharge volume and TSS loading to that of an equivalent sized forested catchment;
- the local intensive rainfall patterns mean that even with significantly greater storage capacity, the Site would be unable to meet the 100 KL/day discharge limit on some occasions. For instance, even if the basin capacity were increased by 10,000 KL, the criteria will still be exceeded during some rainfall events (e.g. a 10 year 72 hour rainfall event);
- whilst deepening the basin will reduce the frequency and volume of overflows, the basin cannot be practically deepened to an extent that prevents exceedance of the 100 KL/day discharge limit during rare and prolonged heavy rainfall events;
- space constraints onsite prevent additional water retention basins from being provided; and
- even if the discharge volume criteria were increased by 100 times, the criteria will still be exceeded during some rainfall events (e.g. a 10 year 72 hour rainfall event);

It is recommended that discharge flow volumes continue to be monitored at the basin outlet to enable future calibration of the water balance modelling. With consideration to discharge quality monitoring results, the annual pollutant loading to Prospect Creek should be estimated on an annual basis to assess the performance of the basins in managing pollutant loading to Prospect Creek.

6.9 Other potential pollutants of concern in waste stockpiles

Other key potential pollutants of concern associated with the storage of waste onsite are outlined in **Table 14** below.

Table 14 Potential key contaminants of concern in waste material

Contamination Source	Key potential pollutants of concern	Management Process
General Solid Waste storage	Broad range of potential pollutants including but not limited to hydrocarbons, solvents, PAH, PCBS, phenols,	Refer to **Table 5**

	sediment, pesticides, herbicides, nutrients, VOCs.	
Scrap metal waste	Metals, Hydrocarbons	Refer to **Table 5**
Garden waste storage	Pesticides, herbicides, nutrients.	Refer to **Table 5**
Solid concrete washout and wet concrete batching plant stirrer waste	Hydrocarbons, sediment, alkalinity	Refer to **Table 5**

6.9.1 Contamination Risk

Management procedures are in place to screen and sort waste once it is received onsite, with higher risk wastes sorted as a priority. Once sorted into various covered storage facilities (i.e. waste bins), the potential for pollutants to be discharged offsite via surface water runoff is effectively removed.

The proposed wet concrete batching plant stirrer waste will be stored within the concrete washout and stirrer waste area pit which is lower than the adjacent landform and has a concrete base. The pit will therefore contain leachable contaminants and runoff.

There is potential for contaminants to be mobilised by surface water runoff generated within the raw material stockpile area. Contaminant concentrations in the raw material stockpiles will be variable depending on the batch waste content. Surface water borne contaminants will be managed by a series of control measures including sediment pits, an oil and grit separator, two stage sediment basin, flocculation and pH adjustment of discharges. Insoluble, particulate and flocculated contaminants are likely to accumulate at the base of the basins within the settled sediments. The sediment will be analysed in accordance with the limits for heavy metals from Table 1, Column 4 of the Recovered Aggregate Order 2014. The testing will be undertaken when the basins are routinely cleared of sediment build up, and depending on the results prior to either being reused within the production process (if appropriate) or disposed of at an appropriate facility offsite. Some residual soluble contaminants could potentially be discharged to Prospect Creek during heavy rainfall events (in excess of 45 mm of rainfall over 5 days).

As detailed in **Section 6.7** and **6.8**, the current control measures are adequately mitigating the current risk associated with sediments, hydrocarbons and alkalinity/acidity. At present, no existing monitoring has been undertaken in the basins or in discharges for the other potential pollutants of concern associated with general solid waste, garden waste and scrap metal waste as detailed in **Table 14**. Therefore, the current risk to the environment is unquantified. However, the level of risk is reduced by the screening and sorting procedures currently in place.

The proposed development is likely to pose a relatively minor increase in the risk posed due to a slight increase in the volume of waste being stored onsite and inclusion of wet concrete batching plant stirrer waste as a permitted waste. The existing control measures should mitigate this increase in the contamination risk, however it is recommended that a monitoring program be undertaken to confirm this (refer to **Section 8.4.2**).

7 STORMWATER QUANTITY ASSESSMENT

Stormwater generated within the western catchment of the Site currently drains overland towards an open drain which runs on the outside of the southern portion of the perimeter haul road. Stormwater is then conveyed to the sediment basins via a 600 mm diameter pipe. During flood events, flow overtops the drain and is conveyed overland to the basins via channels.

Hydrological modelling was undertaken using the ILSAX model of the western drainage catchment (refer to **Figure A2**) which incorporates the proposed haul road realignment and drains to the sediment basins.

The model was used to determine the potential increases in flow rates from the Site under the Proposed upgrade. Any increase in peak flow rate resulting from the proposed upgrade is assumed to result in a similar increase in discharge from the sediment basins and would potentially increase downstream flow rates and flood levels in Prospect Creek.

7.1 Hydrologic Modelling

The following ILSAX parameters were adopted for the hydrologic model:

- Paved area depression – 1 mm;
- Grassed (pervious area depression storage) – 5 mm; and
- Soil Type – 3.

Local rainfall intensity and duration parameters were adopted from Australian Rainfall and Runoff.

7.2 Potential Hydrologic Impacts and Mitigation

The peak flows predicted by the hydrologic model for the pre and post development scenarios are outlined in **Table 15** below. These flow rates illustrate the potential increase in flows to the basins, and represent the potential increase in flow rates from the Site boundary to Prospect Creek.

Table 15 Hydrological Modelling Results

Rainfall Event	Pre-Development Peak Flow from Western Drainage Catchment (m^3/s)	Post Development Peak Flow from Western Drainage Catchment (m^3/s)	Predicted Peak Flow Impact (m^3/s)
5 year ARI	2.30	2.36	+0.06
20 year ARI	2.49	2.55	+0.06
100 year ARI	2.97	3.02	+0.05

In order to mitigate the risk of any minor flood impacts down gradient of the Site, it is recommended that some additional onsite detention storage be provided at source within the western drainage catchment to attenuate the minor increase in peak flows from the western drainage catchment during flood events.

7.2.1 Proposed Mitigation

It is recommended that the proposed realigned haul road and new stockpile area be designed to generate some additional above ground flood storage up gradient of the pipe inlet at the end of the drain.

Hydrological modelling using the ILSAX model was undertaken to estimate the volume of flood detention storage required to attenuate peak flows from the western drainage catchment to pre-development peak flow rates (refer to **Table 15**). A 150 mm high, 20 m wide spillway was adopted. The modelling results are presented in Table 11 below.

The modelling indicates that a total of 102 m^3 of flood storage is required for a 100 year ARI event up to a maximum flood depth of 310 mm.

A minimum of 30 m^3 of flood storage should be provided up to the spillway level of 150 mm. A minimum of 72 m^3 of additional storage should be provided above the spillway between 150 mm and 310 mm. The proposed stage storage relationship for the flood storage area is shown in **Table 16** below. Hydrological Modelling results are shown in **Table 17** below.

Table 16 Proposed Stage Storage Relationship for Flood Storage Zone

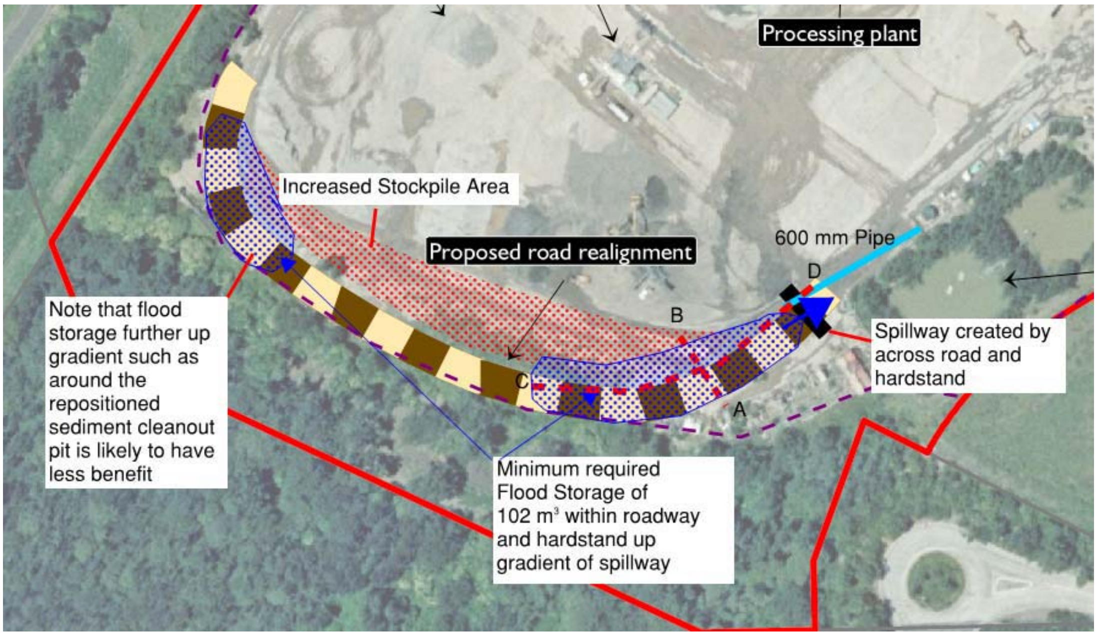
Depth of Ponding (mm)	Volume of Stormwater Storage (m^3)
150	30
260	58
290	83
310	102

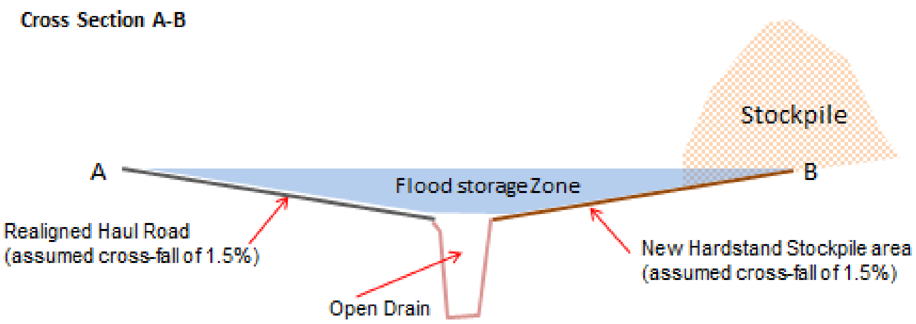
Table 17 Hydrological Modelling Results – With Southern Perimeter Haul Road Mitigation

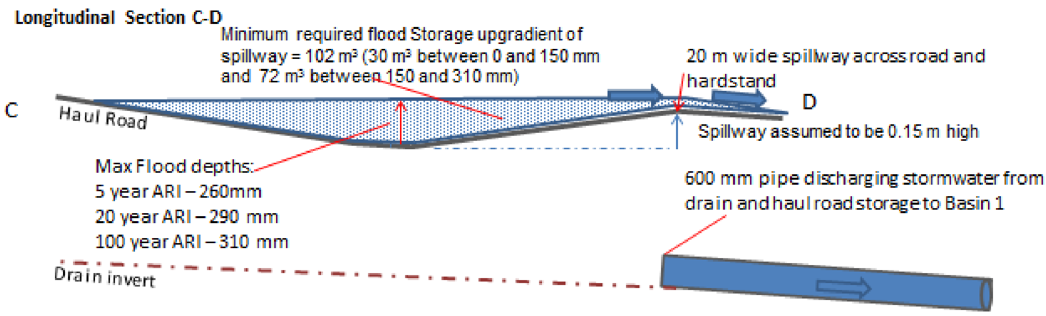
Rainfall Event	Proposed Storage below spillway (m^3)	Proposed storage above spillway (m^3)	Total Flood Storage Required (m^3)	Peak flood depth (mm)	Post Development Peak Flow (m^3/s)	Peak Flow Impact (m^3/s)
5 year ARI	30	28	58	260	2.30	0
20 year ARI	30	53	83	290	2.49	0
100 year ARI	30	72	102	310	2.96	-0.01

Concept sketches of the proposed flood storage mitigation are provided in **Figure 13** below.

Figure 13 Perimeter Haul Road Flood Attenuation Works







8 POTENTIAL SURFACE WATER IMPACTS, MITIGATION MEASURES AND RESIDUAL IMPACTS

8.1 Flood Storage in Prospect Creek

The southern boundary of the development footprint is elevated above the Probable Maximum Flood level in Prospect Creek.

The proposed works will therefore not reduce storage, obstruct overland flow or worsen downstream flooding in the Prospect Creek floodplain.

8.2 Peak Flows in Prospect Creek

When the capacity of the Basin is exceeded, stormwater is released from the basins via an 800mm diameter pipe to Prospect Creek. Based upon stormwater drainage calculations provided in the EIS (ERM, January 2002), the Basins are understood to have existing capacity to manage the 1 in 20 year Average Recurrence Interval (ARI) event.

The proposed road realignment will generate approximately 0.31 ha of additional land available for stockpiling materials. The roadway is to be realigned within an area currently used as an informal laydown / small stockpile area which currently contains no hardstand. The asphalt roadway footprint will increase the impervious area by approximately 0.02 ha.

The proposed road realignment will generate additional stormwater and would marginally increase the rate of discharge from the basins during flood conditions.

To ensure that the existing basins can be retained without exceeding the basin capacity, additional onsite stormwater detention will be provided in the form of above ground flood storage within the haul road to preserve the existing 20 and 100 year ARI flow rates into the Basins.

The proposed works will therefore not increase the existing discharge rates from the Site and will not worsen downstream flooding for events up to and including the 100 year ARI event.

8.3 Erosion in Prospect Creek

As discussed in **Section 8.2**, the Proposal could potentially increase peak flows to Prospect Creek during flood events. This could potentially lead to a minor increase in bank erosion within the creek during flood events.

Given the very minor predicted increase in flow, impacts are likely to be negligible. In any case, the proposed mitigation measures as outlined in Section 7.2.1 will alleviate this impact.

8.4 Stormwater Quality

Pollutant monitoring, as discussed in **Section 5.1** indicates that the management of water quality within the basins is effective in meeting the EPA’s water quality concentration criteria.

The basins drain under gravity and discharge rates are likely to exceed the 100 kL/day EPA licence criterion during heavy rainfall events.

Water balance modelling and pollutant load estimates (refer to **Section 6.8.1**) show that the sediment loads being discharged under the current regime are likely to exceed the maximum permissible sediment loads if discharge from the basins was limited to 100 KL/day.

However, MUSIC modelling (refer to **Section 6.8.1**) indicates that the current TSS loads being discharged are relatively minor compared to equivalent catchments for other urban land uses and slightly less than that of a fully forested catchment.

The Proposal will include an increase (approximately 5%) in hardstand onsite. This is likely to slightly increase (<10%) the total annual overflow volume. The expected increase in overflow volume could potentially lead to a similar magnitude of increase (<10%) in pollutant loading to Prospect Creek. Given that the existing pollutant loading to Prospect Creek was assessed to be less than that of a forested catchment for TSS, any minor increase in pollutant loading as a result of the Proposal is likely to pose a negligible impact to water quality within Prospect Creek.

The portion of the basin which is maintained as the 90th percentile 5 day rainfall event retention storage will be increased to account for the increase in hardstand area (refer to **Table 11**). No further mitigation measures are considered necessary.

8.4.1 Flocculants

Flocculants will tend to accumulate with the settled sediments at the bottom of the basins. During removal from the basin, sediments will be analysed for key contaminants and depending on the analysis results, either disposed of at an appropriate facility or reused within the production process onsite.

Although offsite discharge of flocculants may occur during high flow periods, when discharges to Prospect Creek occur, based upon the available toxicity information (refer to **Section 4.1.4**) and with consideration of likely dilution effects and low exposure periods, there is considered to be a low risk of potential adverse impacts to the downstream environment where flocculants are used at prescribed concentrations.

8.4.2 Waste Storage Pollutants

There is potential for runoff generated within the raw stockpile areas (which may contain general solid waste, garden waste, scrap metal waste and wet concrete batching stirrer waste) to contain a range of contaminants as detailed in **Section 6.9**.

The proposed development is likely to pose a relatively minor increase in the current risk due to a slight increase in the volume of waste being stored onsite and inclusion of wet concrete batching plant stirrer waste as a permitted waste.

It is recommended that further investigation, in the form of a runoff monitoring program, be performed to establish the presence of and subsequent risk posed by the potential contaminants of concern to the environment with consideration to ANZECC (2000) assessment criteria. Due to the variability of wastes onsite an extended monitoring program (undertaken following approval) would be required to provide representative results, for the purpose of establishing appropriate management measures. Monthly monitoring over 12 months is therefore recommended involving sampling of basin water and basin sediment. Sampling of overflow water should also be undertaken on discharge days. All potential contaminants of concern (to be agreed with the EPA) should be monitored during this period. Key contaminants of concern for future monitoring and any additional management measures should be selected based upon the findings of this monitoring program.

Subject to the findings of the initial monitoring program, monitoring of the identified contaminants of concern should be continued on an annual basis during September or October (i.e. months prior to the period where discharges are most likely to occur) so that appropriate reactive management can be undertaken if elevated contaminant levels are identified.

8.5 Potable Water Use

The Proposal will increase the annual water demand for dust suppression as a result of the increase in the stockpiles onsite.

Dust suppression water will continue to be sourced from the sediment basins. The basin water sometimes runs out during prolonged dry periods and potable water is used to fulfil operational needs. The additional water demand could therefore potentially increase the amount of potable water used onsite during the prolonged dry periods.

Adopting a conservative approach whereby it is estimated that the dust suppression demand is equivalent to the increase in hardstand area, it is estimated that the dust suppression demand may increase by approximately 4.5% (approximately 1.6 ML/year) as a result of the Proposal.

The increase in hardstand area of the proposed development will slightly increase the volume of runoff which is able to be captured in the basins and reused onsite. This additional runoff will dramatically reduce the amount of days in which the dam is empty, particularly in dry years as shown in Table 9.

The additional available water is therefore likely to provide all or the majority of any minor increase in dust suppression water demand as detailed above. Impacts to local water resources are considered to be negligible.

No further mitigation measures are considered necessary.

8.6 Riparian Corridor

No changes to the riparian vegetation will occur as a result of the Proposal.

8.7 Contamination and Spills

Accidental spillage or poor management of fuels, oils, lubricants, hydraulic fluids, solvents and other chemicals stored onsite will continue to be controlled through spill management actions to prevent water quality and ecological impacts down gradient of the Site.

An oil and water interceptor is also installed to treat hydrocarbons conveyed in surface water runoff prior to discharge to Basin 1.

Existing management measures are outlined in **Section 8.9.4**.

No further management measures are considered necessary.

8.8 Southern Perimeter Haul Road Drainage Works

At present, in order to minimise maintenance requirements, a series of open drains are used to convey stormwater.

The open drain (currently located adjacent to the southern portion of the perimeter haul road) will be realigned as part of the proposed haul road realignment.

The sediment clean out pits which are currently located adjacent to the existing roadway will be relocated alongside the proposed road realignment.

8.9 Existing Management Measures to be Retained or Updated

8.9.1 Stormwater and Sediment Management

Stormwater will continue to be managed by the current stormwater and operational management measures (refer to **Section 6.1**) and in accordance with the EPL requirements for discharge quality and discharge frequency.

Based upon the water balance modelling results (refer to **Section 5.2**) and impact assessment detailed in **Section 6.8.1**, it is recommended that the EPL discharge volume criteria (i.e. max discharge of 100 KL/day) be removed from the EPL.

The sediment controls onsite, as described in **Section 6.2**, will be retained or replicated.

The stormwater quality within the basins will continue to be managed as per the existing regime (refer to **Section 6.4**).

8.9.2 Basin Monitoring

Water quality monitoring will continue to be undertaken on a daily basis during any discharges from the basins in accordance with the current EPA Licence requirements and at approximately monthly intervals during periods where there are no discharges (refer to **Section 6.4**).

Continuous flow monitoring at the basin outlet will also continue to be undertaken.

It is recommended that additional water quality monitoring be undertaken as detailed in **Section 8.4.2**.

It is recommended that a pollutant load estimate be undertaken on an annual basis with consideration to discharge volumes and discharge quality in order to monitor the performance of the basin in relation to pollutant loading to Prospect Creek.

8.9.3 Water Reuse

Additional water reuse infrastructure and procedures have recently been implemented onsite to maximise reuse of water captured within the basins.

The water stored within Basin 2 will continue to be reused for the following demands:

- Dust suppression;
- Fixed Plant;
- Stab Plant;
- Sprinkler system; and
- Pugmill.

8.9.4 Spill Management

The management of fuel spills will continue to be undertaken in accordance with the OEMP. This includes:

- In the event of a spill, oil absorbent material is used to soak up the spill and the contaminated absorbent is disposed of at an appropriate landfill; and
- A designated bunded area for fuel storage and transfer is provided. Oil absorbent material is kept onsite and a waste bin is maintained onsite to hold used absorbent prior to disposal.

8.10 Residual Impacts

8.10.1 Flooding Impacts

Prospect Creek

The proposed additional flood storage will ensure that the Proposal will not increase peak flood flow rates in Prospect Creek.

Onsite Flooding

The creation of a flood storage area may lead to some additional ponding of water across the southern portion of the perimeter haul road and stockpile area onsite for short periods during flood events. The maximum flood depth of 310 mm will not impact on truck movements around the perimeter haul road.

8.10.2 Erosion Impacts

The provision of additional flood storage, will maintain existing peak flow discharge rates from the Site during flood events. Therefore the residual impact to bank erosion in Prospect Creek is considered to be negligible during flood events.

8.10.3 Stormwater Quantity and Quality

The basins are likely to overflow on slightly more occasions as a result of the Proposal due to the increase in hardstand onsite. However, the overflow frequency is still predicted to meet best practice discharge frequency requirements detailed in the EPL (i.e. no discharge unless 45 mm of rainfall occurs over preceding 5 days). The increase in waste stockpile storage area and inclusion of wet concrete batching plant stirrer waste as a permitted waste may potentially increase the risk of pollutants being discharged to Prospect Creek.

The associated increase in pollutant load being discharged to Prospect Creek as a result of an increase in total overflow volume, increase in waste stockpile storage area and new permitted wastes is considered to be minor. The existing control measures should potentially mitigate this increase in the contamination risk, however it is recommended that a monitoring program be undertaken to confirm this (refer to Section **8.4.2**). The impact to water quality and ecology within Prospect Creek is therefore considered to be negligible subject to the findings of the monitoring program.

8.10.4 Potable Water Usage

Any minor increase in dust suppression demand, associated with the increased stockpile area, is likely to be predominantly offset by the additional water available for reuse as a result of the increase in hardstand area.

Impacts to local water resources as a result of the Proposal are therefore considered to be negligible.

9 CONCLUSIONS AND RECOMMENDATIONS

The Proposal will result in a small addition of impervious surfaces to the Site as a result of the realignment of the southern portion of the perimeter haul road. Additional onsite stormwater detention will be provided in the form of above ground flood storage within the haul road in order to preserve existing peak discharge rates.

The creation of a flood storage area may lead to some additional ponding of water across the southern portion of the perimeter haul road and stockpile area onsite for short periods during flood events. The maximum flood depth of 310 mm will not impact on truck movements around the perimeter haul road.

The provision of additional flood storage, will maintain existing peak flow discharge rates from the Site during flood events. Therefore the residual impact to bank erosion in Prospect Creek is considered to be negligible during flood events. Impacts to local water resources, water quality and ecology within Prospect Creek as a result of the Proposal are considered to be negligible.

Additional water reuse infrastructure and procedures have recently been implemented onsite to maximise reuse of water captured within the basins. The impact of the newly installed facilities and procedures on water availability within the basin over a long period is yet to be observed. However, water balance modelling indicates that the basins will be dry for over half the year. This indicates that the new water reuse facilities may not provide a significant reduction in potable water use onsite, as water reuse is currently limited by the storage capacity of the basins.

It is therefore recommended that the Site investigate options for any additional stormwater retention storage and/or water supply options. This could include (but not be limited to):

- opportunities to extract water from other local basins owned by Boral; and
- opportunities to increase the depth of the existing basins with consideration to health and safety requirements and excavator limitations.

In order to account for the proposed development, the 90^{th} percentile 5 day rainfall event retention volume to be maintained within the basins should be increased to 2,764 KL. A visible marker should be installed in each basin to ensure adequate freeboard (below the overflow pipe invert level) is provided to account for this retention volume. The basin has sufficient additional capacity for sediment settlement and sediment storage.

The EPL criteria stating that the maximum discharge from the Site be limited to 100 KL/day is considered to be unachievable for the existing surface water management system. It is proposed that the 100KL/day discharge limit be removed from the EPL following consultation with the EPA as:

- The EPL criteria for zero discharge for events up to and including the 90^{th} percentile 5 day rainfall event will be maintained and is in effect a volumetric discharge criteria;
- operational procedures are in place and adhered to in relation to surface water reuse with surface water currently being reused as much as possible onsite;
- discussions with Fairfield Council indicate that by adhering to the EPL criteria to retain a 90^{th} percentile 5 day rainfall depth (equivalent to approximately a 10 year ARI 1 hour event or between a 2 and 5 year ARI 2 hour storm event), the frequency and volume of discharge will not significantly impact Prospect Creek;
- existing practices are effectively managing sediment, pH and Oil and Grease pollutant concentrations within discharges to Prospect Creek;
- the basins provide sufficient retention storage and there is sufficient reuse demand to limit the annual discharge volume and sediment pollutant loads to that of an equivalent sized forested catchment;

- the local intensive rainfall patterns mean that even with significantly greater storage capacity, the Site would be unable to meet the 100 KL/day discharge limit on some occasions. For instance, even if the basin capacity were increased by 10,000 KL, the criteria will still be exceeded during some rainfall events (e.g. a 10 year 72 hour rainfall event)
- whilst deepening the basin will reduce the frequency and volume of overflows, the basin cannot be practically deepened to an extent that prevents exceedance of the 100 KL/day discharge limit during rare and prolonged heavy rainfall events;
- space constraints onsite prevent additional water retention basins from being provided; and
- as the 100 KL/day limit is equivalent to only approximately 2 mm of rainfall across the Site, even if the discharge volume criteria were increased by 100 times to 10,000 KL/day, the criteria would still be exceeded during some rainfall events (e.g. a 10 year 72 hour rainfall event).

The proposed development could potentially lead to a relatively minor increase in the risk of pollutants associated with general solid waste, scrap metal waste, garden waste and wet concrete batch stirrer waste, being discharged to Prospect Creek due to a slight increase in the volume of waste being stored onsite and the inclusion of wet concrete batching plant stirrer waste as a permitted waste.

It is recommended that further investigation in the form of a 12 month monitoring program (undertaken following approval) be performed to assess the risk posed by the potential contaminants of concern to the environment with consideration to ANZECC (2000) assessment criteria. Any additional management measures should be selected based upon the findings of this monitoring program. Subject to the findings of the initial monitoring program, it is recommended that monitoring of any identified contaminants of concern be continued on an annual basis during September or October so that appropriate reactive management can be undertaken if elevated contaminant levels are identified.

10 REFERENCES

ANZECC, 2000, Australia and New Zealand Guidelines for Fresh and Marine Water Quality, Vol 1, October 2000

BMT WBM, 2010, Draft NSW MUSIC Modelling Guidelines, Reference – R.B17048.001.01m August 2010

Boral Recycling, 2010, Widemere Operation Environmental Management Plan, DA-21-1-2001-I, MOD-126-8-2005-I, January 2010

Cardno, 2007, Fairfield City Council Water Management Plan, Cardno, February 2007

Department of Environment and Conservation (NSW), 2004, Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales, March 2004

Engineers Australia, 2006, Australian Runoff Quality, a guide to water sensitive urban design, Engineers Australia, March 2006.

Fairfield City Council, http://www.fairfieldcity.nsw.gov.au/upload/bwztj47212/Facts_Figures_doc_creek.pdf accessed 16/07/2014

KBR, 2002, Boral Recycling Plant Widemere West Site Layout, Drawing Number SEK250-C-002, July 2002.

NSW DPI, 2012, Guidelines for riparian corridors on waterfront land, Department of Primary Industries, Office of Water, July 2012.

NSW Government, 2004, Managing Urban Stormwater, Soils and Construction, Volume 1, 4th Edition, March 2004

NSW EPA, 1997, Managing Urban Stormwater: Treatment Techniques, Draft, November 1997

NSW EPA, 1997, Managing Urban Stormwater: Source Control, Draft, December 1998

NSW EPA, 2014a, http://www.environment.nsw.gov.au/ieo/GeorgesRiver/map.htm accessed 3 July 2014

NSW EPA, 2014b http://www.environment.nsw.gov.au/ieo/GeorgesRiver/report-02.htm accessed 3 July 2014

NSW EPA, 2014c, http://www.environment.nsw.gov.au/ieo/GeorgesRiver/maptext-03.htm#wq01 , accessed 04 July 2014

NSW Office of Water, 2014, Email from Mohammed Ismail, Water Regulations Officer, NSW Office of Water, September 2014

NSW Water Resources Council, 1993, The NSW State Rivers and Estuaries Policy

http://www.envirowarehouse.com/damblocks.htm (accessed 31 March 2015).

FLOPAM EM640 CT Material Safety Data Sheet (2003).

Material Safety Data Sheet, DamClear Flocculant Blocks Grades AN1 and AN2, Environmental Warehouse, accessed 31 March 2015.

Appendix A

FIGURES

Report Number 610.14050

k Catchment up-gradient of Site


Basin 1
Basin 2
Outlet to Prospect Creek
Prospect Creek
67
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Appendix B

PHOTOGRAPHS

Report Number 610.14050

Photograph 1 - Prospect Creek down gradient of the site

Photograph 2 - Drain which runs through the industrial estate

Photograph 3 - Primary Basin

Photograph 4 – Secondary Basin

Appendix C

FAIRFIELD CITY COUNCIL FLOODING INFORMATION

Report Number 610.14050

Fairfield City
Celebrating diversity

Fairfield City Council, Administration Centre, 86 Avoca Road, Wakeley 2176
Tel: (02) 9725 0222 Fax: (02) 9725 4249 ABN: 83 140 439 239
All communications to:
Fairfield City Council, PO Box 21, Fairfield NSW 1860
Email address: mail@fairfieldcity.nsw.gov.au

In reply please quote: 195964/2014

11 July 2014

'EIVED
17 JUL 2014
DNEY

SLR Consulting
2 Lincoln St
LANE COVE
NSW 2066

Dear Mr Legg

GOVERNMENT INFORMATION (PUBLIC ACCESS) ACT APPLICATION

I refer to your recent application requesting flooding information for the property at 39 Widemere Rd, Wetherill Park (Lot 4001 DP 1173524).

This parcel is identified as being partly within a **High** Flood Risk Precinct, partly within a **Medium** Flood Risk Precinct, partly within a **Low** Flood Risk Precinct as a result of overland flooding and partly **not affected** by local overland flooding.

Local Overland Flood Details

Size of Flood	**Flood Level (m AHD)**
Probable Maximum Flood (PMF)	34.4-37.9
100 Year ARI	32.8-33.5
20 Year ARI	32.6-33.4

Local overland flood levels in the vicinity of the above property have been extracted from the draft (2014) *Wetherill Park Overland Flood Study.*

Please note that the flood levels and flood risk precincts quoted are draft only and are yet to be formally adopted by Council.

Should you require further information concerning this matter, please contact the writer on 9725 0716. Please quote the Reference Number at the top of the page when contacting Council in this matter.

Yours faithfully

A Samardzic

ANGIE SAMARDZIC
RIGHT TO INFORMATION OFFICER

Fairfield City Council
Administration Centre
86 Avoca Road
WAKELEY NSW 2176
PO Box 21
FAIRFIELD NSW 1860
Telephone: (02) 9725 0222
Facsimile: (02) 9609 3257

FairfieldCity
Celebrating diversity

Flood Information Sheet

Applicant's Details:

Applicant's Name	**SLR Consulting**
Postal Address	**2 Lincoln Street** **LANE COVE NSW 2066**
Phone	
Fax	

Property Particulars:

House No.	**39**
Street & Suburb	**Widemere** **WETHERILL PARK**
Lot Description	**Lot 4001** **DP 1173524**

Council has adopted a policy on flooding which may restrict the development of land. The Fairfield City-Wide Development Control Plan 2013 (which includes provisions for flood management) applies to all of the Fairfield Local Government area.

Part or all of this land may be affected by mainstream flooding.

MAINSTREAM FLOODING

Description

This parcel is identified as being partly within a **High** Flood Risk Precinct, partly within a **Medium** Flood Risk Precinct, partly within a **Low** Flood Risk Precinct as a result of mainstream flooding and partly **not affected** by mainstream flooding.

Mainstream Flood Details

Size of Flood	Flood Level (m AHD)
Probable Maximum Flood (PMF)	34.3
100 Year ARI	32.8
50 Year ARI	32.7
20 Year ARI	32.5

Flood levels in the vicinity of the above property have been extracted from the Bewsher Consulting (2006) *Prospect Creek Floodplain Management Plan, Flood Study Review.*

9 April 2015

Appendix D

RUNOFF VOLUME CALCULATIONS

Report Number 610.14050

ARI	Intensity (mm/hr)	Duration (hrs)	Rainfall depth (mm)	Runoff Volume	Runoff Volume minus 100KL (100KL = current volumetric discharge criteria)	Runoff Volume minus 10000 KL (10000KL = 100 x current volumetric discharge criteria)
1	1.52	72	109.44	7006	6906	-2994
2	2	72	144	9479	-521	-521
5	2.72	72	195.84	13306	3306	3306
10	3.17	72	228.24	15921	5921	5921
20	3.74	72	269.28	19272	9272	9272
50	4.5	72	324	25753	15753	15753
100	5.09	72	366.48	29863	19863	19863
ARI	Intensity (mm/hr)	Duration (hrs)	Rainfall depth (mm)	Runoff Volume	Runoff Volume minus 100KL	Runoff Volume minus 10000KL
1	3.33	24	79.92	5116	5016	-4884
2	4.33	24	103.92	6841	6741	-3159
5	5.72	24	137.28	9327	9227	-673
10	6.54	24	156.96	10949	10849	949
20	7.61	24	182.64	13072	12972	3072
50	9.03	24	216.72	17226	17126	7226
100	10.1	24	242.4	19753	19653	9753
ARI	Intensity (mm/hr)	Duration (hrs)	Rainfall depth (mm)	Runoff Volume	Runoff Volume minus 100KL	Runoff Volume minus 10000KL
1	16.2	2	32.4	2074	1974	-8026
2	20.8	2	41.6	2738	2638	-7362
5	26.5	2	53	3601	3501	-6499
10	29.8	2	59.6	4158	4058	-5942
20	34.2	2	68.4	4895	4795	-5205
50	39.9	2	79.8	6343	6243	-3757
100	44.2	2	88.4	7203	7103	-2897
ARI	Intensity (mm/hr)	Duration (hrs)	Rainfall depth (mm)	Runoff Volume	Runoff Volume minus 100KL	Runoff Volume minus 10000KL
1	25.9	1	25.9	1658	1558	-8442
2	33	1	33	2172	2072	-7928
5	41.2	1	41.2	2799	2699	-7301
10	45.8	1	45.8	3195	3095	-6905
20	52	1	52	3722	3622	-6378
50	60	1	60	4769	4669	-5331
100	66	1	66	5378	5278	-4722
Highlighting indicates that total basin volume + Adopted Volumetric Discharge Criteria Exceeded						
Highlighting indicates that basin retention storage capacity (90%ile 5 day rainfall event) + Adopted Volumetric Discharge Criteria is exceeded						

Appendix F

Threatened species assessment of significance

F.1 Significant impact criteria in accordance with the TSC Act

Section 5A of the *Environment Planning and Assessment Act 1979* provides the criteria that must be considered in the assessment of the significance of potential impacts on all threatened species listed under the TSC Act. An Assessment of Significance (known as the seven-part test) is made up of the following seven questions:

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

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

3. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

   a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

   b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

4. In relation to the habitat of a threatened species, population or ecological community:

   a) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

   b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;

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

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

6. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan; and

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

The following assessments of significance have been undertaken in accordance with *Threatened species assessment guidelines: The assessment of significance* (DEC 2007).

F.1.1 Assessments of significance

i Swamp Oak Floodplain Forest EEC

Swamp Oak Floodplain Forest is listed as an EEC under the TSC Act. This community has been recorded on the southern site boundary, and is regenerating in the form of juvenile Swamp Oaks. A large stand of the community occurs to the south of the site associated with Prospect Creek floodplain.

An assessment of impact criteria under Section 5a of the EP&A Act has been completed to assess the potential impacts of the perimeter haul road realignment on this EEC (Table F.1).

Table F.1 Assessment of impact criteria for threatened ecological communities

Criteria	Discussion
1. Life cycle of threatened species	This question refers to threatened species, therefore is not relevant to this assessment.
2. Life cycle of endangered population	This question refers to endangered populations, therefore is not relevant to this assessment.
3. EEC extent and modification	Swamp Oak Floodplain Forest EEC occurs in a wide corridor along the Prospect Creek floodplain which borders the site to the south and west. This corridor is up to 100 m wide and extends for approximately 7.5km. Juvenile Swamp Oaks from this corridor have started to regenerate in stockpiles on the southern site boundary. Up to 12 juvenile trees will be removed to facilitate the haul road upgrade. The removal of this small amount of juvenile trees on the edge of a wide continuous corridor of this community will not have an adverse effect or substantially modify its composition such that the local occurrence is placed at risk of extinction. The clearing limits will be demarcated with survey pegs to avoid overclearing of the community.
4. Habitat removal, fragmentation, isolation and importance	Up to 12 juvenile Swamp Oaks will be removed to facilitate the haul road upgrade. These trees are not considered critical to the survival of the local occurrence as they are juvenile, have regrown from soil stockpiles and cover a small area when compared with the local occurrence of the community. Fragmentation will not occur as the trees are located on the edge of a continuous corridor on Prospect Creek floodplain.
5. Critical habitat	Critical habitat has not been listed for this threatened ecological community.
6. Consistency with recovery or threat abatement plans	Swamp Oak Floodplain Forest EEC does not have a prepared recovery plan. Its recovery is being managed through the Office of Environment and Heritage's saving our species program, which aims to take a landscape approach to the conservation of threatened biodiversity. The haul road upgrade does not interfere with recovery of the community as impacts are minor.
7. Key threatening processes	Invasion, establishment and spread of Lantana and invasion of native plant communities by African Olive are key threatening processes relevant to the haul road upgrade, as these weeds are invading the edge of the Swamp Oak Floodplain Forest EEC. Clearing, although minor, may add to the edge effects currently affecting the composition of Swamp Oak Floodplain Forest EEC at the site. Weeds will be controlled on the edge of this community prior to clearing to minimise the risk of further alterations to community composition. The site sediment and erosion control plan will also continue to be implemented to prevent further weed invasion.
Conclusions	The haul road upgrade will not have a significant impact on Swamp Oak Floodplain Forest EEC as: • disturbance limits will be clearly demarcated; • weed management will continue to be implemented in accordance with the OEMP; and • site erosion and sediment controls will continue to be implemented.

ii Threatened microbats: Eastern Freetail Bat (*Mormopterus norfolkensis*), and Greater Broadnosed Bat (*Scoteanax rueppellii*)

The Eastern Freetail Bat and Greater Broadnosed Bat are listed as vulnerable species under the TSC Act. They were both recorded in the Cumberland Swamp Oak Riparian Forest adjacent to the haul road upgrade.

The Eastern Freetail Bat occurs in dry sclerophyll forest, woodland, swamp forest and mangrove forests east of the Great Dividing Range. The Greater Broadnosed Bat is most commonly found in tall wet forest. Foraging habitat is present in the Cumberland Swamp Oak Riparian Forest Prospect Creek floodplain. The area adjacent to the haul road upgrade does not contain mature trees with hollows and is unlikely to provide shelter and breeding habitat.

An assessment of impact criteria under Section 5a of the EP&A Act has been completed to assess the potential impacts of the haul road upgrade on these threatened microbats (Table F.2).

Table F.2 Assessment of impact criteria for threatened microbats

Criteria	Discussion
1. Life cycle of threatened species	Foraging habitat is available for the Eastern Freetail Bat and the Greater Broadnosed Bat in the Cumberland Swamp Oak Riparian Forest adjacent to the haul road upgrade. These features will be retained. The haul road upgrade will not affect foraging activities as these bats are nocturnal, and construction works would occur during the day. Shelter and breeding habitat is unlikely to be in this area due to the absence of mature, hollow-bearing trees, therefore the species breeding cycle will not be affected.
2. Life cycle of endangered population	This question refers to endangered populations, therefore is not relevant to this assessment.
3. EEC extent and modification	This question refers to TECs, therefore is not relevant to this assessment.
4. Habitat removal, fragmentation, isolation and importance	The small number of isolated Swamp Oaks being removed do not constitute foraging habitat for these microbat species that prefer to forage in canopy gaps. These species would forage preferentially in the Cumberland Swamp Oak Riparian Forest adjacent to the haul road upgrade. The removal of this small stand of juvenile Swamp Oaks will not fragment the continuous corridor that provides habitat for these species.
5. Critical habitat	Critical habitat has not been listed for these threatened microbat species.
6. Consistency with recovery or threat abatement plans	Action statements for the Eastern Freetail Bat aims to aim to address key knowledge gaps for this species and to inform effective management of this species. Action statements for the Greater Broadnosed Bat aim to ensure the species is secure in the wild in NSW and that its geographic range in NSW is extended or maintained. The removal of a small stand of Swamp Oaks adjacent to known foraging habitat of these species does not interfere with these objectives.
7. Key threatening processes	Invasion, establishment and spread of Lantana and invasion of native plant communities by African Olive are key threatening process is relevant to the haul road upgrade, as these weeds are invading the edge of the vegetation. Clearing, although minor, may add to the edge effects currently affecting the composition of these species habitat at the site. Further invasion by these weeds will increase the difficulty of microbat foraging at the site and may lead them to seek out alternative foraging areas. Weeds will be controlled on the edge of this community prior to clearing to minimise the risk of further alterations to habitat composition. The site sediment and erosion control plan will also continue to be implemented to prevent further weed invasion.

Table F.2 Assessment of impact criteria for threatened microbats

Criteria	Discussion
Conclusions	Future development of the site will not have a significant impact on threatened hollow dependant microbats as: • the riparian corridor which constitutes habitat for these species will be retained; • weed management will continue to be implemented in accordance with the OEMP; and • site erosion and sediment controls will continue to be implemented.

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