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Air Quality Assessment of the Abbot Point Growth Gateway Project

Prepared for:

Advisian

August 2015

Final

Prepared by:

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Glossary

Term	Definition
$\mu g/m^3$	micrograms per cubic metre
µm	microns
°C	degrees Celsius
km	kilometre
m	metre
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
mg	milligram
t	tonnes
tpa	tonnes per annum
Nomenclature	
PM	Particulate matter (fine dust)
$PM_{2.5}$ and PM_{10}	Particulate matter less than 2.5 or 10 microns, respectively
TSP	Total suspended particles
Abbreviations	
EA	Environmental Authority
EHP	Department of Environment and Heritage Protection
NPI	National Pollutant Inventory
US EPA	United States Environmental Protection Agency
GBRMP	Great Barrier Reef Marine Park
GBRWHA	Great Barrier Reef World Heritage Area
APSDA	Abbot Point State Development Area
CIA	Cumulative Impact Assessment

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by Advisian to conduct an air quality assessment of the Queensland Government's proposed Abbot Point Growth Gateway Project (the Project).

The Project will develop infrastructure to support development at the Port of Abbot Point. The Project relates to the development of infrastructure to support development of the planned Terminal 0 project (T0). Dredging of berth pockets and arrival/departure apron is required to provide safe shipping access to the T0 offshore facility. The scope of the approved T0 project does not directly include dredging of the required berth pockets or apron areas.

The Project involves:

- Construction of an onshore dredged material containment pond (DMCP) within the area previously allocated for the development of the Terminal 2 project (T2) and adjoining industrial land
- Capital dredging of approximately 1.1 million m^3 (Mm^3) in situ volume of previously undisturbed seabed for new berth pockets and ship apron areas required to support the development of T0
- Relocation of the dredged material to the DMCP and offshore discharge of return water
- Ongoing management of the dredged material including its removal, treatment, and beneficial reuse within the port area and the State Development Area (SDA), where appropriate.

The air quality impact assessment considered the potential impact of emissions of dust (TSP, PM_{10} and $PM_{2.5}$) associated with construction and long term management and extraction of dredged material within the DMCP.

The construction of this Project has the potential to generate dust emissions. The main sources of dust will be:

- Dust lift-off from exposed surfaces such as stockpiles and other exposed areas
- Construction of embankments, including moving, dumping and shaping material
- Clearing of vegetation and soil from the site
- Wheel-generated dust from the construction haul roads
- Long term dredged material management including treatment and reuse.

The air quality assessment has shown that:

- At the nearest residential receptor the predicted concentrations of dust due to the construction of the ponds are well below all relevant objectives and guidelines for dust
- There is some potential for elevated dust levels to occur in close proximity to construction activities. The construction emissions and potential for impact will vary according to the construction activities that are underway and will be temporary in nature. The Construction Environmental Management Plan (CEMP) will ensure appropriate mitigation measures are implemented and potential impacts are minimised.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) has been commissioned by Worley Parsons to conduct an air quality assessment of the Queensland Government's proposal to obtain approval for the Abbot Point Growth Gateway Project.

The Project is part of ongoing developments at Abbot Point, approximately 25 km north of Bowen.

1.1 The Project

The Project will develop infrastructure to support development at the Port of Abbot Point. The Project relates to the development of infrastructure to support development of the planned Terminal 0 project (T0). Dredging of berth pockets and arrival/departure apron is required to provide safe shipping access to the T0 offshore facility. The scope of the approved T0 project does not directly include dredging of the required berth pockets or apron areas.

The Project involves:

- Construction of onshore dredged material containment ponds (DMCP) within the area previously allocated for the development of the Terminal 2 Project (T2) and adjoining industrial land
- Capital dredging of approximately 1.1 million m^3 (Mm^3) in situ volume of previously undisturbed seabed for new berth pockets and ship apron areas required to support the development of T0
- Relocation of the dredged material to the DMCP and offshore discharge of return water
- Ongoing management of the dredged material including its removal, treatment, and beneficial reuse within the port area and the Abbot Point State Development Area (SDA), where appropriate.

The DMCPs are located to the west of an existing coal terminal (T1). This site has previously been cleared and has been used for agriculture. The DCMP embankments will be constructed to be between 4 and 7 m above natural ground level.

1.2 Scope of work

This study summarises the aspects of construction that may result in emissions to the atmosphere, as well as the legislation, policies and guidelines that are relevant to the assessment and management of air emissions in Queensland and Australia. The key air pollutant likely to be emitted to the atmosphere from the construction of the infrastructure for the Project is dust. Elevated levels of dust can adversely impact the flora and fauna in the wetland and marine environments surrounding the Project. This assessment has estimated the potential for dust emissions associated with the Project and assessed likely dust levels against relevant air quality objectives.

1.3 Overview of assessment methodology

This air quality assessment study includes the following:

- Description of the regulatory requirements including air quality criteria, relevant to the Project such as the *Environmental Protection Air Policy 2008* (Air EPP)
- Description the meteorology in the vicinity of the Project site, including a general discussion of atmospheric conditions with reference to parameters such as air temperature, wind speed and wind direction, relative humidity, stability class and wind speed profile that are important for dispersion of dust from Project activities

- Identification of sensitive receptors relevant to the Project's potential area of influence
- Description of the existing air quality in the vicinity of the Project site, including identification of any existing sources of dust or particulate matter
- Quantification of key air pollutant emissions associated with the Project
- Dispersion modelling using Ausplume
- An assessment of the cumulative impacts due to the Project, existing sources and/or approved sources of air pollutants in the region
- Assessment of predicted air pollutant concentrations against relevant legislation, including but not limited to:
    - *Environmental Protection Act 1994*
    - *Environmental Protection (Air) Policy 2008*
- Identification of any air quality constraints associated with the Project
- Identification of any dust management practices or mitigation measures to be implemented to minimise dust emissions and the potential for environmental nuisance and harm.

The air quality assessment study has drawn upon previous studies conducted for the Abbot Point Cumulative Impact Assessment to quantify levels of air pollutants associated with other activities at Abbot Point.

2. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

The main consideration of this study was the potential impact of the proposed development on flora and fauna in the wetland and marine environment. There is limited information available on threshold concentrations and deposition rates to protect these environments from air pollutants. Air quality guidelines and objectives for other environmental indicators (such as indicators for human health and amenity) were used as reference values in this assessment where specific indicators were unavailable. The following regulatory guidelines and policies are relevant to the assessment of impacts on human health and amenity:

- *Environmental Protection (Air) Policy 2008* (Air EPP)
- Department of Environment and Heritage Protection (EHP) recommended guideline for dust nuisance
- NSW Office of Environment and Heritage (OEH) impact assessment criteria
- Victorian State Environment Protection Policy (SEPP) Air Quality Management (AQM) design criteria
- National Health and Medical Research Council (NHMRC) Australian Drinking Water Guidelines
- National Water Quality Management Strategy Australian and New Zealand Guidelines for Fresh and Marine Water Quality (NWQMS).

Relevant reference criteria that were used in this assessment are summarised in Table 1. In addition to these criteria, predicted dust levels at the receptor zones and surrounding area were compared with a reference criterion for vegetation protection (see Section 2.6).

Although the regulatory guidelines presented above are not directly relevant to impacts on fauna and ecosystems, these have been used to provide a benchmark for comparison of the potential impacts of the Project. For example the human health objective for PM_{10} is based on a standard for urban areas, where $PM_{2.5}$ is expected to be the main source of particulate with PM_{10} being used as a surrogate for $PM_{2.5}$. The project is not in an urban environment, the main emissions are expected to be PM_{10} rather than $PM_{2.5}$ and fauna and ecosystems rather than humans are the nearest receptors. Therefore, the use of the Air EPP objective of 50 µg/m^3 is conservative and will overestimate the potential for impacts.

Table 1 Air quality indicators, objectives and guidelines used in the assessment

Indicator	Averaging period	Objective [a]	Source	Environmental value
TSP – total suspended particulates	Annual	90	Air EPP	Health and wellbeing
PM_{10} [b]	24-hour	50	Air EPP	Health and wellbeing
$PM_{2.5}$	24-hour	25	Air EPP	Health and wellbeing
	Annual	8	Air EPP	Health and wellbeing
Dust deposition rate	120 days [g]	200 mg/m²/day	Expert consultation	Threshold for vegetation protection
	Monthly	120 mg/m²/day	EHP	Dust nuisance
Antimony	3-minute	17	SEPP AQM	Toxicity
Arsenic	Annual	0.007 mg/L	NHMRC	ADWG
		0. 8 µg/L	NWQMS	Freshwater
		6 ng/m³	Air EPP	Health and wellbeing
	3-minute	0.17	SEPP AQM	IARC Group 1 Carcinogen
Barium (soluble compound) [e]	3-minute	0.017 mg/m³	SEPP AQM	Toxicity
Beryllium	3-minute	0.007	SEPP AQM	IARC Group 1 carcinogen
Boron	Annual	90 µg/L	NWQMS	Freshwater
Cadmium	Annual	0.002 mg/L	NHMRC	ADWG
		0.06 µg/L	NWQMS	Freshwater

Indicator	Averaging period	Objective [a]	Source	Environmental value
		0. 7 µg/L		Marine
Cadmium and compounds [c, f]	Annual	5 ng/m³	Air EPP	Health and wellbeing
	3-minute	0.033	SEPP AQM	IARC Group 1 Carcinogen
Chlorine [e]	3-minute	0.1 mg/m³	SEPP AQM	Toxicity
	Annual	0.4 µg/L	NWQMS	Freshwater
Chromium (III) compounds [e]	3-minute	0.017 mg/m³	SEPP AQM	Toxicity
	Annual	7.7 µg/L	NWQMS	Marine
Cobalt	Annual	0.005 µg/L	NWQMS	Marine
Copper	3-minute	33	SEPP AQM	Toxicity
	Annual	1.0 µg/L	NWQMS	Freshwater
	Annual	0.3 µg/L	NWQMS	Marine
Fluorine [e]	3-minute	0.053 mg/m³	SEPP AQM	Toxicity
Lead	Annual	0.01 mg/L	NHMRC	ADWG
		1.0 µg/L	NWQMS	Freshwater
		2.2 µg/L		Marine
Lead and compounds [d]	Annual	0.5	Air EPP	Health and wellbeing
Magnesium oxide fume [e]	3-minute	0.33 mg/m³	SEPP AQM	Toxicity
Manganese	Annual	0.5 mg/L	NHMRC	ADWG
		1200 µg/L	NWQMS	Freshwater
Manganese and compounds [c, e]	Annual	0.16	Air EPP	Health and wellbeing
	3-minute	0.033 mg/m³	SEPP AQM	Toxicity
Mercury	Annual	0.001 mg/L	NHMRC	ADWG
		0.06 µg/L	NWQMS	Freshwater
		0.1 µg/L		Marine
Mercury (organic) [e]	3-minute	0.33	SEPP AQM	Bioaccumulation
Mercury (inorganic) [e]	3-minute	3.3	SEPP AQM	Bioaccumulation
Nickel	3-minute	0.33	SEPP AQM	IARC Group 1 carcinogen
	Annual	8.0 µg/L	NWQMS	Freshwater
		7.0 µg/L		Marine
Selenium	Annual	5.0 µg/L	NWQMS	Freshwater
Vanadium	Annual	50 µg/L	NWQMS	Marine
Zinc	Annual	2.4 µg/L	NWQMS	Freshwater
		7.0 µg/L		Marine

Note:
[a] Air quality objectives are presented in µg/m³ unless otherwise indicated
[b] Five exceedances allowed per year
[c] measured as the total metal content in PM_{10}
[d] measured as the total metal content in TSP
[e] Class 2 Pollutants
[f] Class 3 Pollutants
[g] Refers to 120-day rolling average

2.1 Environmental Protection (Air) Policy air quality objectives

The EP Act provides for the management of the air environment in Queensland. The legislation applies to government, industry and individuals and provides a mechanism for the delegation of responsibility to other government departments and local government and provides all government departments with a mechanism to incorporate environmental factors into decision-making.

The EP Act gives the EHP the power to create Environmental Protection Policies that identify, and aim to protect, environmental values of the atmosphere that are conducive to the health and wellbeing of humans and biological integrity. The administering authority must consider the requirements of the Air EPP when it decides an application for an environmental authority, amendment of a licence or approval of a draft environmental management plan. Schedule 1 of the Air EPP specifies air quality indicators and objectives for Queensland.

The purpose of the Air EPP applies to the environment, with the main purpose of achieving the objective of the Act in relation to the environment. Specifically, the Air EPP aims to enhance the qualities of the air environment that are conducive to human health and wellbeing, with the intention of achieving the purpose of the policy on a long-term basis.

The Air EPP objectives specific to human health and wellbeing for dust and the trace substances relevant to the assessment are presented in Table 2.

Table 2 Air EPP objectives for health and wellbeing

Indicator	Averaging period	Objective [a]	Source	Environmental value
TSP	Annual	90	Air EPP	Health and wellbeing
PM_{10} [b]	24-hour	50	Air EPP	Health and wellbeing
$PM_{2.5}$	24-hour	25	Air EPP	Health and wellbeing
	Annual	8	Air EPP	Health and wellbeing
Arsenic [c]	Annual	6 ng/m³	Air EPP	Health and wellbeing
Cadmium and compounds [c]	Annual	5 ng/m³	Air EPP	Health and wellbeing
Lead and compounds [d]	Annual	0.5	Air EPP	Health and wellbeing
Manganese and compounds [c]	Annual	0.16	Air EPP	Health and wellbeing

Note:

[a] Air quality objectives are presented in µg/m³ unless otherwise indicated

[b] Five exceedances allowed per year

[c] measured as the total metal content in PM_{10}

[d] measured as the total metal content in TSP

2.2 Department of Environment and Heritage Protection Guideline for dust nuisance

Dust nuisance can occur due to the deposition of larger dust particles in residential areas. Elevated dust deposition rates can cause reduced public amenity, as an example through soiling of clothes, building surfaces and other surfaces. Table 3 shows the dust deposition guideline commonly used in Queensland as a benchmark for avoiding amenity impacts due to dust. This is summarised in Table 3.

Table 3 **EHP guideline for dust nuisance**

Indicator	Averaging period	Guideline ($mg/m^2/day$)	Environmental value
Dust deposition rate	Monthly	120	Dust nuisance

2.3 Victorian State Environment Protection Policy design criteria for toxicity

The SEPP (AQM) provides for the establishment of design criteria and intervention levels for pollutants that have been classified as Class 1, Class 2 or Class 3 indicators. These pollutants are classified according to their sources and how widespread they are in the environment, their toxicity, persistence in the environment or their odorous properties. Class 1 indicators are designated in the SEPP (AQM) as common air pollutants. Class 2 and 3 indicators, commonly known as air toxics, are generally source specific. The distinction between Class 2 and 3 indicators is based on the level of toxicity and enables the appropriate level of control to be applied according to the seriousness of the possible adverse effects. Class 2 and 3 indicators are usually (but not always) of concern at a local level. The summary of the design criteria relevant to this assessment is presented in Table 4.

Table 4 **SEPP (AQM) design criteria for toxicity, bioaccumulation and carcinogens**

Indicator	Averaging period	Design Criteria (mg/m^3)	Environmental value
Class 2			
Barium (soluble compound)	3-minute	0.017	Toxicity
Chlorine	3-minute	0.1	Toxicity
Chromium (III) compounds	3-minute	0.017	Toxicity
Fluorine	3-minute	0.053	Toxicity
Magnesium oxide fume	3-minute	0.33	Toxicity
Manganese and compounds	3-minute	0.033	Toxicity
Mercury (organic)	3-minute	0.00033	Bioaccumulation
Mercury (inorganic)	3-minute	0.0033	Bioaccumulation
Class 3			
Arsenic and compounds	3-minute	0.00017	IARC Group 1 Carcinogen
Cadmium and compounds	3-minute	0.000033	IARC Group 1 Carcinogen
Nickel	3-minute	0.33	IARC Group 1 carcinogen

2.4 NHMRC Australian Drinking Water Guidelines

The 2011 *Australian Drinking Water Guidelines* (ADWG) was developed by NHMRC in collaboration with the Natural Resource Management Ministerial Council (NRMMC). The ADWG is designed to provide an authoritative reference to the Australian community and the water supply industry on what defines safe, good quality water, how it can be achieved and how it can be assured. A summary of the reference concentrations of pollutants relevant to this assessment is presented in Table 5.

Table 5 NHMRC Australian drinking water guidelines

Indicator	Averaging period	Concentration (mg/L)	Environmental value
Arsenic	Annual	0.007	ADWG
Cadmium	Annual	0.002	ADWG
Chromium (VI)	Annual	0.05	ADWG
Lead	Annual	0.01	ADWG
Manganese	Annual	0.5	ADWG
Mercury	Annual	0.001	ADWG

2.5 Australian and New Zealand Guidelines for Fresh and Marine Water Quality

The NWQMS (2000) aims to achieve the sustainable use of Australia's and New Zealand's water resources by protecting and enhancing their quality while maintaining economic and social development. The NWQMS is a joint strategy that includes the Australian and New Zealand Environment and Conservation Councils. A summary of the reference concentrations of pollutants relevant to this assessment is presented in Table 6.

Table 6 Trigger values for toxicants at alternative levels of protection (99% level of protection)

Indicator	Averaging period	Concentration (µg/L)	Environmental value
Aluminium	Annual	27	Freshwater
Arsenic (V)	Annual	0.8	Freshwater
Boron	Annual	90	Freshwater
Cadmium	Annual	0.06	Freshwater
	Annual	0.7	Marine
Chlorine	Annual	0.4	Freshwater
Chromium (III)	Annual	7.7	Marine
Cobalt	Annual	0.005	Marine
Lead	Annual	1.0	Freshwater
	Annual	2.2	Marine
Manganese	Annual	1200	Freshwater
Mercury	Annual	0.06	Freshwater
	Annual	0.1	Marine
Nickel	Annual	8.0	Freshwater
		7.0	Marine
Selenium	Annual	5.0	Freshwater
Silver	Annual	0.02	Freshwater
	Annual	0.8	Marine

Indicator	Averaging period	Concentration (µg/L)	Environmental value
Vanadium	Annual	50	Marine
Zinc	Annual	2.4	Freshwater
	Annual	7.0	Marine

2.6 Vegetation protection

There is no statutory limit for the deposition of dust for the protection of vegetation. EHP provides design guidance for dust deposition for the avoidance of dust nuisance, which is related to human perception. In order to provide some guidance, the study on the effects of coal dust on vegetation, with particular emphasis on assessment for vegetation in marshes and wetland, at Abbot Point was conducted as part of the CIA air quality assessment (Katestone, 2012). Aspects relevant to the current study are described below.

The effect of mineral dusts, such as coal and iron ore, on vegetation is principally through interception of light and the consequent effects on the rates of photosynthesis in leaves, plant health and growth (Katestone, 2012). Reviewed publications did not describe quantitative dust loads on leaves associated with reduced physiological activity. Models of dust effects on leaves based on light interception within plant canopies that were exposed to different rates of dust deposition and retention were used in the CIA air quality assessment to identify critical dust loads and deposition rates that would avoid adverse impacts.

The operational goal of a 120-day rolling average deposition rate of 200 mg/m^2/day was recommended as a result of the CIA air quality assessment.

3. EXISTING ENVIRONMENT

The existing environment in the region of interest is discussed in terms of the meteorological conditions that are likely to influence the dispersion of air pollutants from the site activities, other existing sources of air pollution in the region and the location of sensitive receptor zones.

3.1 Climate

The nearest Bureau of Meteorology (BoM) weather monitoring station to Abbot Point is located at Bowen Airport. Climate data from this station has been used to characterise conditions in this report. The Bowen Airport Automatic Weather Station (AWS) is located less than 2 km west of Bowen and is approximately 21 km from the Port of Abbot Point.

The meteorological data for Bowen Airport AWS includes average monthly:

- Maximum and minimum daily temperature
- Highest, mean and lowest rainfall
- 9am and 3pm relative humidity
- Solar radiation exposure.

The local and regional meteorology can impact air quality through its influence on the dispersion of pollutants. The meteorology in the region near Abbot Point is likely to be influenced by a number of factors including terrain features and thermally driven daytime convection and sea breezes. With respect to the formation and transport of dust as fugitive dust emissions from stockpiles, key meteorological parameters to consider include temperature, relative humidity, wind speed and direction. The same parameters also affect dust emissions from construction activities. In general, it is under hot, dry and windy conditions that fugitive dust has the maximum potential to impact adversely on air quality away from its source location. These parameters are summarised in Table 7 and described further in the following sections.

Table 7 Climate statistics for Bowen Airport AWS (BoM, 2014)

Parameter	Annual average value	Data period
Mean maximum temperature (°C)	28.6	1987 – 2014
Mean minimum temperature (°C)	19.4	1987 – 2014
Lowest temperature (°C)	3.2	1987 – 2014
Mean rainfall (mm)	900.9	1987 – 2014
Mean number of days of rain	82.2	1987 – 2014
Mean number of days of rain >= 10 mm	21.0	1987 – 2014
Mean daily solar exposure (MJ/(m^2))	21.3	1990 – 2014
Mean number of clear days	130	1987 – 2010
Mean 9am temperature (°C)	24.5	1987 – 2010
Mean 9am relative humidity (%)	72	1987 – 2010
Mean 3pm temperature (°C)	27.4	1987 – 2010
Mean 3pm relative humidity (%)	61	1987 – 2010

3.1.1 Temperature and solar radiation

The annual mean maximum daily temperature recorded at the Bowen Airport AWS for the period 1987-2014 was 28.6°C, with a mean minimum daily temperature of 19.4°C. The warmest month is January with an average maximum daily temperature of 31.5°C, while November, December, February and March also average above 30°C. In contrast, the coolest month is July with an average maximum daily temperature of 24.5°C, while the mean minimum daily temperature is 13.4°C. The average monthly distribution of maximum and minimum temperatures is illustrated in Figure 1.

Figure 2 shows the average daily solar exposure by month at Bowen Airport AWS. This illustrates the typical monthly pattern of solar exposure, with the mean daily solar exposure almost 70% higher during the summer than winter.

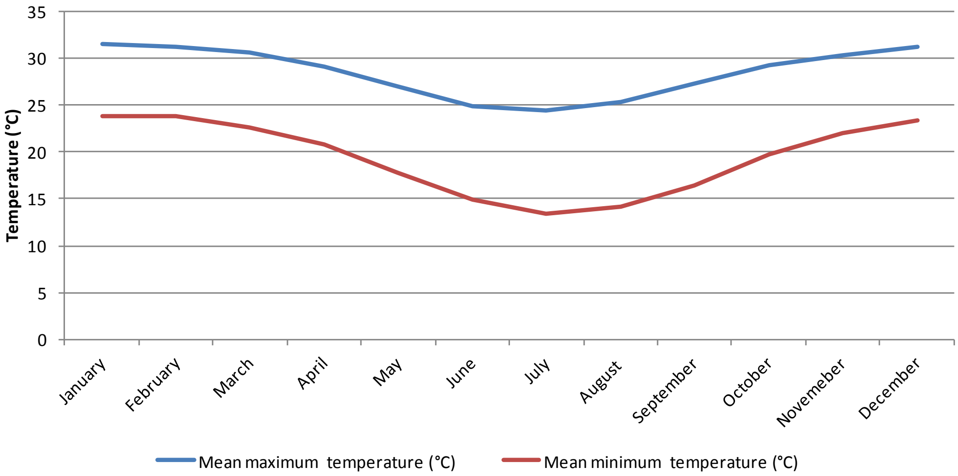

Figure 1 **Mean maximum and minimum temperatures recorded at Bowen Airport AWS (1987-2014)**

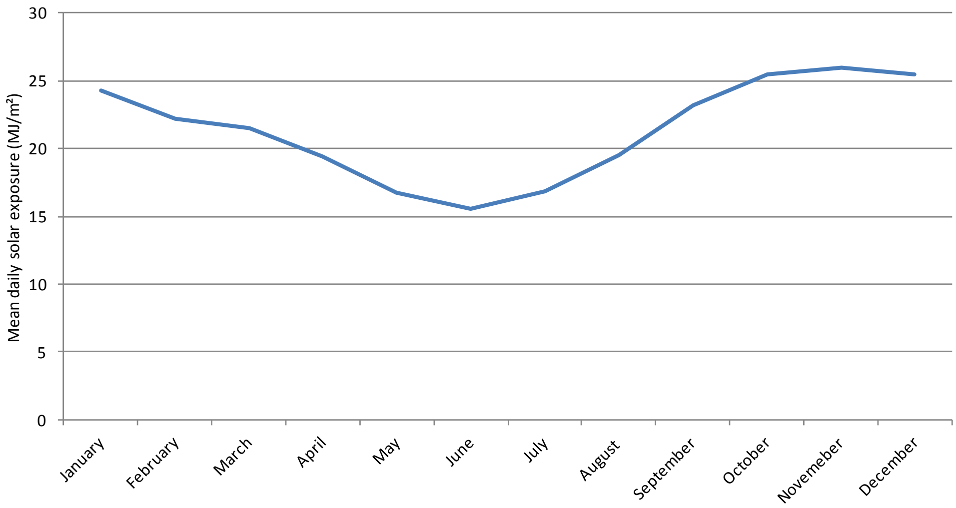

Figure 2 **Mean daily solar exposure at Bowen Airport AWS (1990-2014)**

3.1.2 Rainfall

Rainfall information at the Bowen Airport AWS (Figure 3) indicates that the annual average is 900.9 mm. The wettest period at Bowen is during the summer months from December to March when, on average, 62% of the annual rainfall occurs. Only 7% of the annual average rainfall occurs during the winter months (June to August).

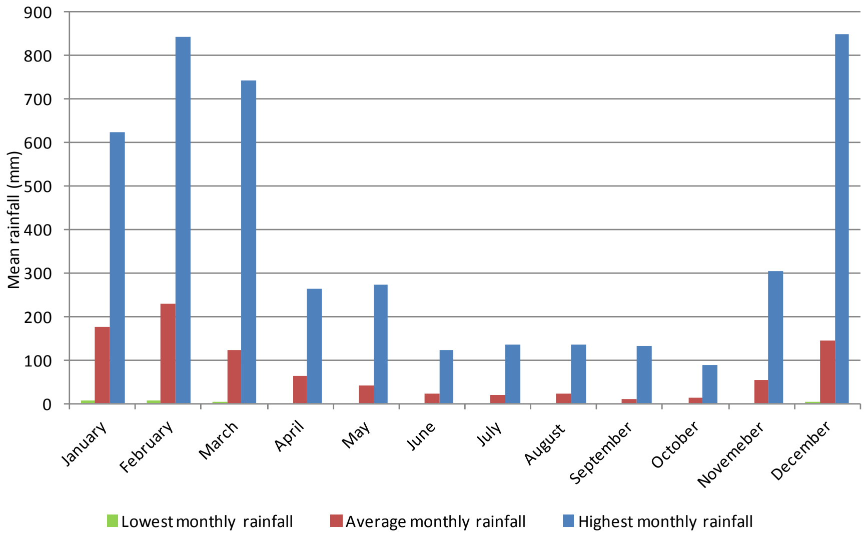

Figure 3 **Range of lowest, average and highest monthly rainfall at Bowen Airport AWS (1987-2014)**

3.1.3 Relative humidity

The monthly averaged distribution of relative humidity at 9am and 3pm at the Bowen Airport AWS is presented in Figure 4. The distribution indicates a slight decrease in the mean daily maximum relative humidity from an average of 74% during the summer months to an average of 71% during the winter months. The data also shows that the average relative humidity is 18% higher at 9am than at 3pm.

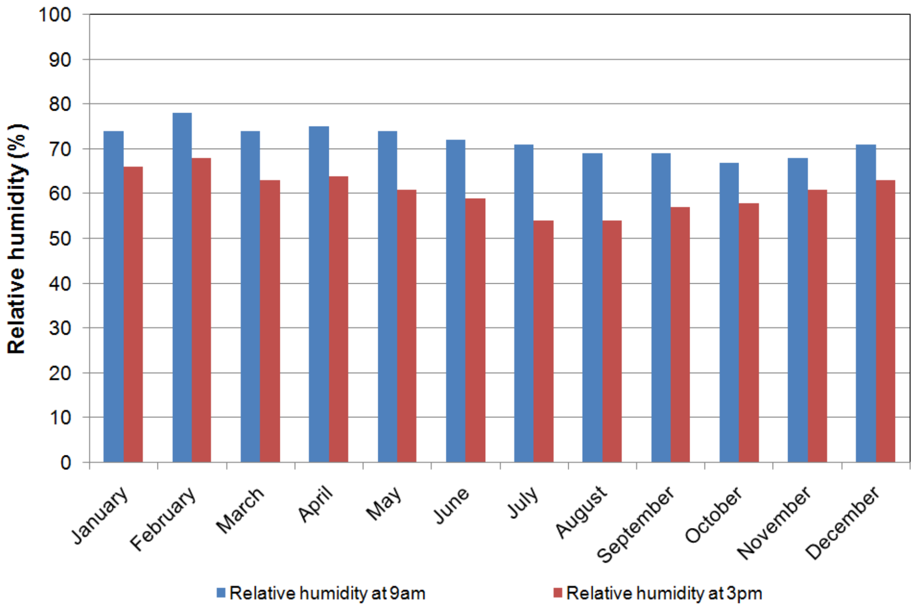

Figure 4 **Mean 9am and 3pm relative humidity at Bowen Airport AWS (1987-2010)**

3.2 Onsite meteorology

This section presents an analysis of the site-specific meteorological data generated by the coupled TAPM/CALMET meteorological modelling system that was used in the dispersion modelling assessment, as described in the CIA air quality assessment (Katestone, 2012). Analysis of the wind speed and wind direction, mixing height and stability class data extracted from the coupled meteorological model at the location of the T1 coal terminal are presented in the following sections.

The meteorological data covers the twelve-month period January to December 2007.

3.2.1 Wind speed and wind direction

Wind speed is important for dust emission from exposed areas such as stockpiles or bare ground. Higher dust emissions will occur during strong winds with the rate of dust emission lower during light winds. During strong winds, dust particles are more likely to be lifted by the wind and carried further off-site than during light winds.

Wind speed and wind direction data were extracted from the CALMET modelling of the region for 2007. The annual distribution of winds at Abbot Point is illustrated in Figure 5, with seasonal and diurnal distributions of wind speed and direction presented in Figure 6 and Figure 7, respectively.

The annual distribution of wind speed and wind direction indicates that Abbot Point is dominated by strong winds from the east to south-southeast, with a reduced frequency of moderate winds from the south to south-southwest and north to east-northeast directions and very few winds from the southwest to north-northwest direction. Seasonal analysis indicates that winds from the east-southeast to south dominate during autumn and winter, while winds from the north to southeast dominate during spring and summer. The diurnal wind rose shows the strong east-southeast sea breeze developing during the day and dominating in the afternoon (12 to 6pm).

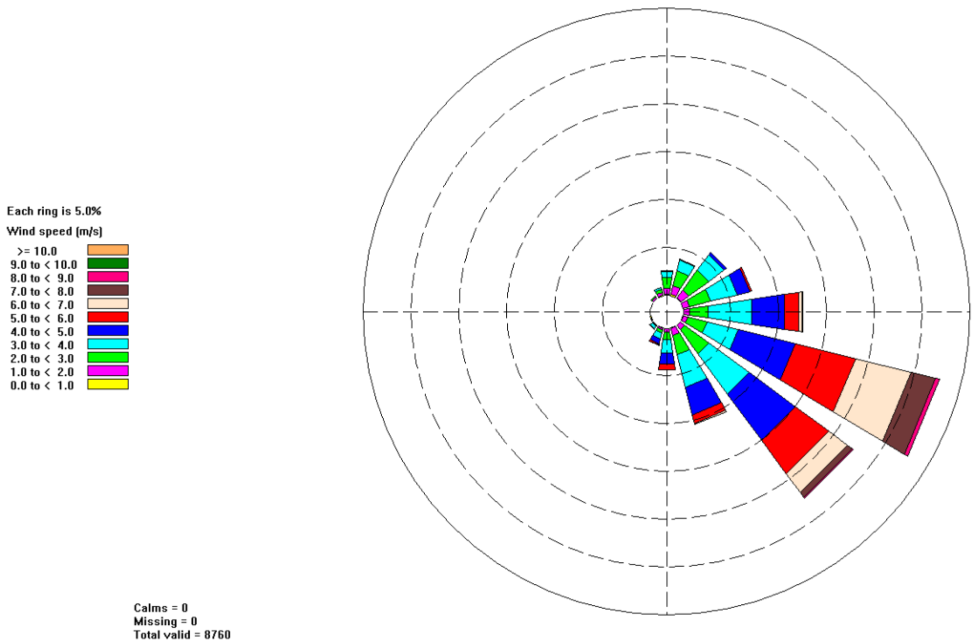

Figure 5 Annual wind speed (m/s) and wind direction (°) at Abbot Point

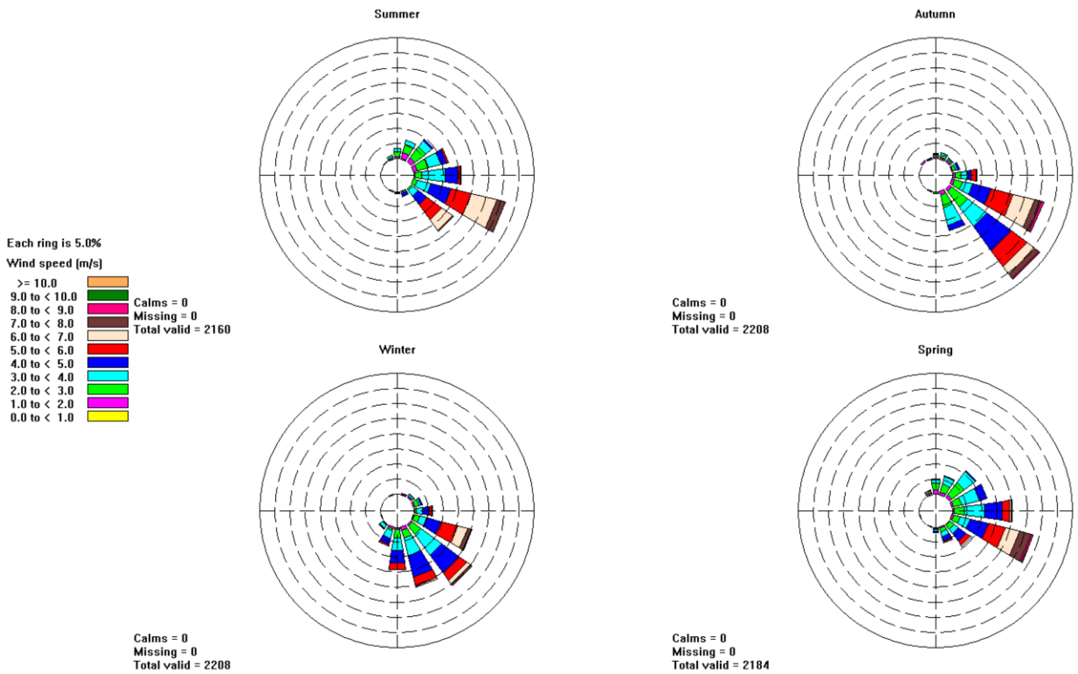

Figure 6 Seasonal distribution of wind speed (m/s) and wind direction (°) at Abbot Point

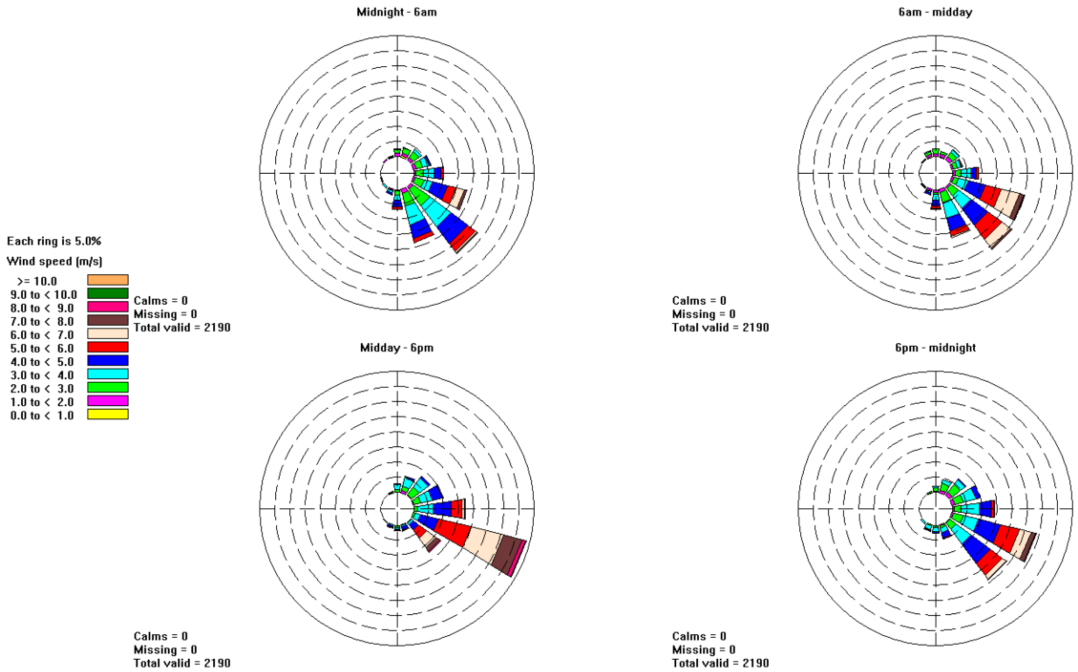

Figure 7 Diurnal distribution of wind speed (m/s) and wind direction (°) at Abbot Point

3.2.2 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class stability which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Table 8 shows the percentage of stability classes at Abbot Point for the January to December 2007 meteorological data used in the dispersion modelling, where Class A represents the most unstable conditions. There is a high percentage of D class or very stable conditions. This is due to the relatively flat location of the site, meaning that strong night-time cooling of the surface is a dominant feature of the microclimatic regime. This leads to a lowering of the mixing height and the possible development of low level inversions.

Table 8 Frequency distribution of surface atmospheric stability at the site

Pascal-Gifford stability class	Frequency (%)	Classification
A	0.6	Extremely unstable
B	4.5	Unstable
C	7.6	Slightly unstable
D	64.8	Neutral
E	11.8	Slightly stable
F	10.8	Stable

3.2.3 Mixing height

The mixing height refers to the height above ground within which particulate matter or other pollutants released at or near ground can mix with ambient air. During stable atmospheric conditions, the mixing height is often quite low and particulate dispersion is limited to within this layer. During the day, solar radiation heats the air at the ground level and causes the mixing height to rise. The air above the mixing height during the day is generally cooler. The growth of the mixing height is dependent on how well the air can mix with the cooler upper level air and therefore depends on meteorological factors such as the intensity of solar radiation and wind speed. During strong wind speed conditions the air will be well mixed, resulting in a high mixing height.

Mixing height information that is representative of the Abbot Point area is presented in Figure 8. The figure shows that the mixing height tends to develop around 5 to 6 am, peaks at midday (12 to 1 pm) before decreasing sharply around sunset (5 to 6 pm).

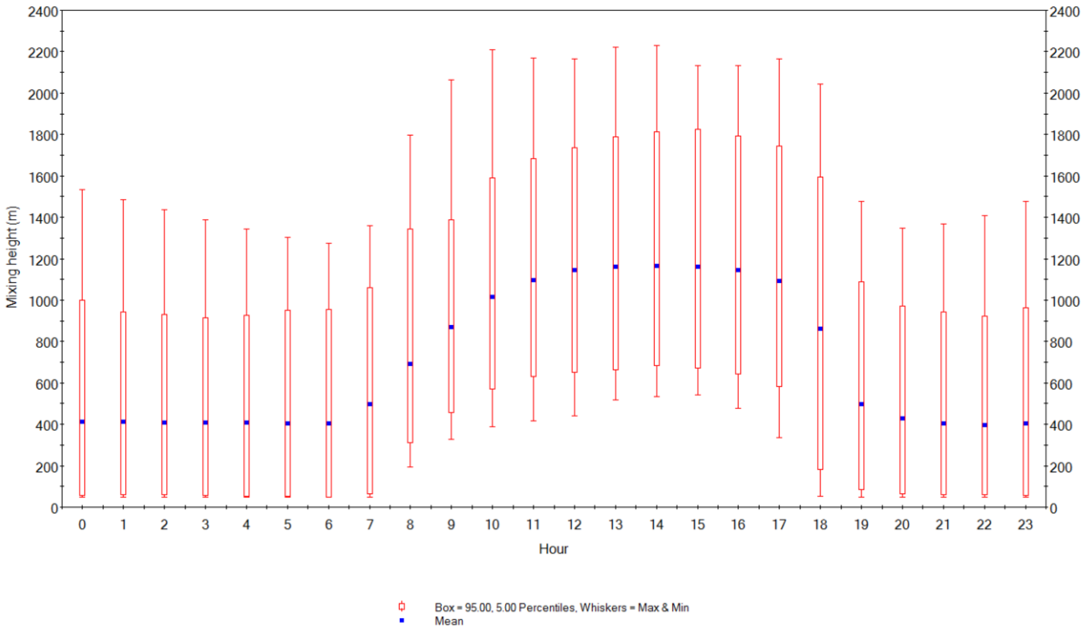

Figure 8 **Mixing height at Abbot Point**

3.3 Air quality sensitive receptors

The main consideration in this study was the potential effect of dust from the construction of infrastructure on flora and fauna in the wetland and marine environments. These sensitive receptor zones are shown in Figure 9. Areas of particular interest are:

- Caley Valley Wetland (Freshwater) (Whilst referred to as freshwater, this area of wetland tends to be brackish)
- Caley Valley Wetland (Estuarine)
- Great Barrier Reef Marine Park (GBRMP)
- Great Barrier Reef World Heritage Area (GBRWHA).

The GBRMP and GRBWHA regions extend over the eastern coast of Australia, and cover areas approximately 35,000 km² and 36,000 km², respectively. The Caley Valley Wetland covers an area over 5,000 ha. This assessment is limited to the Wetland areas closest to the Project, within the State Development Area (SDA).

The nearest residence to the Project is located approximately 13 km to the southwest of the land end of the jetty (Figure 9). Given the distance between the nearest residence and the Project, the residence is unlikely to be affected by the Project.

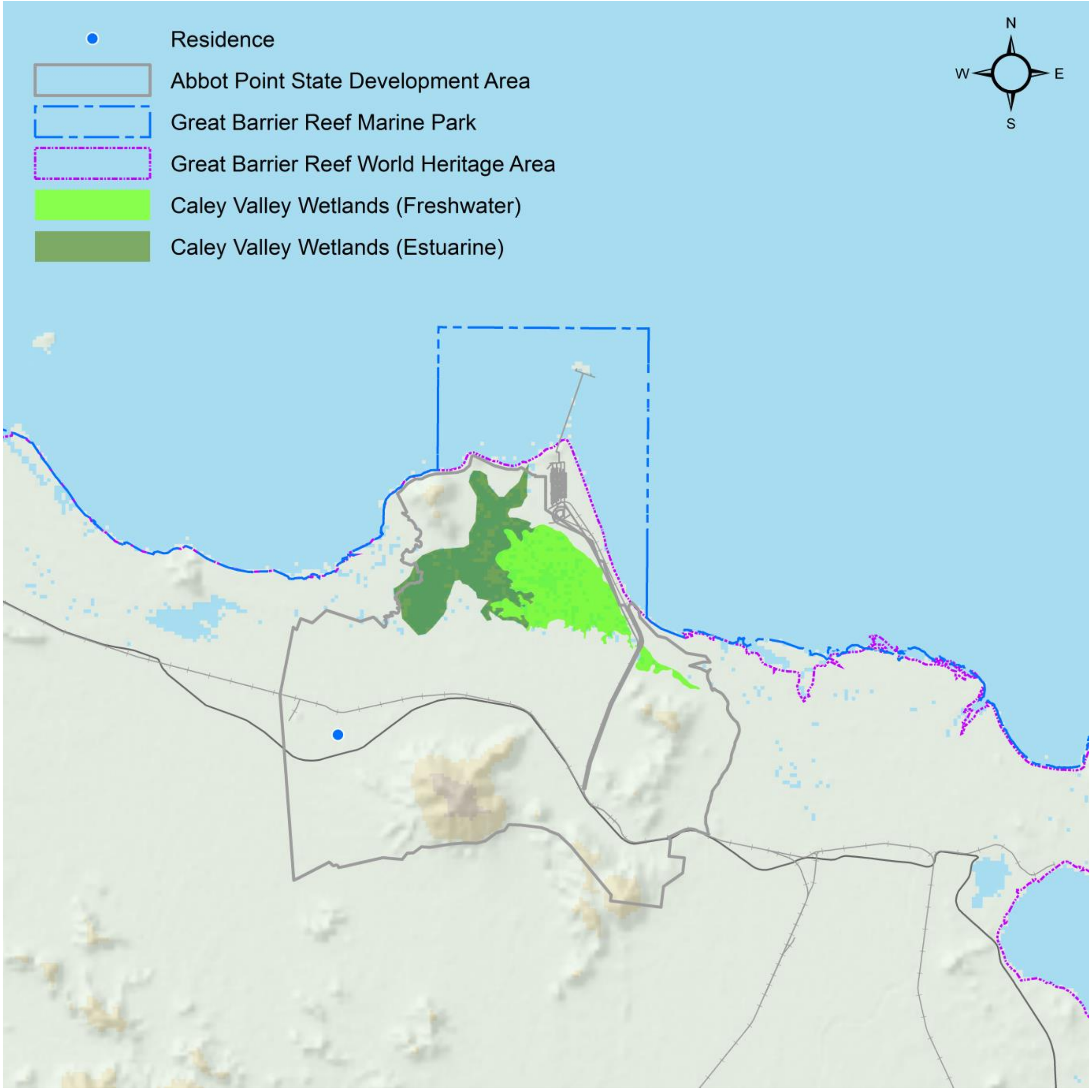

Figure 9 **Air Quality Sensitive Receptor Zones**

3.4 Existing air quality

The land use in the immediate vicinity of Abbot Point is primarily wetland environment. With the exception of the existing and proposed coal terminals, dust sources at the Port of Abbot Point are likely to be natural features of the environment, such as salt spray, pollens, grass seeds and wind erosion of bare ground. The closest existing industrial activity to the site is at Bowen.

3.4.1 Background levels from the natural environment

3.4.1.1 Particulate matter as PM_{10}

The background dust level is generally defined as the level of dust that would exist in the absence of anthropogenic sources. EHP accepts the recommendation of the Victorian EPA to use the 70th percentile of the 24-hour average PM_{10} concentration to represent the background level for air quality assessments. Ambient concentrations of PM_{10} are not currently measured at Abbot Point. The 70th percentile 24-hour average PM_{10} concentration measured at Mackay was determined for each calendar year between 1999 and 2009. The highest value of 28 µg/m^3 has been used in this study to represent the background level of 24-hour average PM_{10}.

3.4.1.2 Particulate matter as $PM_{2.5}$

$PM_{2.5}$ is not measured at Abbot Point or at the EHP monitoring station at Mackay and the use of data from industrialised or urban areas is likely to overestimate the levels of $PM_{2.5}$ expected at Abbot Point. For the purposes of this study, the $PM_{2.5}$ emissions predicted to arise from the Project have been presented without the inclusion of a background level.

3.4.1.3 Particulate matter as TSP

Previous assessments by Katestone and standard conversion ratios detailed in the US EPA's Compilation of Air Pollution Emission Factors Volume 1 (AP-42) and in the National Pollutant Inventory (NPI) Handbooks have found that PM_{10} is usually 50% of the TSP concentration. Due to the absence of any measurements of TSP at Abbot Point or Mackay, this ratio has been employed for this study, giving an annual background level of 56 µg/m^3 for TSP.

3.4.1.4 Dust deposition rate

Dust deposition monitoring in proximity to Abbot Point and in particular T1 is very limited. Monitoring was conducted over two years in 1999 and 2003. Previous studies conducted in Australia have estimated a background dust deposition level of between 20 and 40 mg/m^2/day for rural areas in the absence of anthropogenic activities. Therefore based on available data, a dust deposition rate of 40 mg/m^2/day has been chosen as a conservative background level of natural dust deposition. This level is consistent with the measurements conducted at Abbot Point.

3.4.2 Contribution of existing coal terminals

Whilst there is ambient monitoring of air quality within the vicinity of the Abbot Point coal terminal, the data is not available. Therefore, the CIA air quality assessment (Katestone, 2012) estimated existing dust levels associated with the existing T1 coal export terminal and associated rail located at Abbot Point and modelled the potential impact to determining existing concentrations. Coal dust is the primary air pollutant emitted by coal terminals. Dust emissions can occur at any point where coal is handled, conveyed or open to erosion by the wind. Activities that are expected to be the most significant sources of dust emissions are wind erosion of coal stockpiles, rail receival, the movement of coal through transfer stations, conveyors, stacking, reclaiming and shiploading. Wind-blown dust will also occur due to wind erosion of exposed bare ground.

The range of modelled ground-level concentrations and deposition rates of pollutants at the receptor zones due to the operation of T1 and existing background level are presented in Table 9. Table 9 shows that the dust levels due to T1 operations and background levels of dust at the Caley Valley Wetland (Freshwater), GBRMP and nearest residence are low relative to the reference criteria. Table 9 also shows that the predicted 6th highest 24-hour average ground-level concentration of PM_{10} within the Caley Valley Wetland (Estuarine) and the GBRWHA exceeds the reference criterion for human health and well-being. The highest predicted annual average ground-level concentrations of TSP and 6th highest 24-hour average concentrations of PM_{10} and dust deposition rates are shown to be higher than the reference criteria. The vegetation criterion is predicted to be exceeded on the edge of the GBRWHA.

Dust deposition rates and trace element levels due to the operation of T1 were predicted to comply with the vegetation criteria and other reference criteria established for the Caley Valley Wetland and Marine environments.

Table 9 **Range of ground-level dust concentrations and deposition rates at the receptor zones and nearest residence due to T1 and background levels of dust**

Pollutant	Averaging Period	Units	Caley Valley Wetland (Estuarine)			Caley Valley Wetland (Freshwater)			GBRMP			GBRWHA			Nearest residential receptor	Reference criteria
			Lowest	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean	Highest		
TSP	Annual	µg/m³	56	57	70	56	57	58	56	56	59	56	56	**113**	**56**	**90 [a]**
PM_{10} (6th highest)	24-hour	µg/m³	31	33	**60**	29	34	47	28	29	39	28	30	**123**	**28**	**50 [a]**
$PM_{2.5}$	Annual	µg/m³	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	4	**< 1**	**8 [a]**
	24-hour		1	1	8	1	2	4	<1	1	3	<1	1	23	**< 1**	**25 [a]**
Dust deposition	120 days	mg/m²/month	40	45	142	40	41	46	40	41	47	40	41	**218**	**40**	**200 [b]**
	Monthly		41	47	**216**	40	42	50	40	41	51	40	41	**354**	**40**	**120 [c]**

Note:

[a] Air EPP for health and wellbeing

[b] Dust deposition threshold for vegetation protection

[c] EHP guideline for dust nuisance

4. EMISSIONS TO THE ATMOSPHERE

The key air pollutant associated with construction of the ponds is dust. Emission rates of the important dust indicators (TSP, PM_{10} and $PM_{2.5}$) are estimated in the following sections.

4.1 Project Dust Emissions

There are three distinct phases of the APGG Project that are likely to have distinctively different propensities to generate dust emissions:

- Construction of the pond and embankment (approximate duration 4 to 5 months). For the purpose of this assessment a conservative assumption of 4 months has been utilised. Activities include pond footprint clearing / grubbing, removal of topsoil, embankment subgrade preparation, stockpiling and bulk earthworks for external and internal embankment.
- Dredging campaign (of between 5 and 13 weeks). For the purpose of this assessment 13 weeks has been assumed. Activities include piping dredged material into the pond and laydown of dredging pipeline.
- On-going storage and beneficial re-use (approximate duration 1 – 10 years). Activities include reshaping of the area.

The emission rates of dust in the form of TSP, PM_{10} and $PM_{2.5}$ likely to be generated in each phase have been derived from the following information:

- Golder TQ Response 1 and Response 3 provided by Worley Parsons
- United States Environmental Protection Agency (USEPA), 2006, Aggregate Handling and Storage Piles AP-42 Chapter 13.2.4 USEPA Office of Air Quality Planning and Standards
- United States Environmental Protection Agency (USEPA), 1998, Western Surface Coal Mining, AP-42 Chapter 11.9 USEPA Office of Air Quality Planning and Standards
- United States Environmental Protection Agency (USEPA), 2006, Unsealed Roads, AP-42 Chapter 12.2.2 USEPA Office of Air Quality Planning and Standards
- National Pollutant Inventory (NPI), 2012, Emission Estimation Technique Manual for Mining Version 3.1, Australian Government, Department of Sustainability, Environment, Water, Population and Communities
- Assumptions from the previous air quality assessments for Abbot Point.

The following mitigation measures have been included in the assessment:

- Watering of haul roads (75% control)
- Watering of stockpiles (50% control)

A summary of the emission rates for each phase is provided in Table 10.

Table 10 Emission rates of TSP, PM_{10} and $PM_{2.5}$ for APGG Project phases (g/s)

Phase		TSP	PM_{10}	$PM_{2.5}$
Construction of pond	Total	28.7	8.10	2.17
	Pond footprint clearing (scrapers)	*1.0*	*0.19*	*0.11*
	Topsoil stripping	*1.1*	*0.27*	*0.12*
	Embankment subgrade preparation (scrapers and grading)	*11.4*	*2.91*	*1.08*
	Stockpiles (dumping of material, dozing, wind erosion, material transfer)	*3.7*	*0.93*	*0.38*
	Bulk earthworks (haul, bulldozers, and scrapers/dozers on embankment)	*9.6*	*2.7*	*0.32*
	Wind erosion	*2.2*	*1.1*	*0.17*
Dredging campaign	Total	Negligible - as material will be pumped in as a slurry and therefore will not generate particulate or other emissions to air		
On-going storage and beneficial re-use	Total	3.2	1.29	0.28
	Shaping (dozers)	*1.0*	*0.19*	*0.11*
	Wind erosion	*2.2*	*1.10*	*0.17*

Based on the emission rate summary provided above, the construction phase of the Project results in the highest emissions to air and therefore will represent the highest potential for impact due to the APGG Project. Consequently, dispersion modelling of the construction phase of the Project has been conducted.

4.1.1 Speciation of trace elements

Trace elements are present in the soil and dredged materials. Emission rates of the trace elements were estimated using material compositions determined from site specific soil analysis and data contained in the NPI *Emissions Estimation for Mining Handbook (Appendix B Table 8)* (NPI, 2012). In May 2015, nine soil samples were collected from the project site. The samples were analysed for trace elements by ALS Environmental (ALS, 2015).

The material compositions used in this assessment are shown in Table 11.

Table 11 Speciation of trace elements used in the assessment

Element	Content in material (mg/kg)	Source
Antimony	1	NPI [a]
Arsenic	<5	ALS [b]
Beryllium	<1	ALS [b]
Boron	<50	ALS [b]
Cadmium	<1	ALS [b]
Chromium	4	ALS [c]
Cobalt	3	ALS [c]
Copper	<5	ALS [b]
Fluorine	200	NPI [a]
Lead	<5	ALS [b]
Manganese	110	ALS [c]
Mercury	<0.1	ALS [b]
Nickel	<2	ALS [b]
Selenium	<5	ALS [b]
Vanadium	10	ALS [c]
Zinc	<5	ALS [b]

Table note:
[a] The material type selected for the assessment was 'soil'.
[b] No measurements were above the method detection limit (MDL). Conservatively, the MDL has been used here.
[c] The maximum measured concentration was selected for the assessment.

4.1.2 Long Term Management of and Extraction of Material from the Reuse Facility

During operation of the reuse facility, dust emissions may occur as a result of wind erosion of any exposed material surfaces, wheel generated dust from haul vehicles, excavation of reuse materials and dumping into haul vehicles. Overall, dust emissions from the operation of the reuse facility will be substantially lower than estimated above for the construction phase. Dust emissions will require ongoing management in accordance with the measures detailed in Section 7.

5. ASSESSMENT METHODOLOGY

5.1 Dispersion modelling

Dispersion modelling was conducted to investigate the potential impact of construction and operational activities. The dispersion model Ausplume Version 6.0 was used in the assessment. Ausplume is widely accepted by Australian environmental agencies. The dispersion model was set up with the following inputs:

- Flat terrain
- Surface roughness of 0.1 m to account for surrounding land use (rural/flat) to account for the lack of significant terrain at the site
- Pasquill-Gifford horizontal and vertical dispersion curves
- Gradual plume rise and stack tip downwash options used
- Default temperature gradients used
- Irwin rural wind profile exponents
- Dry depletion option selected for prediction of deposition rates
- Dry depletion option not selected for prediction of concentrations.

The meteorological data used to generate a suitable file for the modelling was described in Section 3.2 and is consistent with the meteorological data that was used in previous assessments at Abbot Point.

The pond construction activities were modelled as a series of area sources. The area sources were modelled at a source height of 2 metres. The emissions were entered as hourly varying to account for those operations that are proposed to occur during daylight hours only and wind erosion emissions happening over a 24-hour period.

5.2 Trace substance concentration in the Wetland

The potential effect of deposition of trace substances on water quality in the Wetland was conducted using the method detailed in the *Air Toxics Hot Spot Program Guidance Manual for Preparation of Health Risk Assessments* (California Environmental Protection Agency, 2003). In equation form, the contribution to direct deposition of the pollutants is defined as:

$$C_{pol} = \frac{DR * SA}{Vol_{water} * N} \div 1000$$

where:

C_{pol}	Concentration of pollutant in water in mg/L
DR	Deposition rate in mg/m²/year
SA	Surface area of the Wetland in m²
Vol_{water}	Volume of water in L
N	Number of changes of water in the year

The quantity of air pollutants that may be deposited was estimated using the following assumptions:

- Emissions of all pollutants
- Surface area of the Wetland within the study domain (Freshwater) of 1,241ha
- Surface area of the Wetland within the study domain (Estuarine) of 1,207ha
- Depth of the Wetland of 0.8 m (Hancock Prospecting Pty Ltd, 2010)
- All material deposited in the Wetland remains suspended in the water.

6. ASSESSMENT OF IMPACTS

6.1 Project Impacts

6.1.1 Construction

The dust emission rates from construction activities have been conservatively calculated to account for uncertainty in the detailed construction process.

6.1.1.1 Human health and amenity

Predicted dust levels associated with construction of the ponds in isolation and with the inclusion of a background are shown in Table 12 for the closest residential receptor.

The results show that for the construction of the ponds, the predicted concentrations of dust are well below all relevant objectives and guidelines for dust at the nearest residential receptor.

Table 12 Ground-level dust concentrations and deposition rates including background levels at nearest residential receptor

Pollutant	Averaging Period	Units	APGG Project in isolation	APGG Project with T1 and ambient background	Reference criteria
TSP	Annual	µg/m³	0.4	56.5	90
PM_{10} (6^{th} high)	24-hour	µg/m³	1.7	30.0	50
$PM_{2.5}$	24-hour	µg/m³	0.5	0.6	25
	Annual		0.03	0.1	8
Dust deposition	120 days	mg/m²/day	0.34	40.5	120

6.1.1.2 Ecologically sensitive receptors

Predicted dust levels associated with construction of the ponds in isolation and with the inclusion of a background are shown in Table 13.

The results show that for the construction of the ponds in isolation:

- The predicted concentrations of dust are well below all relevant objectives and guidelines for dust within the Estuarine parts of the Caley Valley Wetlands.
- The predicted concentrations of dust are well below all relevant objectives and guidelines for dust within the Freshwater parts of the Caley Valley Wetlands, with the exception of PM_{10} where concentrations

are predicted to be marginally above the 24-hour objective for human health to approximately 1.5% of the Freshwater area.

The results show that for the construction of the ponds with the inclusion of a background:

- Predicted concentrations of PM_{10} are above the objective of 50 µg/m³ for human health at the edge of both the Freshwater and Estuarine parts of the Caley Valley Wetlands.
- The predicted concentration of PM_{10} falls with distance from the emission source such that compliance is achieved within, at most, 1,500 metres of the edge of the wetland, corresponding to approximately 8% of the Estuarine area and 17% of the Freshwater area.
- Predicted concentrations of TSP are above the objective of 90 µg/m³ for human health at the edge of the Estuarine part of the Caley Valley Wetlands.
- The predicted concentrations of TSP fall with distance from the emissions source such that compliance is achieved within 300 metres of the edge of the wetland, corresponding to approximately 2% of the Estuarine area.
- Compliance with all other relevant objectives and guidelines for dust within the Freshwater and Estuarine parts of the Caley Valley Wetlands.

Predicted levels of trace elements in air are presented in Table 14 calculated from the site specific soil analysis and NPI trace element speciations. Predicted levels of trace elements in air comply with the reference criteria within the Estuarine and Freshwater parts of the Caley Valley Wetlands.

Predicted mean concentrations of trace elements in water in the Caley Valley Wetlands associated with the proposed pond construction activities are presented in Table 15 calculated from the site specific soil analysis and NPI trace element speciations. Predicted mean concentrations of trace elements in water comply with the reference criteria for all trace elements in the Freshwater and Estuarine parts of the Caley Valley Wetlands.

Levels of trace elements and air quality indicators in the marine environment will be less than the mean levels predicted to be associated with the pond construction.

Whilst localised emissions of dust may have the potential to affect areas on the edge of the wetland, the short duration and proposed mitigation measures will ensure that dust levels are managed to acceptable levels.

Table 13 **Range of ground-level dust concentrations and deposition rates including background levels at the receptor zones due to construction of ponds predicted at ecologically sensitive receptors**

Pollutant	Averaging Period	Units	APGG Project in isolation						APGG Project with T1 and ambient background						Reference criteria
			Caley Valley Wetlands (Estuarine)			Caley Valley Wetlands (Freshwater)			Caley Valley Wetlands (Estuarine)			Caley Valley Wetlands (Freshwater)			
			Lowest	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean	Highest	Lowest	Mean	Highest	
TSP	Annual	µg/m³	0.8	4.4	33.2	0.2	2.3	28.2	57	61	103	56	59	86	**90** [a]
PM_{10} (6th highest)	24-hour	µg/m³	2.8	7.1	27.1	1.4	8.7	69.0	33	40	82	31	43	116	**50** [a]
$PM_{2.5}$	24-hour	µg/m³	1.0	2.6	9.8	0.6	3.1	19.2	1.5	3.9	14.2	1.4	4.9	23.3	**25** [a]
	Annual		0.1	0.3	2.5	<0.1	0.2	2.2	0.1	0.5	3.7	0.0	0.2	2.3	**8** [a]
Dust Deposition	120 days	mg/m²/day	0.8	7.0	63.3	0.1	3.7	66.6	41	47	104	40	44	107	**200** [b]

Note:
[a] Air EPP for health and wellbeing
[b] Dust deposition threshold for vegetation protection

Table 14 Trace element ground-level concentrations at receptor zones due to construction of the ponds

Pollutant	Averaging Period	Units	Caley Valley Wetlands (Estuarine)			Caley Valley Wetlands (Freshwater)			Reference criteria
			Lowest	Mean	Highest	Lowest	Mean	Highest	
Antimony	3-minute	µg/m³	0.0001	0.0004	0.0018	0.0002	0.0006	0.0038	17
Arsenic	3-minute	µg/m³	< 0.0007	< 0.0021	< 0.0092	< 0.0009	< 0.0031	< 0.0188	0.17
	Annual	µg/m³	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	0.006
Beryllium	3-minute	µg/m³	< 0.0001	< 0.0004	< 0.0018	< 0.0002	< 0.0006	< 0.0038	0.007
Cadmium	3-minute	µg/m³	< 0.0001	< 0.0004	< 0.0018	< 0.0002	< 0.0006	< 0.0038	0.033
	Annual	µg/m³	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.005
Chromium	3-minute	µg/m³	0.0006	0.0017	0.0074	0.0007	0.0025	0.0150	17
Copper	3-minute	µg/m³	< 0.0007	< 0.0021	< 0.0092	< 0.0009	< 0.0031	< 0.0188	33
Fluorine	3-minute	µg/m³	0.0276	0.0828	0.3685	0.0363	0.1257	0.7504	53
Lead	Annual	µg/m³	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	0.5
Manganese	3-minute	µg/m³	0.0152	0.0456	0.2027	0.0200	0.0691	0.4127	33
Manganese	Annual	µg/m³	< 0.0001	0.0005	0.0037	< 0.0001	0.0003	0.0031	0.16
Mercury	3-minute	µg/m³	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0004	0.033/3.3
Nickel	3-minute	µg/m³	< 0.0003	< 0.0008	< 0.0037	< 0.0004	< 0.0013	< 0.0075	0.33

Table 15 Mean concentrations of trace elements in water at receptor zones due to construction of the ponds

Pollutant	Averaging period	Caley Valley Wetlands (Estuarine)	Caley Valley Wetlands (Freshwater)	Reference criteria (Marine/Freshwater)
		Mean	Mean	
Arsenic	Annual (µg/L)	< 0.0052	< 0.0028	- /0.8
Boron	Annual (µg/L)	< 0.0522	< 0.0281	- / 90
Cadmium	Annual (µg/L)	< 0.0010	< 0.0006	0.7 / 0.06
Chromium	Annual (µg/L)	0.0042	0.0022	7.7 / -
Cobalt	Annual (µg/L)	0.0031	0.0017	0.005 / -
Copper	Annual (µg/L)	< 0.0052	< 0.0028	0.3 / -
Lead	Annual (µg/L)	< 0.0052	< 0.0028	2.2 / 1.1
Manganese	Annual (µg/L)	0.1149	0.0618	- / 1200
Mercury	Annual (µg/L)	< 0.0001	< 0.0001	0.1 / 0.06
Nickel	Annual (µg/L)	< 0.0021	< 0.0011	7 / 8
Selenium	Annual (µg/L)	< 0.0052	< 0.0028	- / 5
Vanadium	Annual (µg/L)	0.0104	0.0056	50 / -
Zinc	Annual (µg/L)	< 0.0052	< 0.0028	7 / 2.4

6.1.2 Dredging campaign

Dust emissions and impacts from activities during the dredging campaign will be negligible as material will be pumped in as a slurry and therefore will not generate particulate or other emissions to air. The case where the material has dried is covered by the ongoing storage and beneficial reuse scenario.

6.1.3 Ongoing storage and beneficial reuse

Overall, dust emissions and impacts from the operation of the reuse facility will be substantially lower than estimated above for the construction phase. When activities occur on the western or southern side of the Beneficial Reuse Area, dust levels may approach the reference criteria detailed above in the nearest parts of the Caley Valley Wetland (Estuarine). Careful management of these activities will ensure that adverse air quality impacts do not occur in practice.

7. MITIGATION

The dispersion modelling explicitly incorporated the following control measures:

- Watering of haul roads
- Watering of stockpiles

However, the DMCP Construction Environmental Plan (CEMP) will include additional management strategies.

The following mitigation measures are applicable in this assessment with a particular focus to protecting flora and fauna in the wetland and marine environment. However, implementation of these measures will have, as a consequence, favourable implications for other environmental values.

7.1 Construction

This assessment has demonstrated that the construction of the Project has the potential to generate dust emissions. Construction will be temporary activity and it is anticipated that the measures detailed within the CEMP will be sufficient to mitigate potential impacts.

The CEMP is likely to include:

- Earthworks:
    - Ensure that all significant earthworks are avoided where practicable during unfavourable meteorological conditions (e.g. strong winds from the north, northeast and east, when earthworks are in close proximity to the Caley Valley Wetlands)
    - Watering of haul roads to minimise wheel-generated dust
    - Watering of exposed areas including cleared areas and stockpiles to minimise dust lift-off during strong winds from the north, northeast and east
    - For exposed areas and stockpiles that will not be used or accessed for long durations, and haul roads with low traffic volumes, consideration of the use of hydraulically applied tackifier (polymer agents) and organic mulch to protect the surfaces and reduce the need of constant wetting
    - Designation of appropriate maximum speed limits during construction
    - Erection of physical barriers such as bunds and/or wind breaks around long-term stockpiles.
- Embankment construction:
    - Following construction of the embankments, top sides and external batters will be either topsoiled and seeded, or hydro-mulched
    - Watering embankments to minimum dust lift-off during strong winds.
- Monitoring:
    - Dust emissions and potential dust generating activities and areas will be monitored visually during construction
    - Vehicular speeds and loads will be monitored to ensure compliance with site requirements
    - Routine monitoring of vegetation for presence of excessive dust.

7.2 On-going storage and beneficial re-use

The following mitigation measures will be included within the CEMP for the beneficial reuse facility:

- Earthworks:
    - Ensure that all significant earthworks are avoided where practicable during unfavourable meteorological conditions (e.g. during high winds from the north, northeast and east, when earthworks are in close proximity to the Caley Valley Wetlands)
    - Watering of haul roads to minimise wheel-generated dust
    - Watering of exposed areas including cleared areas to minimise dust lift-off during strong winds from the north, northeast and east
    - Designation of appropriate maximum speed limits during operation
    - Erection of physical barriers such as bunds and/or wind breaks around long-term extraction areas.
- Monitoring:
    - Dust emissions and potential dust generating activities and areas will be monitored visually during operations
    - Vehicular speeds and loads will be monitored to ensure compliance site requirements
    - Routine monitoring of vegetation for presence of excessive dust.

8. CONCLUSIONS

Katestone Environmental Pty Ltd (Katestone) was commissioned by Worley Parsons to conduct an air quality assessment to support the Queensland Government to obtain approval for the Abbot Point Growth Gateway Project (the Project).

The Project will develop infrastructure to support development at the Port of Abbot Point. The Project relates to the development of infrastructure to support development of the planned Terminal 0 project (T0). Dredging of berth pockets and arrival/departure apron is required to provide safe shipping access to the T0 offshore facility. The scope of the approved T0 project does not directly include dredging of the required berth pockets or apron areas.

The construction of this Project has the potential to generate dust emissions. The main sources of dust will be:

- Dust lift-off from exposed surfaces such as stockpiles and other exposed areas
- Construction of embankments, including moving, dumping and shaping material
- Clearing of vegetation and soil from the site
- Wheel-generated dust from the construction haul roads
- Long term dredged material management including reclamation and reuse.

The air quality assessment has shown that:

- At the nearest residential receptor the predicted concentrations of dust due to the construction of the ponds are well below all relevant objectives and guidelines for dust

- There is some potential for elevated dust levels to occur in close proximity to construction activities. The construction emissions and potential for impact will vary according to the construction activities that are underway and will be temporary in nature. The Construction Environmental Management Plan (CEMP) will ensure that appropriate mitigation measures implemented and potential impacts are minimised.

9. REFERENCES

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