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Air Quality

An air quality assessment has been undertaken for the EAW expansion project. The assessment focussed on particulate matter emissions associated with the construction phase of the Project. In addition, operational emissions including particulate matter emissions from the expected dry bulk operational areas and combustion emissions from vessels at port have also been assessed.

This chapter presents brief summary results from the air quality assessment (**Appendix I**). It is noted that an assessment on the potential impacts of greenhouse gasses associated with the project is provided in Chapter 12.

11.1 Existing Environment

11.1.1 Background Air Quality

Background air quality monitoring data for the local region has been collected and investigated in order to establish background concentrations of air pollutants. These data provide an indication of the quality of the existing air environment, and the capacity of the local airshed for future increases associated with new developments.

Dispersion modelling was used to provide an indication of the likely cumulative impacts associated with the project. The key air pollutants investigated were PM_{10} (particulate matter with an average aerodynamic diameter of 10 micrometers [10μm] and less), oxides of nitrogen (NO_X [sum of NO and NO_2, reported as NO_2]) and sulphur dioxide (SO_2).

Particulate Matter (Dust)

Particulate matter (dust) measurements were taken by CSIRO (2001) using a tapered element oscillating mass balance (TEOM) at the CSIRO site in Berrimah. The TEOM sampler measures PM_{10}.

PM_{10} measurements were found to be typically less than 10 μg/m^3 during the wet season, increasing to around 20 μg/m^3 in the dry season (as a result of increased dust, and smoke from bushfires). Smokey periods were also observed that resulted in PM_{10} concentrations exceeding the National Environmental Protection Measure (NEPM) standard of 50 μg/m^3 over a 24 hour period, with a maximum 24 hour PM_{10} loading of 70 μg/m^3 being recorded.

Further particulate monitoring was conducted by NRETAS at Casuarina between 2006 and 2008, utilising both a TEOM sampler and a Partisol Dichotomous sampler (measuring PM_{10} and $PM_{2.5}$). The results for 2006 and 2007 showed no measurements of PM_{10} above 50 μg/m^3, with a highest PM_{10} reading of 45.3 μg/m^3 (over a 24 hour period). In 2008, one recording of PM_{10} above 50 μg/m^3, of 64.8 μg/m^3, was noted (NRETAS, 2006, 2007 & 2008).

Thus measurements generally showed dust levels in the Darwin airshed were generally within NEPM standards, however, elevated dust levels were often associated with bushfires or firework displays. Table 11-1 summarises dust monitoring results for the Casuarina monitoring station in 2007 and 2008, broken down from 50th to 99th percentiles.

In this DEIS, the 95th percentile PM_{10} level (33 μg/m^3) has been adopted as the background concentration for the assessment of cumulative impacts. This percentile has been applied given the impacts associated with bushfire and firework events as described above.

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Table 11-1 PM_{10} Monitoring for CDU Casuarina Campus 2007 and 2008

Year	Maximum	Percentiles					
		99th	98th	95th	90th	75th	50th
2008[1]	64.8	40.6	37.8	33	27.3	19	14
2007[2]	45.3	38.4	32.2	27.8	24.1	18.6	11.9

Notes: All units in µg/m^3, and over a 24 hour averaging period

Source: NRETAS, 2008 and NRETAS ,2007

Oxides of Nitrogen

Levels of NO_X, generally being a product of combustion, is present in low concentrations in the Darwin airshed owing to the comparatively low numbers of cars and industrial areas, when compared with other urban centres of Australia.

The measured peak background concentrations in Darwin (in the CBD and at Middle Arm Peninsula) in a study by URS in 2008 were 138 µg/m^3 (1 hour averaging period) and 9.7 µg/m^3 (24 hour averaging period) (URS, 2008). These peak concentrations were within the NEPM criteria of 246 µg/m^3 (1 hour averaging period) and 62 µg/m^3 for (24 hour averaging period).

In this DEIS, as a conservative approach, the maximum measured hourly concentration of NO_2 (138 ug/m^3) has been adopted as the background level for the assessment of cumulative impacts.

Sulphur Dioxide

Sulphur dioxide (SO_2) is an air pollutant emitted mainly from smelting of sulphide ores, in sulphuric acid manufacture and also in combustion of fuels containing sulphur. There is no sulphide ore smelting or sulphuric acid manufacture in Darwin, and Darwin has comparatively low numbers of vehicles and small light industrial areas; also fuel standards have been introduced that limit the concentration of sulphur in diesel fuel. Thus SO_2 is present in the Darwin airshed in low concentrations, when compared to other urban centres of Australia.

SO_2 was monitored in Darwin and Middle Arm in two URS studies (2005, 2008). The 2005 results showed maximum one hour average SO_2 levels in Darwin CBD of between 0–42 µg/m^3, and maximum one hour average SO_2 levels in Middle Arm of between 0–8 µg/m^3. In the 2008 study, a maximum SO_2 level of 415 µg/m^3 was measured in the Darwin CBD; however this elevated level was considered to most probably have resulted from a diesel truck parked nearby, with its engine idling. It has thus been discounted as a background value.

In this DEIS, the adopted background one hour level for the assessment of cumulative impacts is 42 µg/m^3, which was the highest concentration measured in the 2005 study. The other background levels adopted are 9 µg/m^3 (24 hour averaging period) and 2.4 µg/m^3 (annual averaging period). SO_2 background concentrations for the 24 hour average were adopted from the second largest reported 24 hour concentration in URS (2008) data (the largest was found to be atypical). This was for the Fort Hill location. Background concentrations of SO_2 were taken by averaging the URS (2008) 24 hour average concentrations (dry season, and wet season separately) and then adopting the maximum as an annual average. These concentrations are well within the NEPM criteria of 570 µg/m^3 (one hour averaging period), 228 µg/m^3 (24 hour averaging period) and 60 µg/m^3 (annual averaging period).

11.1.2 Sensitive Receptors

The nearest sensitive receptors to the project area have been nominated as:

- **Receptor 1**: Government House / Darwin Waterfront (located approximately 5 km across the bay to the north-west of the EAW project area)
- **Receptor 2**: Kormilda College (located approximately 5 – 6km to the north-east of the EAW project area).

These receptors are consistent with previous assessments for facilities in the EAW, e.g. EAW Quarantine Waste Treatment Facility, GHD (2006).

11.2 Potential Impacts

The assessment of potential air quality impacts has been compiled through:

- A baseline assessment of the existing environment;
- A qualitative assessment of construction activities expected;
- A qualitative assessment of anticipated operational activities; and
- A quantitative assessment of construction and operational phases, incorporating conservative emission estimation in conjunction with conservative dispersion modelling.

The qualitative assessment considered emissions of dust, combustion products, odours and VOC and indicated that generally air emissions associated with construction and operational activities would be minor, however, certain construction and operational activities were identified that required further (quantitative) assessment using dispersion modelling. The approach to the modelling assessment involved the following elements:

- **Scenarios assessed**. Three scenarios were assessed. One scenario incorporated the construction activities, and potential dust emissions from construction equipment. Other scenarios assessed dust releases from the expanded dry bulk trade and the combustion emissions from docked vessels.
- **Emissions quantification**. Emissions were estimated for a range of sources including in the scenarios assessed using published emission estimates (NPI, 2001; ARB 2005);
- **Meteorological data**. The TAPM model suite was used to prepare meteorological data; and
- **Model**. The AUSPLUME dispersion model was used to predict likely concentrations of PM_{10}, NO_2 and SO_2 and is generally considered a suitable and robust model for this type of assessment.

The predicted concentrations are provided in Table 11-2; the predictions from the modelling were shown to be within the adopted criteria.

Whilst impacts from modelled air pollutants were shown to be within the adopted criteria, mitigation measures will be provided to ensure the emissions of air pollutants during the construction phase are contained to minimise adverse air quality impacts.

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Table 11-2 Predicted Incremental and Cumulative Air Quality Impacts

Pollutant and Averaging Time	Background (ug/m³)	Receptor 1		Receptor 2		Criteria (µg/m³)
		Incremental (µg/m³)	Cumulative (µg/m³)	Incremental (µg/m³)	Cumulative (µg/m³)	
Scenario 1 – Construction						
PM_{10} 24 hours	33	9.1	42.1	7.0	40.0	50
Scenario 2 – Operation – Dry Bulk Facilities						
PM_{10} 24 hours	33	13.6	46.6	6.7	39.7	50
Scenario 3 – Operation – Vessels at Berth						
NO_2 1 hour	138	40.2	178.2	16.0	154	246
NO_2 Annual	9.7	1.2	10.9	0.1	9.8	62
SO_2 1 hour	42	33.6	75.6	13.4	55.4	570
SO_2 24 hours	9	9.4	18.4	1.3	10.3	228
SO_2 Annual	2.4	1.0	3.4	0.1	2.5	60

Notes: **Receptor 1**: Government House / Darwin Waterfront (located approximately 5 km across the bay to the north-west of the EAW project area).

Receptor 2: Kormilda College (located approximately 5 – 6km to the north-east of the EAW project area).

11.3 Management of Impacts

The management of air quality impacts will be contained within:

- An Air Quality Management Plan (AQMP) detailed within the CEMP to be developed for the construction phase of the project; and
- The EAW EMP, which will be updated after the conclusion of the EIS process, for the ongoing operation of the expanded EAW facility.

11.3.1 Objectives and Standards

The objectives for air quality management are to:

- Prevent adverse impacts from air pollution, specifically dust, on the environment during the construction phase;
- Establish and maintain awareness of the importance of air pollution management practices during the operational phase, with the focus on the implementation of dust mitigation measures;

Whilst specific air quality guidelines are not available for the Northern Territory, it is understood DPC considers the following regulations and guidelines (Coffey Environments, 2010):

- *National Environment Protection Measure (Ambient Air Quality)*, NEPC (2003) (AAQ NEPM)
- *National Environment Protection Measure (Air Toxics)*, NEPC (2004)
- *State Environment Protection Policy (Air Quality Management) (Victoria)*
- *National Occupational Health & Safety Commission:1003 Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment (1995)*
- *Other State and Territory Guidelines that DPC determines are relevant.*

11.3.2 Management Requirements

Construction

The air quality management requirements for the construction phase of the project would be incorporated within plans and procedures included within the CEMP. Key management controls for construction include:

- Access roads would be sealed as soon as practicable after clearing, and access restricted to open cleared areas, in order to minimise dust emissions from open areas and from vehicle movements.
- Keeping stockpiles of construction materials on site to a reasonable size, and avoiding multiple handling of material where possible.
- Dust suppression techniques will be applied where necessary. Specifically water sprays on open areas and stockpiles, water trucks or dust suppression additives may be utilised.
- Vehicle control measures – these may include minimising vehicle speeds (maximum 20 km/h); limiting movements on unsealed roads; the use of water trucks on unsealed roads; and wheel wash areas.
- Covering of construction material loads on trucks in and out of the construction area to prevent dust releases.
- A vegetation and soil erosion control plan incorporating erosion protection measures; and
- A dredging and dredge spoil disposal management plan, incorporating mitigation measures for controlling odour and dust releases, particularly from dewatered and stored spoil.

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Operation

Operational management is currently covered by the EAW EMP, which (as noted above) will be updated after the conclusion of the EIS process, for the ongoing operation of the expanded EAW facility. The current EMP includes the following air quality management principles (Coffey, 2010):

- Enclosure of dust generating activities where operationally practical and efficient;
- Implementation of appropriate dust suppression or capture technology where enclosure is not practical;
- Efficient operation of machinery, equipment and vehicles to minimise exhaust emissions;
- Clean up of residues and spills in a timely manner;
- Adherence to the activity-specific EMP; and
- Regular review of the efficiency of air quality and greenhouse gas management measures to ensure implementation of continuous improvement.

11.3.3 Monitoring and Reporting

Monitoring would be undertaken during the construction phase of the project in order to meet key targets. The monitoring activities are stipulated below; these would be incorporated and undertaken as part of the CEMP:

- Visual inspections of dust deposition on surrounding areas will be undertaken on a periodic basis;
- Visual inspections will be undertaken during activities likely to cause dust releases (i.e. vegetation clearing, earthworks) to assess the effectiveness of mitigation measures, and need for increased dust suppression;
- An incident-reporting and complaint handling mechanism would be incorporated within the CEMP for dust incidents to be monitored and logged, and corrective and/or preventative actions to be implemented. Response mechanisms may be in the form of:
  - Increased level of application of existing dust suppression management controls;
  - An increase in the monitoring and inspections required;
  - Dust monitoring at the site boundary, using dust measurement instruments where appropriate;
  - A review and update of procedures or plans associated with dust management practice;
  - Training for on site personnel on avoiding, minimising and controlling dust releases.
- Auditing of dust management practices, including review of objectives and targets. Audit findings could result in recommended corrective action measures such as:
  - Updating plans and associated documentation to reflect changes to dust management practices;
  - Alteration or inclusion of training practices for on-site personnel in practices for avoiding, minimising and controlling releases of dust;
  - Seeking additional resources to assist in achieving the CEMP objectives in relation to dust.

It is understood that the following measures, which are currently contained in the EAW EMP, would continue after the development is complete:

- Environmental incident reporting including incident investigation and the inclusion of corrective and preventative actions;
- Monitoring of air quality, with sampling undertaken on a quarterly basis at sites on or around EAW, EAW stockpiles, Fort Hill Wharf, Fishermans Wharf and the centre of the harbour; and

- External and internal audits of the EMP biennially.

11.4 Commitments

The following commitments are made in relation to air quality:

- *A CEMP would be detailed outlining the AQMP prior to construction.*
- *Inspections of dust releases and associated control measures would be conducted on a regular basis.*
- *Vehicle movements on unsealed areas and roads would be kept to a minimum, to reduce dust releases from vehicle movements.*
- *Access roads would be sealed as soon as practicable after clearing, and access restricted to open cleared areas, to reduce dust releases from vehicle movements*.
- *Water sprays would be used on open areas and stockpiles, water trucks would be utilised on access roads and open areas, and wheel washes would be used, as appropriate.*
- *Where appropriate, a speed limit of 20 km/hr would be enforced for all vehicles onsite, to reduce dust releases from vehicle movements.*
- *All truck deliveries in and out of the construction area would have their loads covered to prevent dust releases.*
- *All stockpiled materials would be kept to a reasonable size and controlled via wet suppression and/or covers where deemed appropriate.*
- *Multiple handling of construction materials would be avoided where possible.*
- *A vehicle inspection and maintenance program for all on site construction vehicles would be implemented and adhered to.*

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