McConnell Dowell - OHL Joint Venture

CLIENT: ROADS AND MARITIME SERVICES

PROJECT: PACIFIC HIGHWAY UPGRADE - KUNDABUNG TO KEMPSEY

LOCATION: NSW

PROJECT NO.: 2602

Quality Management System

APPENDIX B6 - CONSTRUCTION AIR QUALITY MANAGEMENT SUB-PLAN

QMS number 025–Y002–2602

Revision History

Rev	Date	Details	By	Approved
A	04/07/14	Draft for Review by RMS and Project ER	J.Crawford	T.Jackson
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HOME WITHOUT HARM

EVERYONE EVERYDAY

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GLOSSARY/ ABBREVIATIONS

Term/ Abbreviation	Definition
CAQMP	Construction Air Quality Management Plan
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSWMP	Construction Soil and Water Management Plan
DDG	Dust Deposition Gauge
DEC	Department of Environment and Conservation. Now superseded by Office of Environment and Heritage (NSW)
EA	Environmental Assessment
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environmental Protection Licence
EWMS	Environmental Work Method Statement
FM Act	Fisheries Management Act
K2K	Kundabung to Kempsey
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NERDDC	National Energy Research, Development and Demonstration Council
NGER	National Greenhouse and Energy Reporting Act
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PESCP	Progressive Erosion and Sediment Control Plan
POEO Act	Protection of the Environment Operations Act
Project, the	The Kundabung to Kempsey Pacific Highway Upgrade project
RMS	Roads and Maritime Services (formerly RTA)
RTA	Road Transport Authority (now RMS)
SoC	Revised Statement of Commitments included in the Submissions Report

1.0 INTRODUCTION

1.1 CONTEXT

This Air Quality Management Sub Plan (CAQMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the upgrade of the Pacific Highway between Kundabung and Kempsey (hereafter referred to as 'the Project' or 'K2K').

This CAQMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the RMS Statement of Commitments (SoC), the mitigation measures listed in the Oxley Highway to Kempsey Environmental Assessment (EA) and all applicable legislation.

1.2 BACKGROUND

For the purposes of approvals the project was assessed as Oxley Highway to Kempsey. The McConnell Dowel OHL Joint Venture ('the JV') is delivering the 13.7km K2K section of the Oxley Highway to Kempsey Pacific Highway Upgrade. Air quality management specifically related to this section of the highway is contained within this document.

The Oxley Highway to Kempsey – Upgrading the Pacific Highway – Environmental Assessment (RTA 2010) assessed air quality impacts from the Project in Chapter 20.

The EA identified the potential for minor impacts on air quality during construction typically associated with dust. However, concluded any potential impacts could be managed by standard mitigation and management measures.

1.3 ENVIRONMENTAL MANAGEMENT SYSTEMS OVERVIEW

The overall Environmental Management System for the Project is described in the **Construction Environmental Management Plan (CEMP)** (**QMS # 025-Y001-2602).**

The CAQMP is part of the JV's environmental management framework for the Project, as described in Section 4.1 of the CEMP. Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS).

EWMS will be developed and signed off by environment and management representatives prior to associated works and construction personnel will be required to undertake works in accordance with the identified requirements and associated mitigation measures.

Used together, the CEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by JV personnel and contractors.

The review and document control processes for this Plan are described in Chapters 9 and 10 of the CEMP.

2.0 PURPOSE AND OBJECTIVES

2.1 PURPOSE

The purpose of this Plan is to describe how the JV proposes to manage and protect air quality during construction of the Project.

2.2 OBJECTIVES

The key objective of the CAQMP is to ensure that impacts on air quality are minimised and within the scope permitted by the planning approval. To achieve this objective, JV will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise air quality impacts and potential adverse impacts to the sensitive receivers along the Project corridor.
- Ensure appropriate measures are implemented to address the relevant CoA and SoC outlined in Table 3-1 and Table 3-2, and the mitigation measures detailed in the EA.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.

Refer to Appendix B7 Construction Waste and Energy Management Sub Plan for measures to reduce greenhouse gas emissions during construction.

2.3 TARGETS

The following targets have been established for the management of air quality impacts during construction of the Project:

- Ensure full compliance with the relevant legislative requirements, CoA and SoC.
- Implement feasible and reasonable air quality control measures with the aim of constructing the Project in a manner that minimises dust emissions from the site.
- Complaints from the community and stakeholders are minimised and managed.

3.0 ENVIRONMENTAL REQUIREMENTS

3.1 RELEVANT LEGISLATION AND GUIDELINES

3.1.1 Legislation

Legislation relevant to air quality management includes:

- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Protection of the Environment Operations Act 1997 (POEO Act).*
- *National Greenhouse and Energy Reporting Act 2007 (NGER Act)*

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the CEMP. Matters relating to the *National Greenhouse and Energy Reporting Act 2007* are addressed in the Waste and Energy Management Sub Plan.

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- National Environment Protection Council's (NEPC) – NEPM) for Ambient Air Quality Guidelines.
- Protection of the Environment Operations (Clean Air) Regulation, 2002.
- AS 2922 Ambient Air Guide for Citing of Sampling Equipment.
- AS 3580.10.1-1991 Methods of Sampling Analysis of Ambient Air.
- Action for Air 1998 (NSW DEC).
- Approved Methods and Guidance for the Modeling and Assessment of Air Pollutants in NSW (DEC 2005).
- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline), Refer to Table 5-1 below.

3.2 MINISTER'S CONDITIONS OF APPROVAL

The CoA relevant to this Plan are listed Table 3-1 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1 Conditions of Approval relevant to the CAQMP

CoA No.	Condition Requirements	Document Reference
B30(e)(i)	Measures to monitor and manage dust emissions including dust from stockpiles, blasting, traffic on unsealed public roads and materials tracking from construction sites onto public roads.	Table 7-1
C2	The Proponent shall employ feasible and reasonable measures (including cessation of relevant works, as appropriate) to ensure that the project is constructed in a manner that minimises dust generation including wind-blown, traffic-generated dust, dust from stockpiles and material tracking from construction and ancillary facility sites onto public roads.	Table 7-1

3.3 STATEMENT OF COMMITMENTS

Relevant SoC are listed Table 3-2 below. This includes reference to required outcomes, the timing of when the commitment applies and relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2 Statements of commitment relevant to this CAQMP

Outcome	Ref #	Commitment	Timing	CAQMP Reference
Minimise dust generation and impact to sensitive receivers.	AQ1	Feasible and reasonable mitigation measures will be adopted to minimise windblown, traffic-generated or equipment-generated dust and emissions.	Construction	Table 7-1
	AQ2	Dust generating activities will stop where visible dust is being emitted outside the construction corridor and dust suppression measures are ineffective.	Construction	Table 7-1

4.0 EXISTING ENVIRONMENT

The following sections summarise what is known about factors influencing air quality within and adjacent to the Project corridor.

The key reference document is Section 20.1 of the EA.

4.1 AIR QUALITY RECORDS

Local air conditions in the Project area are not influenced by large-scale industrial land uses, exposed soil areas or burning of material and are therefore considered to be good quality.

Long-term monitoring is not usually undertaken outside metropolitan and/or industrial areas, because pollutants typically do not exist in concentrations that would cause adverse environmental or health impacts. However, there has been short-term air quality monitoring adjacent to a dual carriageway section of the Pacific Highway at Korora, which is located in an urban area approximately 120 kilometres north of Kempsey. A monitoring station was established at Korora to monitor the ambient air quality from October 2005 to January 2007.

Table 4-1 Korora air quality monitoring results

Pollutant	Averaging period	NEPM goals		Korora monitoring results	
		Maximum concentration	10-year goal (max allowable exceedence)	Maximum recorded concentration	Average recorded concentration
National standards and goals for ambient air quality					
Carbon monoxide	8 hr	9.0 ppm (10mg/m^3)	1 day a year	0.2 ppm (0.3 mg/m^3)	0.03 ppm (0.04 mg/m^3)
Nitrogen dioxide	1 hr	0.12 ppm (246 µg/m^3)	1 day a year	0.036 ppm (73.8 µg/m^3)	0.004 ppm (9.2 µg/m^3)
Particles as PM_{10}	1 day	50 µg/m^3	5 days a year	37.8 µg/m^3	20.3 µg/m^3
Advisory reporting goals					
$PM_{2.5}$	1 day	25 µg/m^3	Gather data to facilitate review of goal	15.4 µg/m^3	7.7 µg/m^3

Results of the monitoring at Korora showed that all levels were well below NEPM air quality goals.

The JV will implement best practice procedures during the operation of plant and machinery in order to comply with NEPM goals. In addition, PM_{10} monitoring will be undertaken for the duration of the project.

4.2 RAINFALL, SOIL DRYNESS AND WIND

The rainfall records from Port Macquarie, Telegraph Point and Kempsey have been selected to reflect the potential rainfall conditions across the Project site due to the proximity of the Bureau of Meteorology's weather stations to the overall site. A summary of the rainfall records from the Bureau of Meteorology is provided in Table 4-2, and illustrated in Figures 4-1 and 4-2.

Table 4-2 Summary of rainfall records

Summary of rainfall records to present													
	Summer / Autumn						Winter / Spring						
	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Year
Station: Kempsey (Wide Street) **Available records: 1882 – present**													
Mean rainfall (mm)	109.4	134.8	158.4	151.0	115.9	92.1	100.0	65.5	61.4	55.6	78.5	95.6	1218.6
Mean rain days	8.7	9.4	9.8	10.5	8.3	6.9	6.1	5.1	4.8	5.2	7.0	8.0	89.8
Station: Telegraph Point (Farrawells Road) **Available records: 1910 – present**													
Mean rainfall (mm)	113.2	137.9	176.8	164.7	128.7	105.0	108.8	68.8	57.1	60.4	83.8	108.8	1317.0
Mean rain days	This data set isn't available for this station. Telegraph Point monthly rainfall [http://bit.ly/1GMLTDi] There are gaps in the data, the Bureau of Meteorology urge caution, it would not be appropriate to attempt to analyse.												
Station: Port Macquarie Airport **Available records: 1995- present (refer Note 1)**													
Mean rainfall (mm)	100.3	149.1	172.6	165.7	151.4	119.6	147.9	71.0	59.8	61.1	75.6	163.4	1424.4
Mean rain days	9.1	9.0	10.6	10.9	9.3	8.1	7.5	6.9	5.5	5.3	7.4	10.7	100.3
Note 1. Statistical analysis not recommended by BOM, as there are less than 30 years of records available.													

Figure 4-1 – Mean rainfall and mean rain days, Kempsey (Wide Street), 1882 – Present)

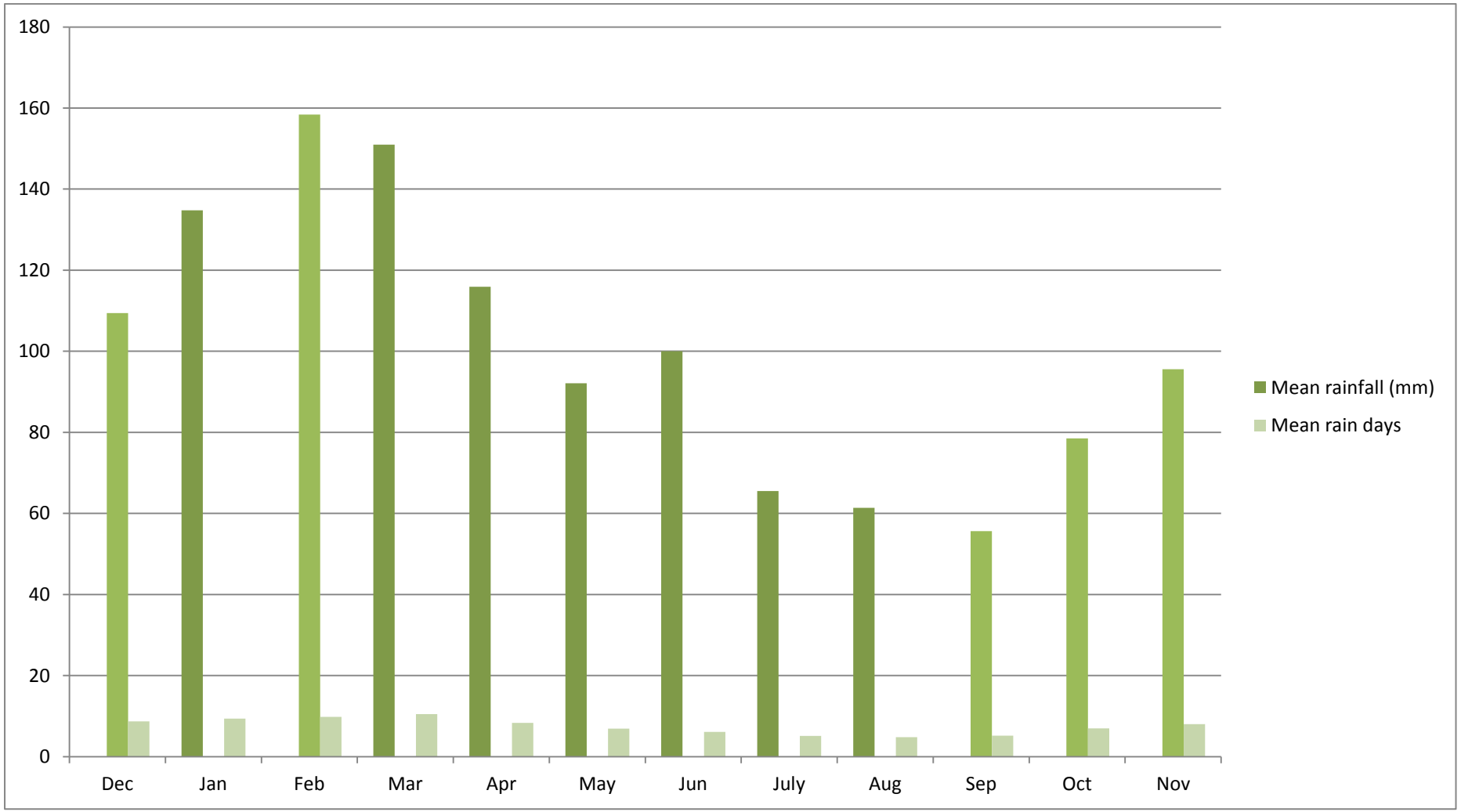
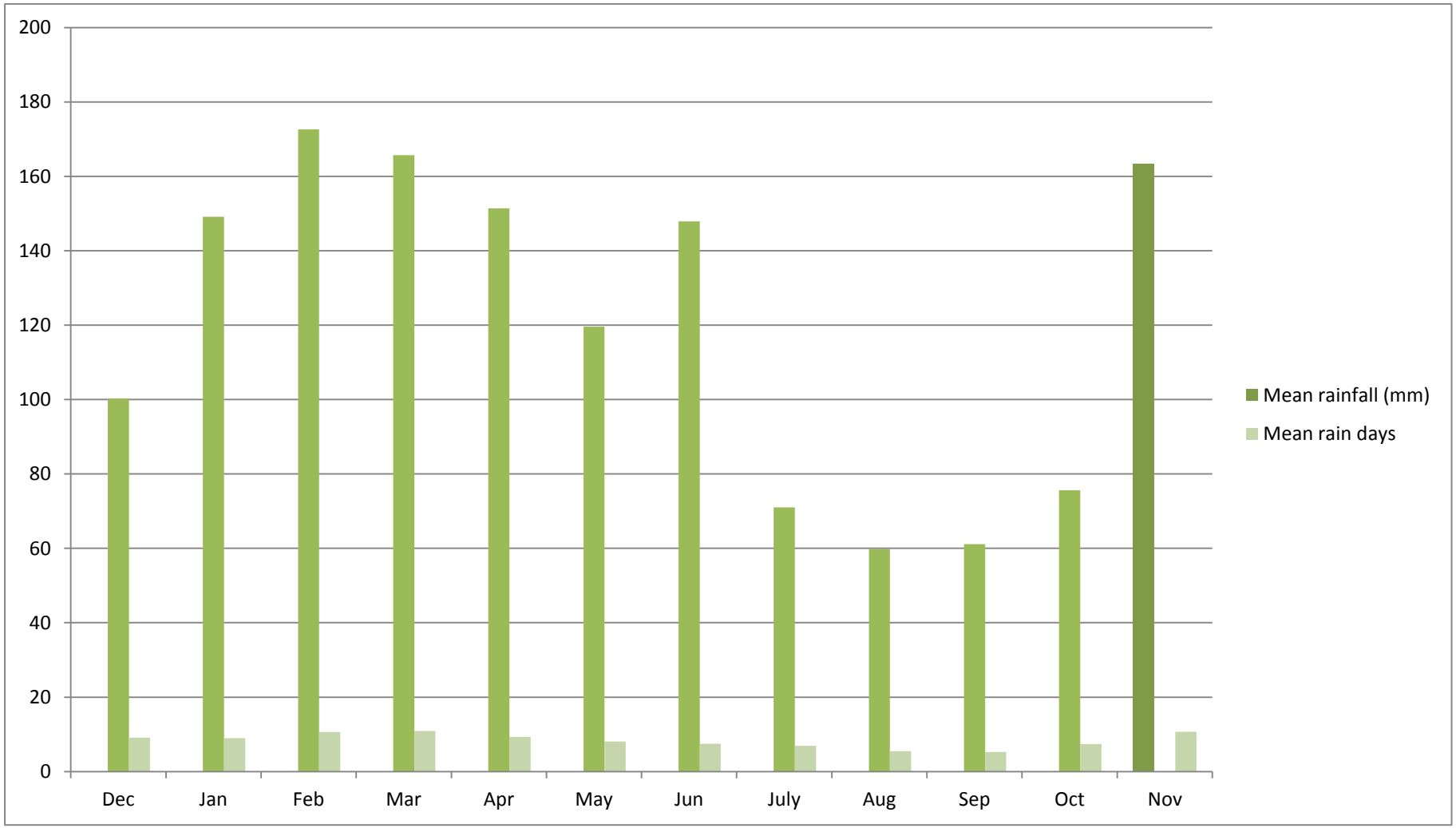


Figure 4-2 - Mean rainfall and mean rain days, Port Macquarie Airport (1995 –Present)



The above table provides a consideration of typical climatic factors that contribute to the proliferation of dust particulates. In addition to the exposure of unconsolidated material during construction e.g. earthworks, climatic factors such as prolonged dry weather, combined with high winds, can increase the likelihood of dust particulate emissions.

It can be seen from Table 4-2 and Figures 4-1 and 4-2 that rainfall is typically higher during summer and autumn. Typically rainfall is much lower during the winter and spring (July – October). Wind data from Port Macquarie has been selected to predict the likely wind speed and across the Project site (http://www.bom.gov.au/climate/averages/wind). Seasonal wind conditions at Port Macquarie are characterised by the following wind speed and directions:

Spring and Summer months:

- Morning: Moderate (10-20 km/hr) wind speeds from the south west
- Afternoon: Moderate (10-20 km/hr) to high wind (20-30 km/hr) speeds from the north east.

Autumn and Winter months:

- Morning: Calm to low (0-10 km/hr) wind speeds from the west
- Afternoon: Moderate (10-20km/hr) wind speeds from the north east.

4.3 SOIL CHARACTERISTICS

The soil types along the Project are described in Table 4-3, with an indication of the potential for wind erosion.

Table 4-3 Soil type and characteristics

Chainage	Soil type	Characteristics
Ch24000-26000 Ch28750-30500 Ch31000-31750 Ch35600-37000	Kundabung (kg)	Description: Undulating rises with broad crest, extensive footslopes and drainage plains on Permian mudstones of the Kempsey and Beechwood Beds. Slope gradients: 3% - 10% (often <5%) Elevation & relief: 5m – 30m Limitations: • Seasonal waterlogging • Gully erosion hazards - subsoils • Foundation hazard • Run-on (localised) • Shallow soils (localised) • Hardsetting • Low to Moderately erodible • Sodicity • Strong acidity • Low wet bearing strength • Low permeability • High aluminium toxicity potential

Chainage	Soil type	Characteristics
Ch24000-26000 Ch28750-30500 Ch31000-31750 Ch35600-37000	Kundabung (kg)	Description: Undulating rises with broad crest, extensive footslopes and drainage plains on Permian mudstones of the Kempsey and Beechwood Beds. Wind Erosion risk: • Moderate to high wind erosion risk due to hardsetting and low permeability soil horizons. • Large fraction of fine soils poses high risk of dust emissions due to vehicle movements and soil handling. • North-south alignment exposed to prevailing winds. K factor: 0.017 to 0.094 Sediment Type: “D” Type – Dispersible & “F” Type - Fine
Ch26000-27700 Ch31750-35600 Ch37000-37750	Euroka (eu)	Description: Rolling low hills on Permian mudstones of the Kempsey and Beechwood Beds. Slope gradients: 10% - 15% rising to 33% at times Elevation & relief: Elevation 20m - 90m, local relief 20-60m Limitations: • Seasonal waterlogging (localised) • Gully erosion hazard • Foundation hazard • Shallow soils (localised) • Hardsetting and infertile • Moderate erodible • Sodicity • Very strong acidity • Low wet bearing strength • High plasticity • Low permeability • High aluminium toxicity potential Wind Erosion risk: • Moderate to high wind erosion risk due to hardsetting and low permeability soil horizons. • Large fraction of fine soils poses high risk of dust emissions due to vehicle movements and soil handling. • North-south alignment exposed to prevailing winds. K factor: 0.011 to 0.037 Sediment Type: “D” Type – Dispersible & “F” Type – Fine

Chainage	Soil type	Characteristics
Ch27700-28750 Ch30500-31000	Pipers Creek (pc)	Description: Level alluvial terraces to coastal streams draining mudstones. Developed on late Pleistocene alluvium. Slope gradients: <1% Elevation & relief: 5m – 9m Limitations • Flooding hazard • Seasonal waterlogging • Gully erosion hazards (localised) • Foundation hazard • Hardsetting • Moderate erodibility • Strong sodicity • Very strong to extreme acidity • Low wet bearing strength • Low permeability • High aluminium toxicity potential Wind Erosion risk: • Moderate to high wind erosion risk due to hardsetting and low permeability soil horizons. • Large fraction of fine soils poses high risk of dust emissions due to vehicle movements and soil handling. • North-south alignment exposed to prevailing winds. K factor: 0.033 to 0.092 Sediment Type: “D” Type – Dispersible & “F” Type - Fine

4.4 SENSITIVE RECEIVERS

The construction of the project will interact with a number of sensitive receivers and natural environments. The lands surrounding the Project have been considered for potential sensitivity to dust and air quality impacts. The potential sensitive receivers include:

- Residences.
- Native vegetation.
- Sensitive commercial or industry users.
- Road users.
- Watercourses.

The nearest potentially affected non-residential sensitive receivers have been identified as, but not limited to, the following:

- Stumpy Creek;
- Maria River;
- Pipers Creek;
- Smiths Creek;
- Maria River State Forest;
- Ballengara State Forest; and

- All service/ side roads and roadside rest areas in the immediate vicinity of the project works.

Residential sensitive receivers have been identified from their close proximity to the Project. These receivers have been grouped into dust catchment areas. The location of these catchments and residential receivers are shown in Appendix A.

5.0 AIR QUALITY CRITERIA

The Environment Protection Authority (EPA) sets goals for ambient dust concentrations and dust deposition, which is a measure of the impacts of nuisance (EPA 2001).

The acceptable increment in annual average dust deposition depends on the existing deposition level. These are based on research by Dean (1990) and other investigations, which detail community response to dust fallout. It should be remembered that the air quality goals relate to the total dust burden in the air and not just the dust from the Project. In other words, there needs to be some consideration of background levels when using these goals to assess impacts.

Table 5-1 below details the air quality monitoring criteria for deposited dust.

Table 5-1 Air quality monitoring criteria for deposited dust[a]

Pollutant	Annual concentration		Source
Deposited dust[b]	2g/m^2/month[c]	4 g/m^2/month[d]	NERDDC (1988)

Note:

a. Adapted from DEC guideline; Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.

b. Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

c. Maximum increase in deposited dust level.

d. Maximum total deposited dust level.

6.0 ENVIRONMENTAL ASPECTS AND IMPACTS

6.1 CONSTRUCTION ACTIVITIES

Emissions to the atmosphere during construction that could result in adverse impacts to air quality are typically divided into two categories. These are:

- Dust and particulates.
- Gaseous.

Key aspects of the project that could result in dust emissions include:

- General earthworks particularly during site establishment.
- Vegetation clearing.
- Bulk Earthworks.
- Drilling and blasting;
- Crushing and screening operations.
- Operation of concrete / asphalt batching plants.
- Topsoil / material handling including stockpiling, material loading and material haulage.
- Vehicular movements over unpaved surface (including unsealed access roads).
- Wind erosion of exposed areas and temporary stockpiles.
- Tracking of dirt onto roads.

Air emissions, other than dust, which may be generated by construction activities include:

- Vehicle and plant exhaust emissions, which may be excessive if vehicles and plant are poorly maintained.
- Odours/gases released during:
- Excavations of organic or contaminated materials.
- During sealing works.
- Operation of concrete / asphalt batching plants.

6.2 FACTORS LIKELY TO LEAD TO DUST GENERATION AND IMPACTS

In addition to the inherent risks of specific construction activities creating the potential to generate dust, a number of other environment factors also affect the likelihood of dust emissions. These include:

- Wind direction – determines whether dust and suspended particles are transported in the direction of the sensitive receivers.
- Wind speed – governs the potential suspension and drift resistance of particles.
- Soil type – more erodible soil types have an increased soil or dust erosion potential.
- Soil moisture – increased soil moisture reduces soil or dust erosion potential.
- Rainfall or dew – rainfall or heavy dew which wets the surface of the soil and reduces the risk of dust generation.

6.3 IMPACTS

The potential for impacts on air quality will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction might include:

- Deposition of dust on surfaces where it may cause damage and/or lead to a need for increased cleaning or repair.
- Aesthetic effects that arise from visible airborne dust plumes and from deposits of dust on surfaces.
- Need for increased maintenance of air filtering systems (e.g. air conditioners etc.).
- Potential adverse health effects including eye, nose and throat irritation from excessive inhalation of fine particles.
- Impacts on water quality and/or vegetation health from dust deposition.
- Impacts on residential sensitive receivers, including impacts on living areas, swimming pools and general amenities.
- Complaints from the public relating to dust or odours.

Some impacts on air quality attributable to the Project are anticipated and have been described in the EA. Chapter 7 of this Plan provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

7.0 ENVIRONMENTAL CONTROL MEASURES

A range of environmental requirements and control measures are identified in the various environmental documents, including the EA, Statement of Commitments, supplementary assessments, Conditions of Approval and RMS documents, and from recent experience on similar road projects. Specific measures and requirements to address impacts on air quality are outlined in Table 7-1.

Table 7-1: Air quality management and mitigation measures

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
GENERAL					
AQ1	Training will be provided to all project personnel, including relevant sub-contractors on sound air quality control practices and the requirements from this plan through inductions, toolboxes and targeted training.	Environmental Awareness Training Material	Pre-construction Construction	Construction Manager / Environment Manager	G38/G36, Good practice
AQ2	Air quality control measures from this plan will be included in relevant Environmental Work Method Statements (EWMS) and/or Progressive Erosion and Sediment Control Plans (PESCP).	EWMS PESCP	Pre-construction / Construction	Site Engineer / Environmental Officer	Good practice
AQ3	Vegetation clearing will be staged where possible to minimise the area and time that surfaces are exposed.	Clearing and Grubbing EWMS	Construction	Site Engineer	CoA B30(e)(i) and C2 SoC AQ1 G36
AQ4	Exposed surfaces with no scheduled work for two weeks will be treated to minimise dust generation. Exposed surfaces will be stabilised progressively using the most practical site specific methods, including watering and geo-fabrics for short term exposure and emulation spray, spray grass, soil compaction and revegetation for longer term exposed areas or final finishes.	Stockpile Management Protocol PESCPs Dust suppression equipment	Construction	Foreman	CoA B30(e)(i) and C2 SoC AQ1 G36 EA
AQ5	Construction activities will be modified, reduced or controlled during high or unfavourable wind conditions if they have a potential to increase off-site dust generation.	Weather station data Daily inspections	Construction	Foreman	CoA B30(e)(i) and C2 SoC AQ2 G36
AQ6	Control measures including water carts, sprinklers, sprays, dust screens or the application of geo-binding agents will be utilised where applicable to control dust emissions. The frequency of use will be modified to accommodate prevailing conditions.	Dust suppression equipment Daily inspections	Construction	Foreman	CoA B30(e)(i) and C2 SoC AQ1 G36

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
AQ7	Erosion control structures will be checked regularly for buildup of silt and other materials to ensure deposits do not become a dust source.	Weekly Enviromental Inspections Rainfall Inspections Environmental Monitoring Procedure	Construction	Foreman	CoA B30(e)(i) Good practice
AQ8	Waste will be segregated and collected on a regular basis to ensure odours associated with waste do not become an issue.	Construction Energy and Waste Management Sub-Plan	Construction	Foreman	Good practice
AQ9	The application of pesticides will be modified, reduced or controlled during high or unfavourable wind conditions where wind can carry pesticides outside of the defined treatment area.	Weed and Pathogen Management Plan	Construction	Foreman	G36
AQ10	Stockpiles will be located in accordance with the criteria established in Appendix H of the SWMP. A suitable cover crop or provision of other covering over topsoil stockpiles that will be established where stockpiles prone to wind erosion are in place for longer than 2 weeks.	Stockpile Management Protocol	Construction	Site Engineer / Foreman	CoA B30(e)(i) and C2 G36
AQ11	There will be no burning off of waste.	Construction Energy and Waste Management Sub-Plan	Construction	Foreman	G36
VEHICLE MOVEMENT AND MATERIAL STORAGE					
AQ12	Areas of disturbed material and access roads will be stabilised where possible by methods such as compaction. Compounds, ancillary facilities, administration access roads and standing areas will be hard surfaced.	Stockpile Management Protocol Construction Soil and Water Management Sub-Plan	Construction	Superintendent	CoA B30(e)(i) and C2 SoC AQ1 G36

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
AQ13	Measures implemented to minimise dust, soil or mud from being deposited by vehicles on public roads. This will be achieved by implementing mitigation measures such as rumble grids and rail ballast at entry/exit points. Manual cleaning will also be carried out where appropriate. In the event of any spillage or tracking, the spilt material will be removed within 24 hours.	Construction Soil and Water Management Sub-Plan Weekly Environmental Inspections	Construction	Superintendent	CoA B30(e)(i) and C2 SoC AQ1 G36
AQ14	Hardstand areas and surrounding public roads will be cleaned, as required, using methods including brooms, bobcat attachments or street sweepers.	Construction Soil and Water Management Sub-Plan	Construction	Foreman	Good practice
AQ15	Vehicle movement will be confined to designated haul roads and areas. These roads will have speed limits of 40km/h in order to reduce dust generation. Reduced speed limit maybe implemented where dust generation persists	Construction Traffic Management Sub-Plan Daily inspections	Construction	Superintendent	CoA B30(e)(i) and C2 SoC AQ1 G36
AQ16	All loaded haulage trucks will be covered where there is a risk of release of dust or other materials and at all times on public roads.	Dust suppression equipment	Construction	Foreman	CoA B30(e)(i) and C2 SoC AQ1 G36

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
PLANT AND EQUIPMENT					
AQ17	Haul trucks and plant equipment will be switched off when not in operation for periods of more than 15 minutes.	Environmental Monitoring Procedure Daily inspections	Construction	Foreman / Operators	SoC AQ1 G36
AQ18	Engines of plant parked next to residents will be switched off when not in operation.	Environmental Monitoring Procedure Daily inspections	Construction	Foreman / Operators	Good practice
AQ19	Exhaust systems of construction plant, vehicles and machinery will be maintained in accordance with manufacturer's specifications to ensure that emissions do not exceed EPA regulations. Periodic visual checks will be undertaken to ensure ongoing compliance, typically weekly.	Environmental Monitoring Procedure Daily inspections	Construction	Foreman	SoC AQ1 G36
BATCH PLANTS					
AQ20	Water carts will be used to suppress dust around batch plants.	Batch Plant Establishment and Operation EWMS Daily inspections	Construction	Foreman	CoA B30(e)(i) and C2 SoC AQ1 Good practice
AQ21	Batch plants will be swept and cleaned to keep them in a tidy state to prevent the build-up of dust.	Batch Plant Establishment and Operation EWMS Daily inspections	Construction	Foreman	Good practice
AQ22	High dust emitting structures or processors in batch plants (eg conveyer belts) will have water spraying systems installed to suppress dust.	Batch Plant Establishment and Operation EWMS	Construction	Site Engineer	Good practice

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
AQ23	Concrete batch plants to be fitted with dust filters to minimise air quality impacts from batching operations.	Batch Plant Establishment and Operation EWMS	Construction	Site Engineer	G36
BLASTING AND CRUSHING					
AQ24	Where practical during blasting, a combination of the following mitigation measures will be used to suppress dust: Weather reports checked prior to blasting to ensure wind-blown dust will not reach surrounding residents. Controlled blasts to minimise dust produced.	Blasting EWMS Bureau of Meteorology (BOM) website	Construction	Foreman	CoA B30(e)(i) Good practice
AQ25	Crushers will be positioned in protected areas, where practical, to reduce wind dispersion of dust particles (eg within cuts). Water spraying will be utilised if necessary.	Blasting EWMS	Construction	Foreman	CoA B30(e)(i) Good practice
INSPECTION, MONITORING AND RECORDS					
AQ26	Public roads will be inspected each day at main entry and exit points to and from areas where construction activities are taking place and compound. Material tracked onto the road pavement will be removed in accordance with AQ13.	Environmental Monitoring Procedure Daily inspections	Construction	Foreman	G36
AQ27	Dust deposition gauges will be established three months prior to the commencement of construction to establish background dust levels. Monitoring equipment will remain in place until completion of the construction works and/or where ground conditions are stable. Results will be captured on a monthly basis and collected in accordance with DEC's "Approved Method for the Sampling and Analysis of Air Pollutants in NSW" guidelines.	Approved Method for the Sampling and Analysis of Air Pollutants in NSW (DEC,1998) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2001)	Pre-construction / Construction	Environmental Officer	G36

ID	Measure / Requirement	Resources needed	When to implement	Responsibility	Reference
AQ28	Weather forecast will be reviewed on a daily basis and appropriate measures implemented where unfavourable weather conditions (dry weather, strong winds) are anticipated.	Onsite weather station equipment Bureau of Meteorology (BOM) website	Construction	Environmental Manager / Foreman	Good practice
AQ29	An onsite weather station will be established to record weather data. Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established.	Onsite weather station equipment	Pre-construction / Construction	Environmental Manager	Good practice
AQ30	Dust control and operational procedures will be reviewed and modified if results exceed the air quality criteria and are attributable to construction activities.	Environmental Monitoring Procedure RMS Environmental Incident Classification and Reporting	Construction	Environmental Manager / Foreman	Good practice
AQ31	Where stockpiles are located within 200 metres of residences, these stockpile areas will be monitored for odour. If nuisance odours are generated and are impacting sensitive receivers, odour control measures will implemented, if feasible and reasonable. If this is not possible, material found to be emitting odours will be relocated to an alternative stockpile location away from residences.	Stockpile Management Protocol Environmental Monitoring Procedure	Construction	Environmental Manager / Foreman	Good practice

8.0 COMPLIANCE MANAGEMENT

8.1 ROLES AND RESPONSIBILITIES

The Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4.2 of the CEMP. Specific responsibilities for the implementation of environmental (flora/fauna) controls are detailed in Chapter 7 of this Plan.

8.2 TRAINING

All employees, contractors and utility staff working on site will undergo site induction training relating to air quality management issues. The induction training will address elements related to air quality management including:

- Existence and requirements of this sub-plan.
- Relevant legislation.
- Roles and responsibilities for air quality management.
- Air quality mitigation and management measures.
- Procedure to be implemented in the event of an incident (e.g. release of dust or gaseous emissions from site).

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in air quality management. Examples of training topics include:

- Erosion and sediment control installation methodology.
- Preparedness for high wind events.
- Lessons learnt from incidents and other event e.g. low rainfall/high wind.

Further details regarding staff induction and training are outlined in Chapter 5 of the CEMP.

8.3 MONITORING AND INSPECTION

Regular monitoring and inspections will be undertaken during construction. Monitoring and inspections will include, but not be limited to:

- Monthly dust monitoring in accordance with EPA's "Approved Method for the Sampling and Analysis of Air Pollutants in NSW" guidelines.
- Weather data at the premises, including rainfall measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established.

Additional requirements and responsibilities in relation to inspections are documented in section 8 of the CEMP.

Daily visual inspections of the construction site will be undertaken by the Environment Manager/ Advisor (or delegate) and construction personnel to identify actual or potential air quality concerns.

The results of dust monitoring will be incorporated into the Monthly Environmental Reports. Results will be assessed against baseline monitoring data, control gauges and the criteria outlined in Table 5-1 of this Plan. Exceedences of this criteria will be investigated and mitigation measures reviewed and adapted if necessary.

Areas for improvement will be identified and incorporated into the regular auditing, monitoring and reporting program.

Air quality monitoring using dust deposition gauges (DDGs) will be organised and undertaken monthly by the Environment Manager/ Officer or delegate in accordance with "*Approved Methods for Sampling and Analysis of Air Pollutants in NSW*" and "*Approved Methods for the Modelling and*

Assessment of Air Pollutants in New South Wales". DDGs will be placed at selected locations along the length of the project, as outlined in Appendix A. Included are a number of baseline dust deposition gauges installed as controls in areas away from the influence of the works.

8.4 LICENCES AND PERMITS

An EPL will be obtained for the scheduled activity "road construction". The EPL typically prescribes air quality parameters to be measured. The air quality monitoring criteria for the Project is listed in Table 5-1.

Any other relevant licenses or permits will be obtained in the lead up to and during construction as required.

8.5 AUDITING

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in section 8.3 of the CEMP.

8.6 REPORTING

Reporting requirements and responsibilities are documented in sections 8.4 and 8.5 of the CEMP.

9.0 REVIEW AND IMPROVEMENT

9.1 CONTINUOUS IMPROVEMENT

Continuous improvement of this plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement. This will be achieved through the process documented in Section 9 of the CEMP.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

9.2 CAQMP UPDATE AND AMENDMENT

The processes described in Chapter 8 and Chapter 9 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Only the Environment Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 10.2 of the CEMP.

APPENDIX A – DUST CATCHMENT AREAS AND SENSITIVE RECEIVERS

DUST CATCHMENT AREAS AND SENSITIVE RECIEVERS

Table 0-1: Dust Catchment Areas and Residential Sensitive Receivers[NB]

ID	Dust Catchment Area		Residential Sensitive Receiver	Approx. Distance (to nearest 25m) from Proposed Pacific Highway Alignment (m)
	No.	Description		
1	DCA01	North of Old Coast Road (western side)	81 Scrubby Creek Road, South Kempsey	125
2	DCA01		740 Pacific Highway, South Kempsey	25
3	DCA02	Kundabung Road to Kemps Road (eastern side)	74 Kemps Road, South Kempsey	350
4	DCA03	Piper's Creek to Beams Road (western side)	100 Ravenswood Road, Kundabung	50
5	DCA04	Area north of Kundabung and across Ravenswood Road (eastern side)	1313 Pacific Highway, Kundabung	50
6	DCA05	Upper Smiths Creek Road to Pipers Creek (western side)	73 Rodeo Drive Kundabung	120
7	DCA06	Smiths Creek to Upper Smiths Creek Road (western side)	139 Rodeo Drive	25
8	DCA07	Kundabung area (eastern side)	33 Kundabung Road	225
9	DCA08	Mingaletta Road to Upper Smiths Creek Road (western side)	Lot 101, Pacific Highway, Kundabung	225
10	DCA08		113 Old Pacific Highway, Kundabung	300
11	DCA08		183 Old Pacific Highway, Kundabung	325
12	DCA09	Wharf Road area (eastern side)	8 Wharf Road, Kundabung	150
13	DCA09		27 Wharf Road, Kundabung	240
14	DCA10	Mingaletta Road area (eastern side)	Mobbs Drive, Kundabung	210
15	DCA10		61 Mingaletta Road, Kundabung	50

NB: DCA01 - DCA10 are commensurate with noise catchment areas NCA01 – NCA10.

Table 0-2: Dust Gauge Locations

Dust Gauge Location No.	Dust Catchment Area	Lot Number	Property address	Purpose
1	DCA01	Lot 5	722 Pacific Highway, South Kempsey	Dust deposition sampling
2	DCA02	Lot 33	38 Kemps Road, South Kempsey	Dust deposition sampling
3	DCA02	Lot 32	74 Kemps Road, South Kempsey	Control
4	DCA03	Lot 12	100 Ravenswood Road, Kundabung	Dust deposition sampling
5	DCA04	Lot 26	1359 Pacific Highway, Kundabung	Dust deposition sampling
6	DCA04	Lot 3	180 Rodeo Drive, Kundabung	Dust deposition sampling
7	DCA07	Lot 621	Pacific Highway, Kundabung	Dust deposition sampling
8	DCA09	Lot 1	8 Wharf Road, Kundabung	Dust deposition sampling
9	DCA08	Lot 113	35 Old Pacific Highway, Kundabung	Dust deposition sampling
10	DCA08	Lot 115	183 Old Pacific Highway, Kundabung	Control
11	DCA08	Lot 115	183 Old Pacific Highway, Kundabung	Dust deposition sampling
12	DCA10	Lot 1	61 Mingaletta Road, Kundabung	Dust deposition sampling

Figure 0-1: Residential Sensitive Receptor Locations

Source: Google Maps (2014)

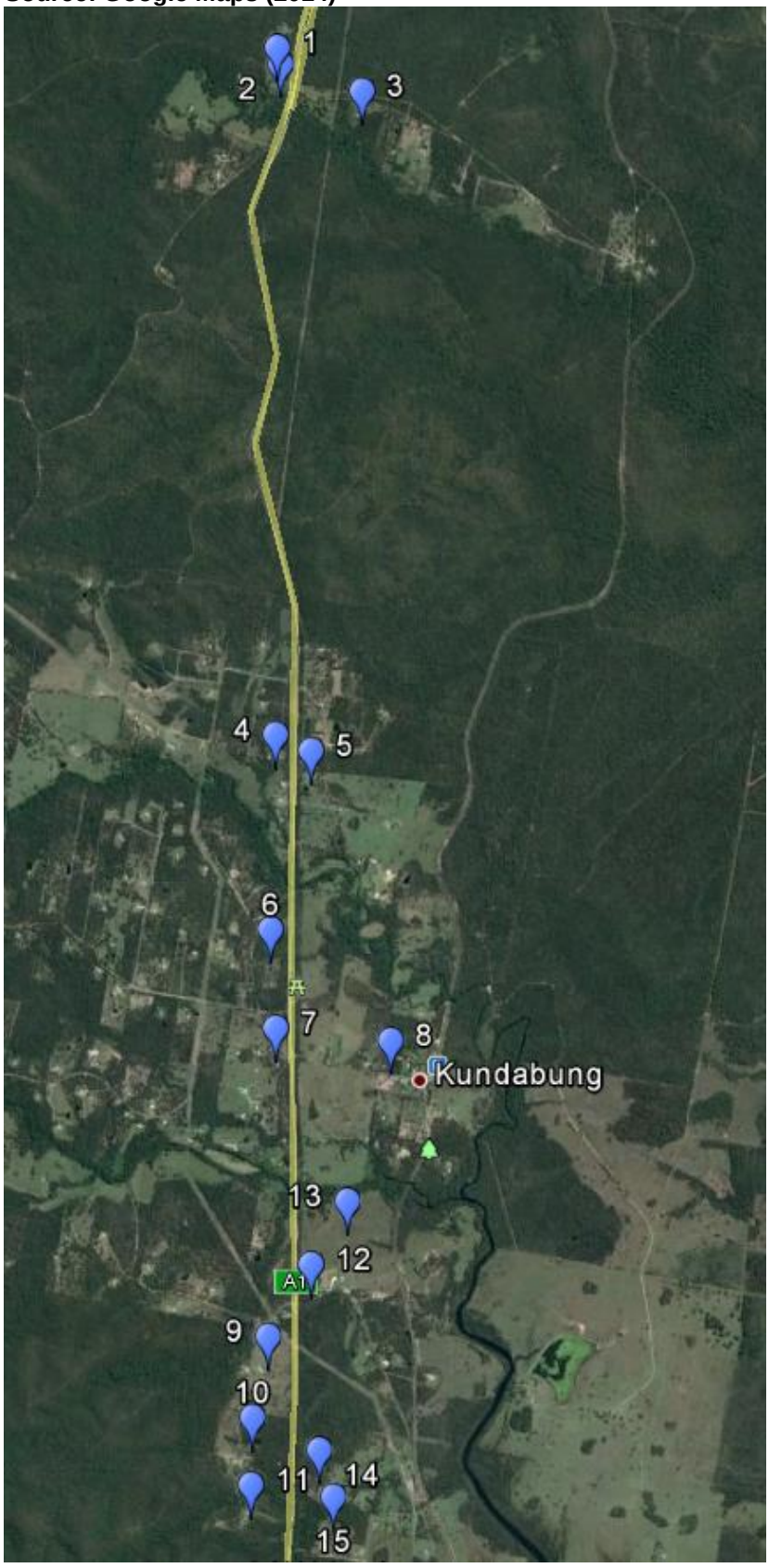


Figure 0-2: Dust Gauge Locations: Gauges 1-3

Figure 0-3 Dust Gauge Locations: Gauges 4 to 7

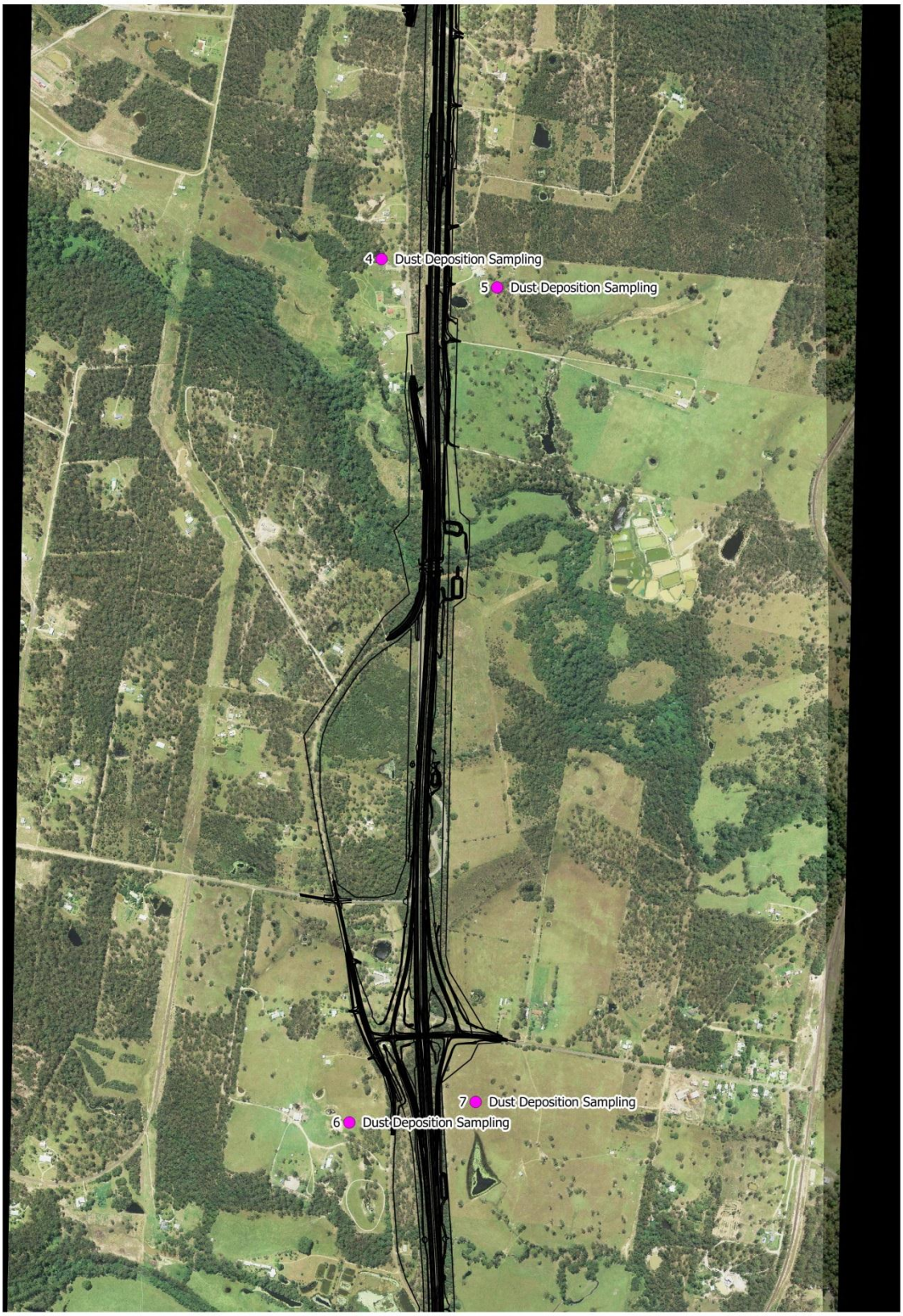


Figure 0-4 Dust Gauge Locations: Gauges 8 to 12