City Pacific Limited

TOWNSVILLE OCEAN TERMINAL - AIR QUALITY ASSESSMENT

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CONTENTS

EXECUTIVE SUMMARY

Introduction

The Townsville Ocean Terminal (TOT) Project incorporates residential, tourism and commercial development as well as providing a cruise terminal and wharf. Achieving acceptable air quality for the development is necessary, from both a health risk and an amenity perspective. The Terms of Reference (TOR) for the preparation of an Environmental Impact Statement (EIS) for the proposed TOT Project identify a series of air quality aspects that must be addressed for the Project. These relate to existing air quality (Section 4.8.1 of the TOR), and to potential impacts and mitigation measures (Section 4.8.2 of the TOR). This Air Quality Assessment presents the information and data necessary to address these issues.

Potential Receptors

At present, the nearest receptors with a potential sensitivity to air quality impacts are located at the Casino Peninsular and Mariners Drive Peninsular. Residential and commercial activities at these locations could be affected by construction and/or operational emissions from the TOT Project (Section 1.3).

The TOT Project itself will also introduce receptors (residential and commercial) with a potential to be affected by air quality emissions at the Project Site. These receptors will be in closer proximity to the existing Port of Townsville Operations than existing commercial and residential development in the locality. The receptors at the TOT Project site will also be in close proximity to the proposed Cruise Ship Terminal, hence have potential to be affected by these operations (Section 1.3).

Existing Air Quality

Ambient air quality data has been compiled from published sources (Sections 5.2.1 and 5.3-5.7), data provided by the Port of Townsville (Sections 5.2.2, 5.3 – 5.7) and through project specific monitoring (Sections 5.2.3 and 5.3 - 5.7). The air quality data provides detailed data relating to the existing air quality in and around the TOT Project area for a range of pollutants (suspended and deposited particulates, nitrogen oxides, sulphur oxides and hydrocarbons). The monitoring data indicates that the air quality at the TOT Project site is generally very good, and within the relevant State and National air quality goals for these pollutants. Limited analysis of available monitoring for lead has identified similar levels of deposited lead at both Project specific and background monitoring sites. Further investigation of lead emissions in the Townsville area is currently being undertaken by the Qld EPA and is expected to provide additional information on the extent and source of the emissions.

Impacts of Existing Port Activities

The potential impacts of existing Port operations of the Project Site have been assessed through a comprehensive air quality monitoring program. Monitoring of particulates, oxides of nitrogen, sulphur dioxide and hydrocarbons has been undertaken at positions representative of the Project Site.

The Queensland Environmental Protection Agency has also undertaken extensive monitoring of the so called 'black dust' identified by some community groups as resulting from emissions

from the Port.

Detailed analysis of the ambient air quality monitoring datasets (including data collected by the EPA) that are representative of the TOT Project site has been completed (Sections 5.3 – 5.7). This analysis confirms that the existing ambient air quality meets the appropriate air quality health risk and nuisance values and criteria by a significant margin. The monitoring data has been further correlated with specific activities occurring at the Port of Townsville. This comparison has demonstrated that emissions from ship movements, docked vessels and loading and unloading activities at the nearest berths to the Project site do not result in measurable changes in short term air quality or result in significant dust impacts at the Project Site.

Local Climatology

Meteorological monitoring is completed at Townsville Airport and the Port of Townsville. These data indicate that the climate at the TOT Project site is dominated by sea breezes for much of the year, as would be expected given the coastal location (Section 4.1). The available meteorological measurements have been utilised in the development of a suitable meteorological dataset for use in the air dispersion modelling completed for the TOT Project (Section 6.3).

Potential Emissions

Potential air emissions that could affect the TOT Project are primarily associated with existing activities at the nearby Port of Townsville. Emissions arise from normal Port activities (eg, loading and unloading of ships) as well as from a number of industrial activities that are located on Port of Townsville land (Section 7.2.12).

There is also potential for air emissions to occur as a result of the TOT Project. These relate to activities associated with the Cruise Ship Terminal, primarily vessel emissions while berthed (Section 7.4).

In addition, the potential for changes in air quality emissions to occur as a result of future planned changes at the Port of Townsville has been considered (Section 7.3).

Air Dispersion Modelling

To allow analysis of the potential for emissions from the construction of the TOT and for future activities to affect the TOT Project, air dispersion modelling has been completed.

To provide suitable data inputs to the air dispersion model, information relating to terrain, landuse and prevailing surface and upper atmosphere meteorology has been compiled. These data have been utilised in the TAPM and CALMET meteorological models to develop a site-specific prognostic meteorological dataset for use in the air dispersion modelling (Section 6.2).

The CALPUFF atmospheric dispersion model has been utilised for the prediction of construction impacts and future air quality at the TOT Project (Section 6.4). This model allows for consideration of terrain features, temperature inversions, land-sea breeze effects at coastal interfaces and strong convective conditions.

Modelling has also been completed to assess the air quality risk posed by existing cattle

export activities as insufficient monitoring data is available to determine the potential amenity risks associated with this activity

Emission Data Incorporated into the Air Dispersion Model

Emissions have been estimated by referencing published databases, environmental licences and by completing emissions monitoring (Section 7). Emissions estimates have been completed for both the construction phase (for nuisance dust amenity impacts) and the operational phase when residents, visitors and staff at the TOT could be affected by adverse air quality.

For the construction phase, particulate emissions associated with earth moving, stockpiling and removal activities are the primary issue. Emissions estimates have accounted for the expected moisture content of these materials. The largest quantity of earth moving is associated with the material used for the land reclamation, the majority of which will be dredged and placed while wet.

For the future expansion of the Port, there is potential for a range of individual sources of emissions however it is expected that particulate emissions are likely to be the dominant source. Emission data for existing odour emissions and potential future sources of particulate and gaseous emissions have been compiled, and are considered in the air dispersion modelling.

Predicted Construction Impacts

The air dispersion modelling for the construction phase (Section 8.2) indicates that, without mitigation, particulate concentrations at existing receptors in the surroundings of the site could approach, or exceed, the appropriate air quality guide values for health amenity and nuisance dust impacts.

Gaseous emissions from construction plant are predicted to remain within the appropriate health criteria.

Predicted Impacts from Live Cattle Export

The results of the air dispersion modelling of existing odour emissions from the Port indicate that a potential for exceedence of the air quality criteria exists as a result of cattle export activities. Odour is associated with nuisance, or amenity impacts and there is not a direct correlation with physical health impacts. These exceedences could be expected to result in odour nuisance at the Project site while cattle export ships are in berth.

Predicted Impacts from Future Port Activities

The results of the air dispersion modelling of future activities at the Port of Townsville (Section 8.4) indicate that compliance is predicted for particulates and gaseous pollutants. The air dispersion modelling is considered to be highly conservative due to the incorporation of conservative emissions data.

Verification of Predicted Impacts

With respect to odour, the monitoring data confirms the modelling predictions, and indicates that there is potential for odour nuisance impacts to occur at the TOT Project site when cattle

ships are berthed at the Port of Townsville (Section 8.3). Although cattle ship movements are infrequent at present, the monitoring data indicates that there is a potential for exceedance of the recommended planning thresholds for odour (which require compliance for 99.5 % of the year) at the Project Site if ships are docked for more than 2 days a year (approximately equivalent to 0.05 % of the year).

Mitigation Measures

Mitigation measures for the construction phase have been identified for management of suspended and deposited particulates (Section 9.1). These mitigation measures are incorporated in the Construction Environmental Management Plan for the Project.

With respect to odour impacts from live cattle export at the Port of Townsville, mitigation would involve ensuring cattle ships are berthed for no more than 2 days per year. This is likely to be unrealistic in terms of the Ports normal operations. Odour is associated with nuisance, or amenity impacts and there is not a direct correlation with physical health impacts. Therefore, as an alternative to a reduction in cattle exports from the Port, the potential for occasional odour impacts associated with Port operations should be included in the Port Protection Agreement such that all potential owners of Project land would be notified of potential impacts. The Port Protection Code prepared for the Project could also require all residential buildings be fitted with air conditioners capable of recycling internal air such that internal air quality can be controlled within individual premises during cattle export activities. In addition, it is recommended that the Port Authority be requested to notify the general public in the Townsville area and the Project Body Corporate of scheduled cattle export activities and the potential for odour emissions prior to the event.

1 INTRODUCTION

1.1 OVERVIEW

Air Noise Environment Pty Ltd were commissioned by City Pacific Limited to undertake an air quality assessment for the proposed Townsville Ocean Terminal development proposed to be constructed in Townsville as shown on Figure 1.

The proposal will provide Townsville with:

- a dedicated cruise terminal and wharf for cruise ships and military vessels, located on the Port Western Breakwater, adjacent to the Port of Townsville;
- an integrated residential and tourism development providing residential land parcels of mixed density for development;
- extended public access to the Breakwaters and provide future open space areas to land to be reclaimed to the north of the existing Townsville Hotel and Casino Complex and the Townsville Entertainment Centre; and
- increased marina berths for the marine industry, general recreational vessels, and provide berthing facilities for superyachts.

This report provides an assessment of potential air quality impacts associated with both the construction and operational phases of the Project. The assessment has been undertaken to provide an input into the Environmental Impact Statement (EIS) being prepared for the development and addresses the air quality issues raised in the Terms of Reference (TOR) developed for the EIS (QLD Dept of Infrastructure, 2007). Section 2 of this report provides an overview of the issues raised in the TOR applicable to potential air quality impacts and identifies where each of these requirements are addressed in the report.

1.2 PROPOSED DEVELOPMENT

The Townsville Ocean Terminal (TOT) project site (the Project Site) is located on and adjacent to the existing Townsville foreshore and incorporates the existing Port Western Breakwater and the Northern (Offshore) Breakwater, the existing perimeter of the land around the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre. A location plan for the site is presented on Figures 1 and 2.

The Project Site is located to the north east of Sir Leslie Thiess Drive and Entertainment Drive. The Project Site is in close proximity to the recently completed Strand foreshore improvement works.

The existing Casino Peninsula, Mariners Drive Peninsula and the Northern Breakwater were reclaimed and constructed between 1980 and 1986. The Port Western Breakwater constructed prior to this time. The Breakwaters and revetment walls consist of rock walls with reclaimed land formed from hydraulically and mechanically placed fill.

The Casino Peninsula is the location of the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre. A large portion of the Casino Peninsula is also used for

event and overflow parking for the Townsville Entertainment Centre and the Casino Complex. Mariner's Drive peninsula is currently used for various purposes including residential apartments, the Townsville Sailing Club, marina and fuel services including boat maintenance. The existing Port Western Breakwater forms the western side of the navigation channel known as the "Platypus channel", the main access channel for the Port of Townsville. This channel forms an extension to Ross Creek and the channel is currently dredged to a level of approximately 12 m below Lowest Astronomical Tide (LAT).

The Cruise Ship Berths are proposed to be "cut" into the Port Western Breakwater, with the reclamation of land for the cruise ship terminal and proposed residential area being located adjacent to this. The reclamation works will require the sourcing of approximately 2,500,000 m^3 of fill material which will be imported to the Project Site together with necessary armour rock and breakwater construction materials.

Figure 1: Proposed TOT Site Location

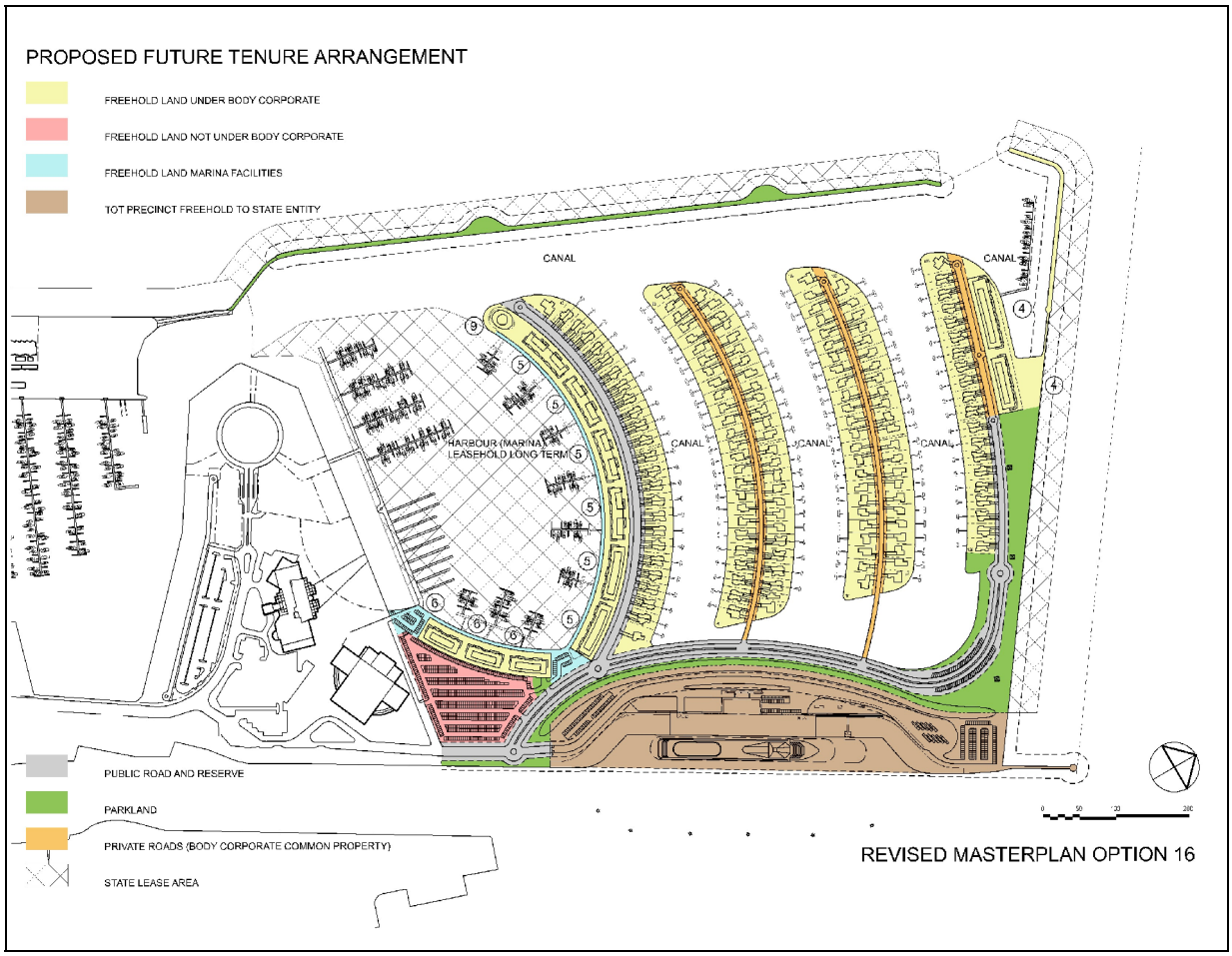

Figure 2: Proposed Site Layout for TOT Project

1.3 POTENTIAL RECEPTORS

The nearest existing receptors to the Project Site include the residential apartment developments and commercial receptors located at the Casino Peninsular and Mariners Drive Peninsular as identified on Figure 1. Given the proximity to the TOT site it is possible that these receptors could be affected by emissions during the construction and operational phases of the TOT Project.

In addition, the development of the TOT Project is to introduce a range of receptors (both commercial and residential) as part of the development. These receptors will be located closer to sources of emissions associated with the existing Port of Townsville Operations than existing commercial and residential development in the locality. Furthermore, the receptors at the TOT Project site will also be in close proximity to the proposed Cruise Ship Terminal, hence have potential to be affected by these operations.

These receptors are considered in the assessment of emissions from the TOT and the existing and future Port operations.

1.4 PORT-RESIDENTIAL AIR QUALITY INTERFACES

The TOT Project involves development of a major multi-use site in close proximity to an existing industrial area. In air quality terms, this potentially represents a significant conflict between land uses that require a high level of air quality (residential and tourism) and existing industrial land uses that can be significant emitters of pollution.

In situations of this type, it is appropriate to consider two potential types of air quality impact:

- potential health impacts; and
- potential amenity impacts.

Of these, the potential for health impacts is paramount. Air quality criteria are legislated in Queensland for the protection of human and ecological health. These criteria are based on empirical data that demonstrates dose-response effects for different pollutants and exposures. It is considered essential that, for a project such as the TOT, these air quality thresholds are achieved by a significant margin.

Amenity impacts relate to issues such as odour and dust that are often more readily noticed by the community than pollution concentrations that could result in health risk. Because odours can be smelt, and dust may be observed visually, community complaints may arise because of these types of emissions. Traditionally in Australia and many parts of the world Port operations have been associated with odour and dust emissions, as the fundamental purpose of a port is the handling of goods and materials. Whilst amenity issues are more likely to result in complaint, the actual impacts are termed 'nuisance' as the effects are usually temporary, and generally are not associated with physical harm. Thus, whilst compliance with amenity criteria must always be the primary objective for proposed developments, where pre-existing sources of emissions are present there may be greater tolerance of occasional amenity impacts. Where premium properties are being developed, and this is often the case for waterfront locations, tolerance of amenity impacts may be less.

In recent times, there has been a tendency for urban renewal of older dock and port areas in Australia (eg, Freemantle, Western Australia) and other parts of the world (eg, London and Cardiff). In many cases, high density residential development has been successfully co-located with remnant port related operations.

An example of high density residential development in close proximity to port operations is Mackay Port. Here a major marine and tourist development is being developed adjacent to the Port of Mackay. The existing port operations include many activities that are similar to those at Townsville Port. The Queensland Department of State Development has highlighted the success of this development, commenting that Port Binnli is '*now the major marina, residential, commercial, recreation and tourism development in the area, with extensive public access and walkways throughout. When complete in early 2007 it will be a prime example of total integrated marine infrastructure, which provides an ideal base for associated marine businesses*'.

Planning for these projects generally requires a detailed air quality assessment to ensure that the expected air quality impacts at sensitive receptors proposed to be co-located with port related activities are acceptable. Many of the projects cited above are recent, and data relating to any amenity impacts (for example, complaints from residents) are not readily available. Similarly, ambient air quality monitoring has not been completed for these projects hence detailed analysis of health related air quality issues not possible.

Whilst there appears to be a growing trend for sensitive development to be incorporated in major port projects, in the absence of specific data relating to actual or perceived air quality impacts firm conclusions about the suitability of such projects cannot be made. In the case of the TOT project, it is fortunate that extensive ambient air quality data is available (as discussed in Section 5 of this assessment). Therefore, for this project, an objective analysis of the potential health and amenity risks can be completed as presented in this assessment and provides the basis for determining the suitability of the port-residential interface from an air quality perspective.

2 TERMS OF REFERENCE (TOR)

An Initial Advice Statement (IAS) was prepared for the project (Hyder, 2006) to provide a description of the project. This document, along with advisory agency requirements, submissions from stakeholders and the community were the basis for development of Terms of Reference (TOR) for the Project by the Queensland Department of Infrastructure.

This report provides an assessment or response to a number of the issues raised in the TOR for the project as they specifically relate to potential air quality impacts. Table 2.1 summarises the sections of the TOR that are relevant to air quality issues. The table also identifies where the issues raised in the TOR are addressed in this report. Issues relating to emissions of greenhouse gases as a result of the Project have been considered in a separate study. A copy of the report detailing the findings of this study is presented in Appendix B.

TABLE 2.1: AIR QUALITY ISSUES RAISED IN THE TERMS OF REFERENCE

Issue Raised	Section of Report Where Addressed
2.2 Compatibility with the Port of Townsville	
The EIS shall discuss the compatibility of the Project, particularly the proposed Breakwater Cove precinct, with existing and future operations associated with the Port of Townsville. The discussion must consider the future expansion and operations of the port to at least 2050 including potential capital works, dredging and consideration of growth in throughput over new and existing berths. The EIS must provide examples of similar residential developments located near industrial port facilities and discussion of their compatibility.	Sections 1 and 7
2.2.1 Emissions associated with port operations	
Describe the potential for nuisance and amenity impacts within the proposed Breakwater Cove precinct associated with existing and future predicted emissions from the port. Baseline monitoring should be undertaken. It should take seasonality into account. The description of emissions should include: ▪ A description of existing emission sources and potential capital works and operations in the port that may influence future emissions including port infrastructure, vessels, rail and road transport. ▪ A report on air quality (dust, fumes, particulates and odours - organic and inorganic) impacting on the Project site based on current and future port activities	Sections 5 and 7
4.8.1 Description of environmental values	
▪ Identify existing and future sensitive receptors and identify the potential for nuisance and amenity impacts associated with air	

Issue Raised	Section of Report Where Addressed
emissions from the proposed development including a description of existing emission sources and the climatic conditions that may influence air quality.	Sections 1.3 and 4
▪ Address both construction and operational phases of the development.	Section 8
▪ Include: ▪ Preparation of land use and terrain information for the area to enable prediction of air concentrations at ground level; ▪ Review of existing air quality monitoring and meteorological data for the area. ▪ Modelling of the area to establish the projected changes to atmospheric environment due to existing pollutant generators and the new facility.	Section 6 Sections 4 and 5 Section 8
▪ A baseline monitoring program should be undertaken at the nearest sensitive receptors to determine ambient air quality. Appropriate air quality criteria should be proposed for suspended particulates and dust deposition during construction and operation of the Project.	Section 3 and 5.2.3
4.8.2 Potential impacts and mitigation measures	
This section defines and describes the objectives and practical measures for protecting or enhancing environmental values for air, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.	Section 9
Describe in detail the expected quantity and quality of all air emissions (including particulates, fumes and odours) from the project during construction and operation. Particulate emissions include those that would be produced by transportation equipment (e.g. trucks, either by entrainment from the load or by passage on unsealed roads) or disturbed by wind action on stockpiles. Additional particulate and gaseous emissions include those released from cruise ships while in berth.	Sections 7 and 8
The objectives for air emissions should be stated in respect of relevant standards (ambient and ground level concentrations), relevant emission guidelines, and any relevant legislation, and the emissions modelled using a recognised atmospheric dispersion model. The potential for interaction between the emissions from the Project and emissions in the air shed from existing pollutant generators, and the likely environmental harm from any such interaction, should also be detailed.	Section 3
The projected changes to the atmospheric environment due to existing pollutant generators and the Project should be compared with the national environmental protection measures (NEPM) for ambient air	Section 8

Issue Raised	Section of Report Where Addressed
quality (1998), the National Health Medical Research Council (NHMRC) national guidelines (1985) for control of emissions from stationary sources, the Environmental Protection (Air) Policy (1998) and the Environmental Protection Act 1994. Where appropriate, the predicted average ground level concentrations in nearby areas should be provided. These predictions should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. Ground level predictions should be made for the Project site and surrounding areas believed to be sensitive to the effects of predicted emissions. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained. The assessment of the Project's impact, i.e. environmental harm, on air quality should consider at least the following matters: ▪ A review of construction activities likely to cause air emissions including material extraction, material transport, excavation and filling, site compounds and stockpiles, etc.; ▪ A review of operational impacts associated with increased road and river traffic emissions, cruise ships and other vessels docked in the dedicated berth and air quality issues associated with servicing the facility ▪ The human health risk associated with emissions from all hazardous or toxic pollutants should be assessed whether they are or are not covered by the National Environmental Protection Council (Ambient Air Quality) Measure or the Environmental Protection (Air) Policy 1998. ▪ Features of the Project designed to suppress or minimise emissions, including dusts and odours, should be detailed. ▪ The proposed levels of emissions of dust, fumes and odours should include emissions during typical and worse case conditions. Consideration should be given to the range of potential upset condition scenarios including the air emissions that may be generated as a result. ▪ Where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the Project area (i.e. sea breezes, strong convection, terrain features, temperature inversions and pollutant re-circulation), a combination of acceptable models will need to be applied and referenced. ▪ The limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models. ▪ Air quality predictions should be compared to the relevant goals in the National Environmental Protection Council (Ambient Air Quality) Measure and the Environmental Protection (Air) Policy 1998 goals. ▪ Estimation of projected emissions both with and without the	Sections 6, 7 and 8

Issue Raised	Section of Report Where Addressed
project. ▪ Comparison of the modelling results with the existing environment and legislative and regulatory requirements for air quality. ▪ Presentation of the results of the assessment including maps of modelled emissions and predicted concentrations.	

3 RELEVANT LEGISLATION

3.1 INTRODUCTION

The Terms of Reference for the project nominate the following air quality criteria:

- The National Health and Medical Research Council (NHMRC) national guidelines (1985) for control of emissions from stationery sources.
- Environmental Protection Air Policy (1997) (EPP Air) and the Environmental Protection Act (1994).
- National Environmental Protection Measure (NEPM) for Ambient Air Quality (1998)

The Project does not include stationary sources, hence application of the NHMRC criteria is not relevant.

In the case of the EPP Air and NEPM, for some pollutants the guide values indicated in the two policies differ. As both are referred to in the TOR, for the purposes of this assessment the more stringent criteria are adopted in the air quality assessment.

3.2 QUEENSLAND ENVIRONMENTAL PROTECTION POLICY (AIR)

In Queensland, air quality goals are defined in the Queensland Environmental Protection (Air) Policy (EPP Air). The EPP Air goals are presented in Tables 3.1a and 3.1b.

TABLE 3.1a: EPP AIR QUALITY GOALS – PARTS 1 AND 2

Air Quality Indicator	Air Quality Goal	Averaging Time
Visual and Amenity:		
Carbon disulphide	20 μg m^{-3}	30 minutes
Hydrogen sulphide	7 μg m^{-3}	30 minutes
Particles (visibility reducing)	20 km visibility	1 hour
Styrene	70 μg m^{-3}	30 minutes
Tetrachlorethylene	8 μg m^{-3}	30 minutes
Toluene	1 μg m^{-3}	30 minutes
Biological Integrity:		
Fluoride -		
Generally:	2.9 μg m^{-3} 0.84 μg m^{-3} 0.5 μg m^{-3}	24 hours 30 days 90 days
Agricultural producing areas:	1.5 μg m^{-3} 0.4 μg m^{-3} 0.25 μg m^{-3}	24 hours 30 days 90 days

Air Quality Indicator	Air Quality Goal	Averaging Time
Protected Areas under the Nature Conservation Act 1992:		
Nitrogen dioxide	0.1 μg m^{-3} 95 μg m^{-3} 30 μg m^{-3}	90 day 4 hours 1 year
Ozone	210 μg m^{-3} 65 μg m^{-3} 60 μg m^{-3}	1 hour 24 hours 100 days of the growing season
Sulphur Dioxide	100 μg m^{-3} 60 μg m^{-3}	24 hours 1 year
Total deposited nitrogen	3 g m^{-2}	1 year

TABLE 3.1b: EPP AIR QUALITY GOALS – PART 3

Air Quality Indicator	Air Quality Goal	Averaging Time
Cadmium	20 ng m^{-3} maximum*	1 year
Carbon disulphide	100 μg m^{-3}	24 hours
Carbon monoxide	10 mg m^{-3}	8 hours
1, 2 dichlorethane	0.7 mg m^{-3}	24 hours
Dichloromethane	3 mg m^{-3}	24 hours
Formaldehyde	100 μg m^{-3}	30 minutes
Hydrogen sulphide	150 μg m^{-3}	24 hours
Lead	1.5 μg m^{-3}	90 days
Manganese	1 μg m^{-3}	1 year
Nitrogen dioxide	320 μg m^{-3}	1 hour
Ozone and photo-chemical oxidants	210 μg m^{-3} 170 μg m^{-3}	1 hour 4 hours
Particles (as PM_{10})	150 μg m^{-3} 50 μg m^{-3}	24 hours 1 year
Particles (as total suspended)	90 μg m^{-3}	1 year
Styrene	800 μg m^{-3}	24 hours
Sulphate	15 μg m^{-3}	1 year
Sulphur dioxide	700 μg m^{-3} 570 μg m^{-3} 60 μg m^{-3}	10 minutes 1 hour 1 year
Tetrachlorethylene	5 mg m^{-3}	24 hours
Toluene	8 mg m^{-3}	24 hours
Trichloroethylene	1 mg m^{-3}	24 hours
Vanadium	8 μg m^{-3}	24 hours

** No increase in existing cadmium levels allowed.*

In addition to the goals provided in the EPP (Air), the Queensland Environmental Protection Agency (EPA) also refer to a goal of 120 mg/m^2/day for nuisance dust levels. The goal, while not defined in the QLD legislation, is often referred to in environmental authorities issued by the EPA. This goal is considered in the assessment of nuisance dust impacts associated with both the construction and operational phases of the Project.

3.3 ODOUR IMPACT ASSESSMENT FROM DEVELOPMENTS

Odour impact assessment criteria are not specifically provided in state or national legislation. Rather, Queensland EPA provide a guideline document detailing methodologies for the assessment and consideration of odour impacts associated with proposed developments for planning purposes. Specifically, the *'Odour Impact Assessment from Developments'* guideline states the following:

> *'The modelled odour concentrations at the "most exposed existing or likely future off-site sensitive receptors" should be compared with the following guideline values.*
>
> - *0.5 ou, 1-hour average, 99.5th percentile for tall stacks*
> - *2.5 ou, 1-hour average, 99.5th percentile for ground-level sources and down-washed plumes from short stacks, and*
> - *for facilities that do not operate continuously, the 99.5th percentile must be applied to the actual hours of operation.'*

In this instance, odour emissions from operations at the port are generally limited to emissions from product fill points and vessel ventilation exhausts. Thus, on the basis of the policy guideline, the criteria of 2.5 ou (odour units), 1-hour average, 99.5th percentile is applicable for the assessment.

3.4 NATIONAL ENVIRONMENTAL PROTECTION MEASURE (AMBIENT AIR QUALITY)

The National Environmental Protection (Ambient Air Quality) Measure (NEPM) was made in June 1998 by the National Environmental Protection Council of Australia. The measure was designed to ensure that uniform national ambient air quality standards are adopted throughout Australia.

The NEPM sets national air quality standards (or pollutant concentration levels) and goals, and monitoring requirements for the following criteria pollutants:

- Particulate matter with an equivalent aerodynamic diameter of less than 10 micrometres or less, PM_{10};
- Sulfur Dioxide;
- Carbon Monoxide;
- Nitrogen Dioxide;
- Photochemical Oxidants (as Ozone); and
- Lead.

The standards are health based and are designed to protect the most vulnerable in the community from the health impacts of the pollutant. For each standard the NEPM identifies the allowed number of days each year the standard can be exceeded. The goal of the NEPM is that by 2008, for each of the standards, the number of exceedences is not greater than allowed. For example the goal for the ozone 1-hour standard is an exceedence on no more than one day each year.

A variation to the NEPM was introduced by the National Environmental Protection Council in June 2003 with respect to finer particulates ($PM_{2.5}$). The variation incorporates monitoring requirements and advisory reporting standards for $PM_{2.5}$. The purpose of the advisory reporting standard is to indicate levels for jurisdictions to report against, although there is no target date by which jurisdictions are expected or required to comply with the advisory reporting standard.

Table 3.2 presents a summary of the standards included in the National Environmental Protection Measure (Ambient Air Quality).

TABLE 3.2: SUMMARY OF STANDARDS – NEPM (AMBIENT AIR)

Pollutant	Averaging Period	Maximum Concentration		Goal within 10 years Maximum allowable exceedences
		ppm	µg/m³	
Carbon monoxide	8 hours	9.0	11,245	1 day a year
Nitrogen dioxide	1 hour 1 year	0.12 0.03	246 62	1 day a year none
Sulphur dioxide	1 hour 1 day 1 year	0.20 0.08 0.02	571 228 57	1 day a year 1 day a year none
Lead	1 year	-	0.50	none
Particles as PM_{10}	1 day	-	50	5 days a year
Particulates as $PM_{2.5}$	1 day 1 year	-	25 8	Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Particles as $PM_{2.5}$ Standards as part of the review of this Measure scheduled to commence in 2005

3.5 SUMMARY OF ASSESSMENT CRITERIA

Table 3.3 provides a summary of the criteria and sources of the criteria utilised in the assessment of health and amenity impacts associated with the Project. These criteria are selected based on the type of emissions likely to be emitted by the development and the surrounding landuses. Where different air quality goals are nominated in the State legislation and the National Environmental Protection Measure (NEPM), both are referenced. It is noted that the State legislation is legally binding, while the NEPM guide values are not legislative requirements for the Project. It should also be noted that, although some emissions of metals could be expected from Port operations, there is currently limited information available

regarding the quantity or type of emissions. As a result consideration of these emissions in the predictive assessment has not been included.

TABLE 3.3: SUMMARY OF ADOPTED AIR QUALITY CRITERIA

Pollutant	Averaging Period	Criteria (µg/m^3)	Source
Carbon monoxide	8 hours	10,000	EPP Air
Nitrogen Dioxide	1 hour 1 year	246 63	NEPM NEPM
Sulphur Dioxide	1 hour 1 day 1 year	570 228 57	EPP Air NEPM NEPM
Total Suspended Particulates (TSP)	1 year	90	NEPM
PM_{10}	24 hours 1 year	50 50	NEPM EPP Air
Formaldehyde	30 minutes	100	EPP Air
Odour	99.5th percentile of hourly averages over a one year period	2.5 ou	QLD EPA
Dust fallout	1 day	120 mg/m^2/day	QLD EPA

4 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 CLIMATOLOGY

The climatology in the Townsville area is typical of a tropical environment, however, due to its geographical location, rainfall is not as high as elsewhere in the tropics. Winter months are dominated by SE trade winds and mostly fine weather. The summer months are hot and humid with "build-up" thunderstorms starting in late October or November. Bursts of monsoon rains from late December through until early April deliver the highest rainfall.

Figures 3 and 4 present seasonal wind roses for the Townsville Port Authority meteorological station located at Berth 10 of the Port of Townsville (located approximately 180 m east of the Project Site) for the period January 2004 – June 2007. Review of the wind roses confirms that wind conditions at the Port of Townsville are typically defined by sea breezes in summer and spring.

Winds are noted to be predominantly easterly and north-easterly during the wet season and easterly to south south westerly in the dry season. For all periods the occurrence of calms in the Project Site area is low with less than 1 % calms recorded in any season of available monitoring data.

The average annual rainfall recorded at the Bureau of Meteorology monitoring station located at Townsville Airport is 1143 mm for an average of 91 rain days, most of which falls in the six month "wet season" November to April. Figure 5 presents a summary of average rainfall per month across a typical year.

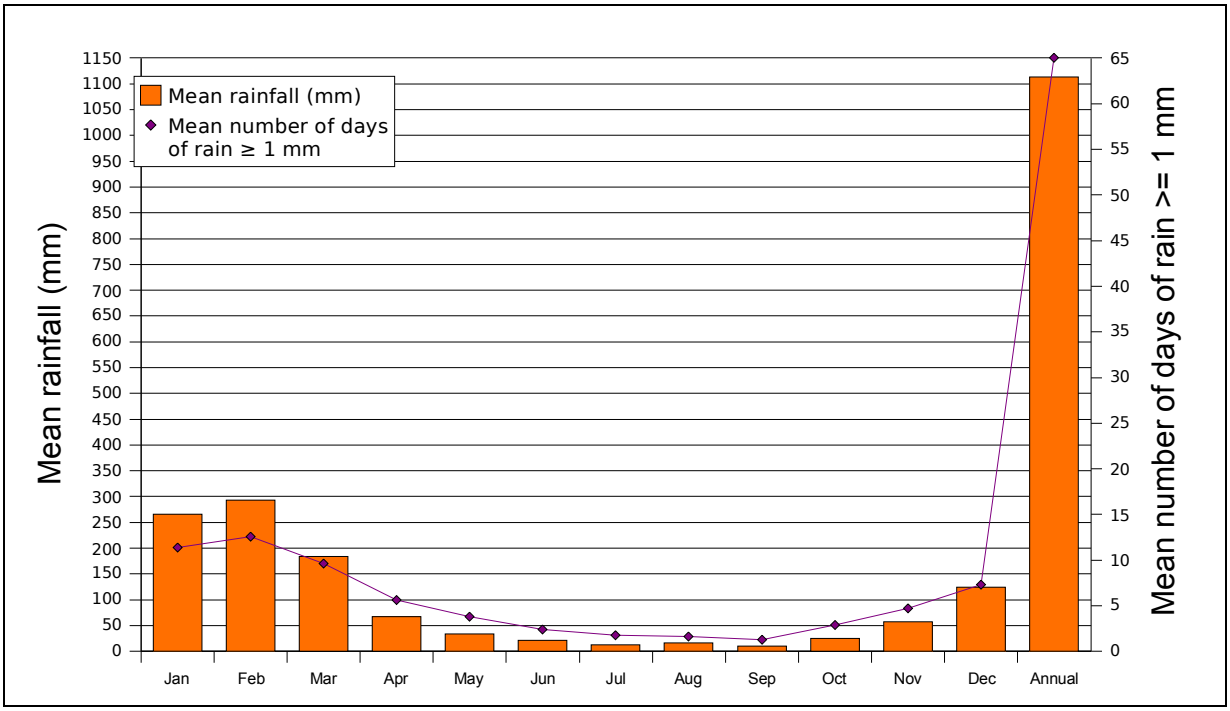

Figure 5: Typical Rainfall Patterns for Townsville Region (average over all years of recorded data)

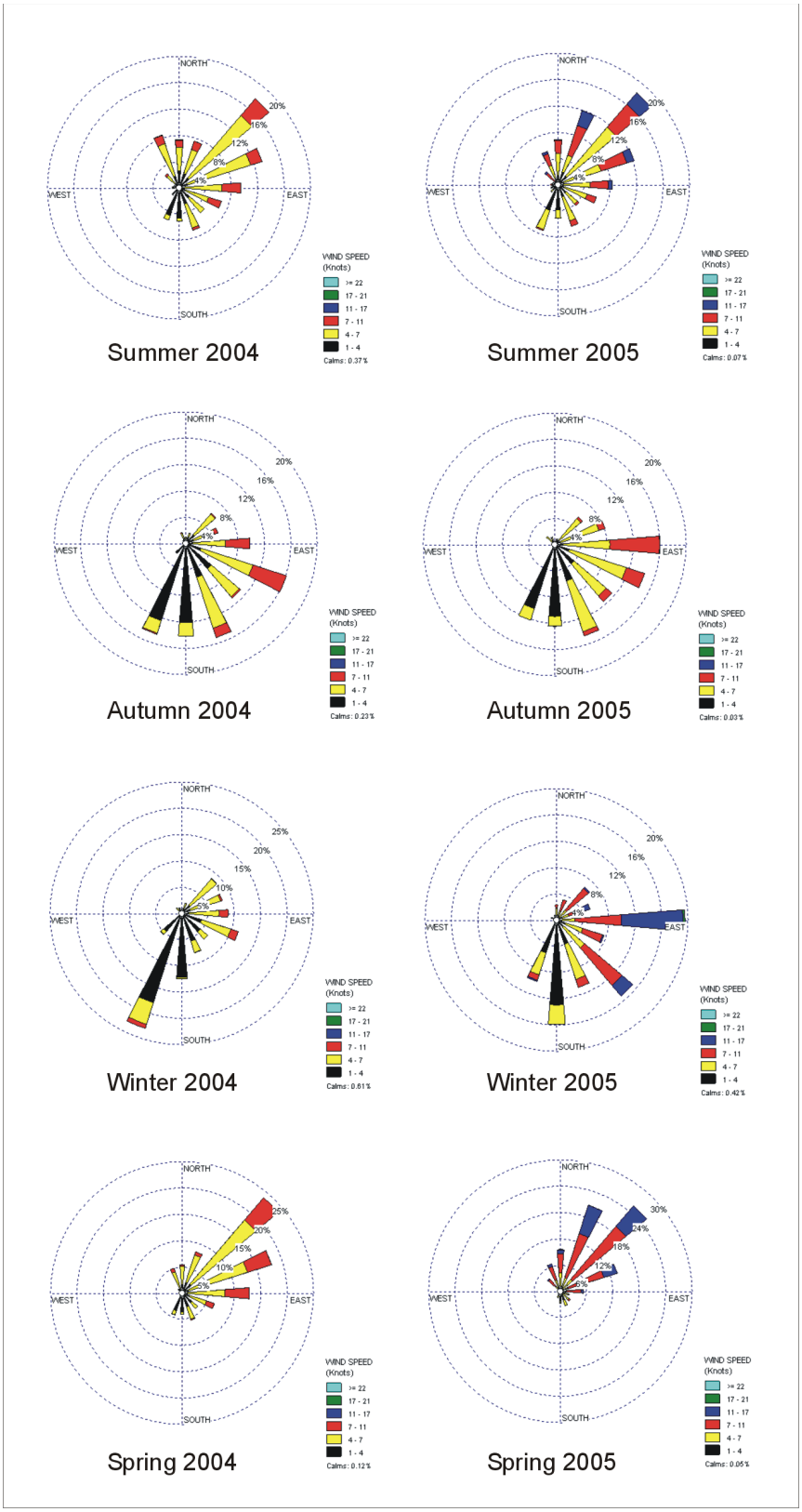

Figure 3: Seasonal Windroses for Townsville Port Berth 10 Monitoring Station (2004 – 2005)

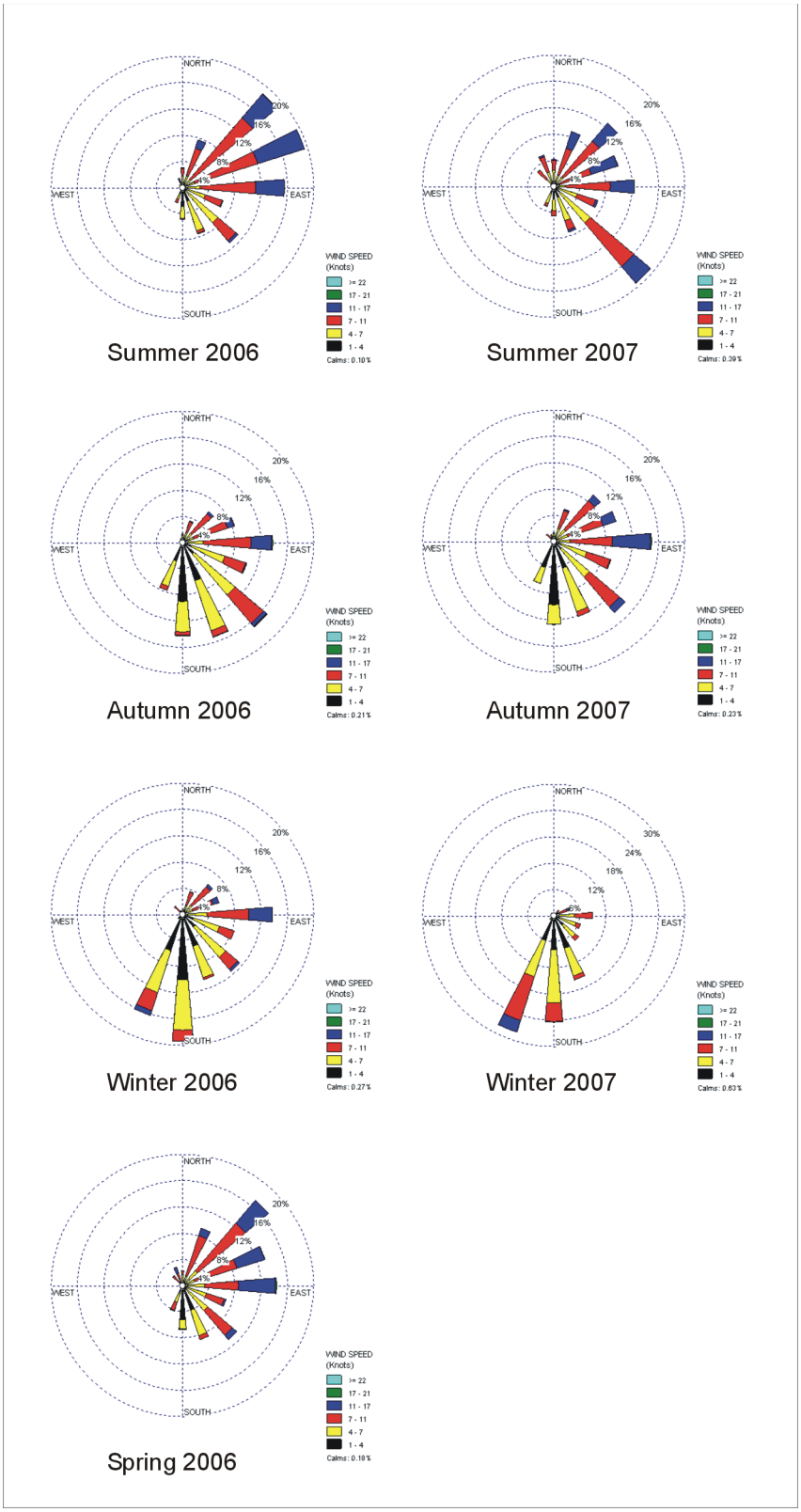

Figure 4: Seasonal Windroses for Townsville Port Berth 10 Monitoring Station (2006 – 2007)

4.2 SURROUNDING LANDUSES

The Site is located in an area surrounded by industrial (Townsville Port) activities to the east and south-east, the commercial development including the Entertainment Centre and Townsville Casino to the south, and residential development to the west, south and south-west. Figure 6 presents a summary of the existing landuses in the area.

In terms of potential air quality impacts on the Project Site, there is significant areas of industrial activities to the east of the Project Site with the potential to result in emissions to air. These sources are discussed in detail in Section 7 of this report.

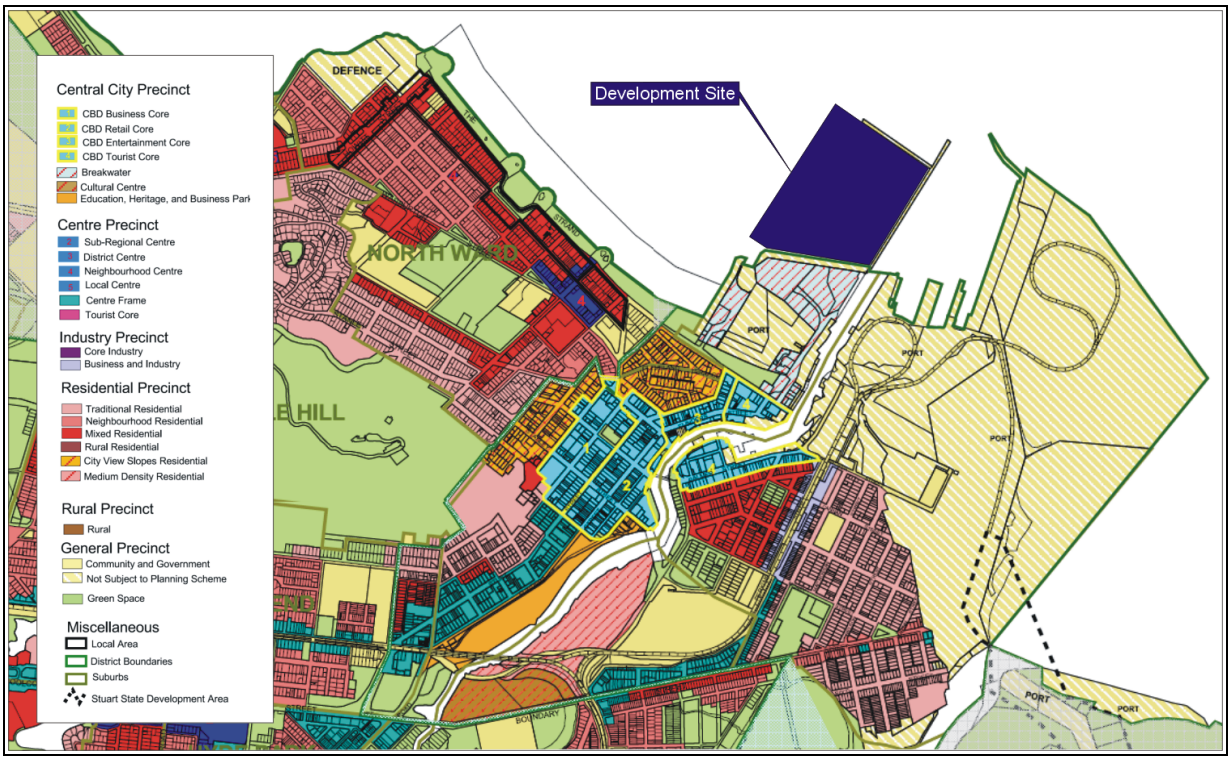

Figure 6: Existing Landuses in the Townsville Area

5 IMPACTS OF EXISTING PORT OPERATIONS

5.1 INTRODUCTION

The potential impacts of existing Port operations on the Project Site have been assessed by referencing the extensive database of air quality data that is available for the Project site locality. Monitoring data for particulates, oxides of nitrogen, sulphur dioxide and hydrocarbon measurements at positions representative of the Project Site is available through specific monitoring completed for the Project, data collected by the Port of Townsville and the QLD EPA.

The following sections provide a detailed analysis of the ambient air quality monitoring datasets (including data collected by the EPA) that are representative of the TOT Project site. The pollutants considered in the ambient monitoring are as identified by a site audit of existing industrial operations (refer to Section 7.3.12) in the area surrounding the Project Site.

5.2 AMBIENT AIR QUALITY MONITORING STATIONS

5.2.1 Queensland Environmental Protection Agency

The Queensland Environmental Protection Agency operate and maintain a network of ambient air quality monitoring stations across Queensland. The monitoring stations are intended to provide information to identify long-term trends in air quality across Queensland and to help assess the effectiveness of air quality management strategies.

There are a total of five EPA monitoring stations located in the Townsville area measuring a range of contaminants as follows:

- ***Pimlico***: *'The Pimlico monitoring station is located within the grounds of the Barrier Reef Institute of TAFE Pimlico Campus, surrounded by residential suburbs. It was established in June 2004 to measure general population exposure to air pollutants from the range of emission sources in the Townsville area. Ozone, nitrogen oxides and PM_{10} are measured at this site. Wind speed and direction are also recorded.'*

- ***South Townsville***: *'The South Townsville station is located in the grounds of a kindergarten in a residential area near to the city's port operations. The EPA began monitoring here in 1994, measuring PM_{10} concentrations using a high-volume air sampler.'*

- ***Townsville Port***: *The Townsville Port monitoring station is located at a terminal of the Townsville Port Authority in Townsville Harbour. It was established in partnership with the Townsville Port Authority in 1994 to monitor the impact of port activities on nearby residential areas. PM_{10} is measured at this site using TEOM instrumentation. Wind speed and direction are also recorded. The Townsville Port Authority funds and operates this station under the guidance of the EPA.*

- ***Garbutt***: *The Garbutt station is located in an industrial area of Townsville. It began monitoring PM_{10} levels in 1994 using a high-volume air sampler.*

- ***Stuart***: *The Stuart monitoring station is located on private property adjacent to an*

industrial area comprising several metal processing plants. Sun Metals Corporation funds and operates the station under the guidance of the EPA. Sulfur dioxide and wind speed and direction are monitored at this site.

Figure 7 presents the locations of the five EPA monitoring stations in relation to the proposed Project Site.

Figure 7: EPA Continuous Monitoring Stations

In addition, the Environmental Protection Agency has recently undertaken an investigation into dust complaints from residents living in the Yarrawonga area. The complaints centre around the presence of high levels of 'black dust' alleged to be the result of the operation of the Port of Townsville.

The study measured dust fallout and collected dust wipe samples from three residential premises in Townsville. Figure 8 presents the monitoring locations considered in the Environmental Protection Agency study. The results and findings of this study are discussed in Section 5.4.2.

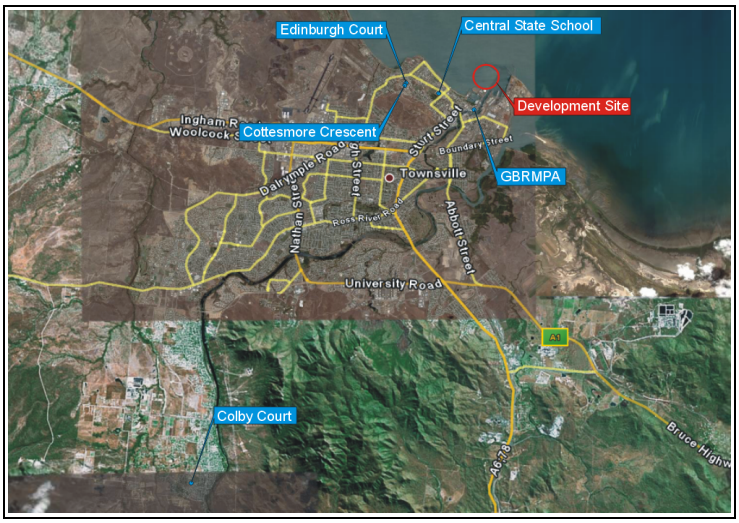

Figure 8: EPA Nuisance Dust Study Monitoring Locations

5.2.2 Townsville Port Authority

Continuous monitoring of meteorology and PM_{10} concentrations is undertaken at a permanent monitoring station located at Berth 10. Berth 10 is located between major loading activities at the Port and the Project Site and as such is likely to represent the maximum emissions likely to impact of the Site. It should be noted that although the continuous monitoring equipment at Berth 10 is maintained by the Port, all data collection, analysis and reporting is undertaken by the EPA in accordance with *AS 3580.9.8-2001 Method for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.*

In addition to the continuous monitoring, Townsville Port Authority also undertake routine monitoring of dust deposition at a number of locations around the Port site as identified on Figure 9. Of these monitoring stations, Berth 10 is the closest to the Project Site and may be representative of levels of dust deposition that could potentially be experienced at the site.

Figure 9: Townsville Port Authority Deposited Dust Monitoring Locations

5.2.3 Project Specific Monitoring

5.2.3.1 Introduction

The existing sources at the Port of Townsville produce a range of gaseous and particulate emissions. Monitoring for a range of gaseous pollutants, including nitrogen dioxide, sulphur

dioxide and hydrocarbons, is not undertaken in the Townsville Port area. In addition, whilst deposited nuisance dust is measured at various locations around the Port, with the exception of a single station at Berth 10, the existing stations do not provide representative levels of dust exposure at the Project Site.

To provide further information about the existing ambient air quality at the Project Site and in the surrounding region, project specific monitoring has been undertaken for particulates (both nuisance dust), oxides of nitrogen (NO_x), sulphur dioxide (SO_2) and hydrocarbons (methane, non-methane and total hydrocarbons). This monitoring has been undertaken continuously with nuisance dust monitoring commencing in November 2006 and gaseous monitoring (NO_x, SO_2 and hydrocarbons) commencing in late July 2007.

The monitoring was undertaken to supplement available monitoring data regarding the existing ambient environment during normal Port operations. Discussions with the Port have identified that Port operations during the monitoring are considered to be normal with vessels both importing and exporting product on a regular basis. Appendix C provides an example of the shipping schedule for a month of the project specific monitoring undertaken (August 2007) review of this data confirms that, for the majority of time, a ship was in berth on most berths every week.

5.2.3.2 Deposited Dust

Site specific monitoring stations have been installed to provide an indication of levels of dust deposition likely to impact on the Project Site as a result of Port of Townsville operations. In addition, dust deposition monitoring stations have also been established to give an indication of ambient conditions in the surrounding area prior to commencement of any construction works on the proposed development site.

Table 5.1 presents a summary of the site specific deposited dust monitoring stations established for the project. Figure 10 shows these stations in relation to the proposed development site and surrounding landuses. All monitoring was undertaken in accordance with *AS 3580.10 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.*

TABLE 5.1: SITE SPECIFIC DEPOSITED DUST MONITORING STATIONS

Location	Description of Site
1 (Breakwater Wall 1)	Represents the nearest part of the Project Site to the existing Townsville Port operations. This site provides an indication of existing dust levels impacting on the Project Site
2 (Breakwater Wall 2)	Represents the nearest part of the Project Site to the existing Townsville Port operations. This site provides an indication of existing dust levels impacting on the Project Site
3 (Casino Carpark))	Representative of ambient dust levels at the adjacent future residential construction site. This provides an indication of existing background dust levels associated with the operation of the Port for the western side of the Project Site.

Location	Description of Site
4 (Mariners Peninsula)	Representative of ambient dust levels at the adjacent residential Mariners Peninsula. This provides an indication of existing background dust levels for the western side of the Project Site.
5 Jezzine Army Barracks	Representative of ambient dust levels in the Townsville Strand area, from operations at the Townsville Port, hence provides an indication of typical background dust levels.

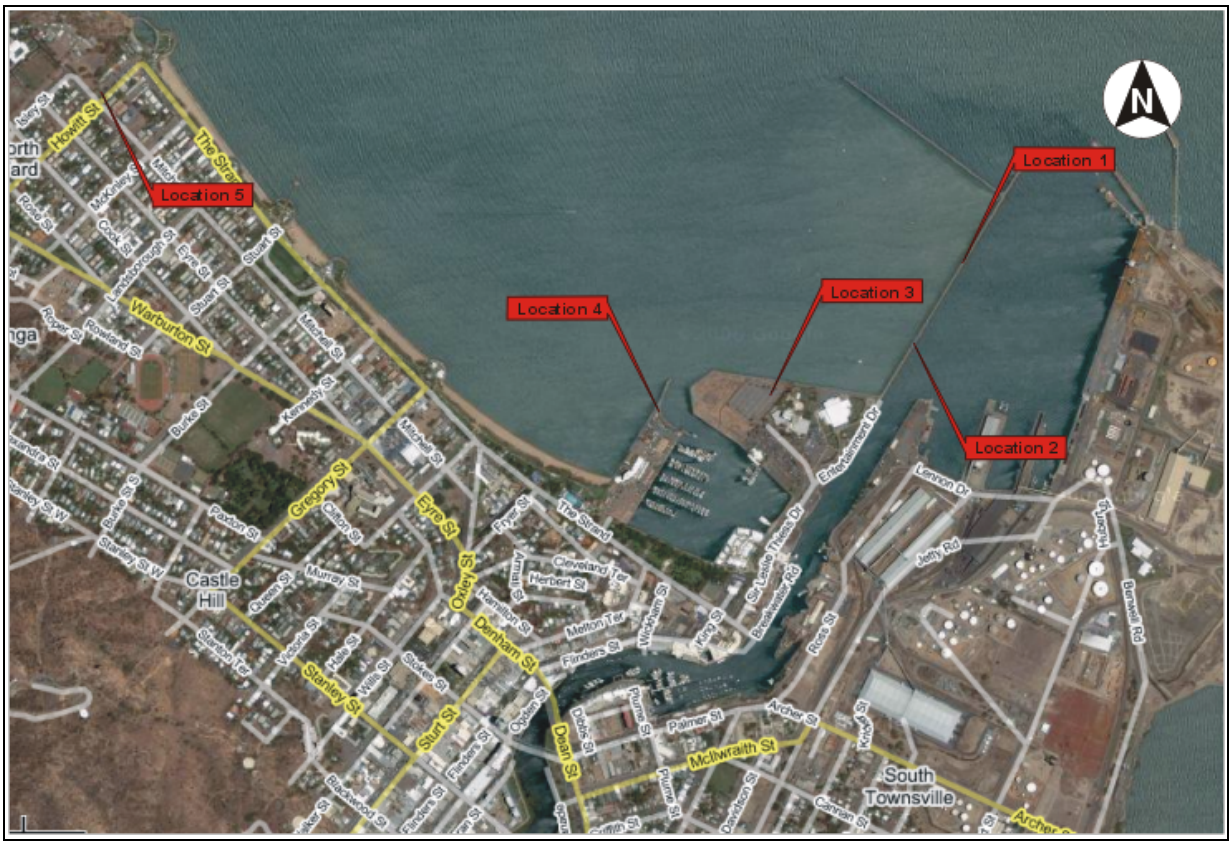

Figure 10: Site Specific Air Monitoring Stations

5.2.3.3 Gaseous Pollutants

Monitoring for gaseous pollutants has been completed at the existing ambient monitoring station at the Port (which measures meteorology and PM_{10}). The monitoring station is located approximately 175 m from the Project Site at the end of Berth 10 (see Figure 9), an active berth, in close proximity to a range of Port activities. Analysers for continuously measuring nitrogen oxide, sulphur dioxide and both methane and non-methane hydrocarbons have been installed. The station was established in late July 2007 and is expected to operate for a minimum of three months.

All continuous gaseous monitoring is undertaken in accordance with the Australian Standard sampling methodologies as presented in Table 5.2.

TABLE 5.2: SAMPLING STANDARDS ADOPTED FOR CONTINUOUS GASEOUS MONITORING

Pollutant	Standard / Method
Methane, Non-methane and Total Hydrocarbons	AS 3580.11.1-1993 Methods for sampling and analysis of ambient air - Determination of volatile organic compounds - Methane and non-methane volatile organic compounds - Direct-reading instrumental method
Sulphur Dioxide	AS 3580.4.1-1990 Methods for sampling and analysis of ambient air - Determination of sulfur dioxide - Direct reading instrumental method
Oxides of Nitrogen	AS 3580.5.1-1993 Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen - Chemiluminescence method

Table 5.3 Provides a summary of meteorolgical conditions during the monitoring of continuous gaseous emissions at the Port to date. Review of this data confirms that for most days of monitoring winds were from a north-easterly or easterly direction. Thus, for much of the monitoring period, winds were blowing from the major sources at the Port to the monitoring station. Given this, monitoring data is likely to represent the potential for impacts from Port operations at the Project Site.

TABLE 5.3: SUMMARY OF METEOROLOGICAL CONDITIONS DURING CONTINUOUS GASEOUS MONITORING

Date	Temps		Rain	09:00:00						15:00:00					
	Min	MaxMax		Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
	°C	°C	mm	°C	%	8th	km/h		hPa	°C	%	8th	km/h		hPa
11/08/07	17.5	26.6	0	22.4	68	1	SE	15	1021.3	24.2	65	2	NE	26	1017.7
12/08/07	13.6	26.5	0	21.4	65	1	WSW	9	1020.4	24.5	60	3	NE	20	1017.2
13/08/07	15.7	26	0	21.6	82	6	SE	15	1019.7	24.1	68	1	NE	24	1016.5
14/08/07	17.2	26.3	0	22.5	73	3	SE	17	1018.3	24.7	66	1	NE	30	1015.7
15/08/07	19.5	27.4	0	23.1	74	7	ESE	24	1017.8	25.9	57	7	E	31	1015.5
16/08/07	19.8	27.4	0	23.6	73	7	SE	15	1019.6	26.4	58	5	E	28	1017
17/08/07	20.2	27.6	0.2	24.6	58	5	ESE	28	1020.4	25.3	56	5	ENE	33	1017.7
18/08/07	17.7	25.6	0	22.5	65	7	ESE	20	1019.6	23.6	66	7	ENE	26	1016.6
19/08/07	18.8	25.3	0.2	21.4	76	7	S	7	1019.6	21	89	8	S	11	1018.1
20/08/07	18.5	24.7	1	20	70	7	SSW	33	1019.3	24.4	50	7	SSW	24	1016.1
21/08/07	15.5	26.2	0	20.6	36	1	SSW	22	1017.9	24.2	34	1	ENE	30	1012.7
22/08/07	12.5	26.9	0	21.6	54	1	S	2	1016	25.1	40	6	NE	15	1011.8
23/08/07	13.4	26.6	0	22.7	60	1	W	6	1015.8	25.6	51	2	N	13	1011.7
24/08/07	16.1	28.7	0	19.8	58	1	SSW	26	1016.7	25.5	48	1	NE	19	1011.8
25/08/07	13.5	27.6	0	22.8	53	0	SE	4	1016.2	26.1	45	1	ENE	20	1012.3
26/08/07	14.3	26.7	0	22.9	63	2	SE	11	1019.2	25	62	2	ENE	28	1015.6
27/08/07	18.8	27.3	0	23.2	64	4	ESE	20	1021.5	25.2	47	1	ENE	35	1018.6

Date	Temps		Rain	09:00:00						15:00:00					
	Min	MaxMax		Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
	°C	°C	mm	°C	%	8th	km/h		hPa	°C	%	8th	km/h		hPa
28/08/07	18.2	27.6	0	22.5	48	7	ESE	26	1021.8	26.4	38	2	ENE	30	1019.2
29/08/07	16.1	27.3	0	22.8	54	3	ESE	19	1022.7	26.2	43	3	ENE	28	1019.5
30/08/07	15	26.4	0	23.1	56	6	SE	17	1021.9	25	49	7	ESE	30	1019
31/08/07	18.5	28.3	0	22.3	68	7	SSE	15	1021.1	25.1	52	5	ENE	31	1018.2
01/09/07	14.8	27.6	0	23.1	57	3	ESE	11	1022.5	26.1	42	3	E	39	1019.1
02/09/07	15.2	27.7	0	22.8	59	2	SSE	13	1021.4	24.8	56	4	ENE	30	1017.7
03/09/07	16.8	26.1	0	22.9	59	1	ESE	15	1019.1	24.7	61	1	ENE	28	1015.3
04/09/07	18.8	25.4	0	23.9	59	7	ESE	9	1017.1	24.5	61	7	ENE	11	1014
05/09/07	19.1	26.1	1.6	20.8	78	7	SSE	13	1017	23.5	66	6	ENE	31	1013.5
06/09/07	17.1	27.3	0.4	20.8	73	7	SSW	20	1016.9	24.3	55	3	ENE	24	1012.6
07/09/07	14.6	27.6	0	20.9	61	1	SSW	28	1016.3	25.8	44	5	NNE	17	1011.4
08/09/07	13.8	26.4	0	22.9	56	1	WSW	6	1016.7	24.1	52	5	ENE	28	1012.4
09/09/07	15.9	26.8	0	23.3	63	2	E	15	1017.3	24	62	2	ENE	28	1013.1
10/09/07	15.4	27	0	23.8	63	3	ESE	13	1018.2	25.4	47	3	ENE	28	1014.3
11/09/07	13.8	26.7	0	23.9	53	1	NE	9	1017.5	25.6	51	1	ENE	24	1013.7
12/09/07	13.5	26.8	0	23.7	64	2	NE	7	1016.6	25.9	60	1	ENE	26	1012.4
13/09/07	15.9	27.5	0	25.2	66	5	NNW	6	1017.2	25.6	58	1	ENE	19	1013.4

5.3 FINE PARTICULATES (PM_{10})

Table 5.4 presents a summary of measured contaminant concentrations since 2000 at each of the EPA air quality monitoring stations. It is noted that monitoring of PM_{10} at the Pimlico, South Townsville and Garbutt sites ceased in 2004 hence monitoring results for 2005 onwards are not available for these sites.

TABLE 5.4: SUMMARY OF 24-HOUR AVERAGE PM_{10} MONITORING DATA ($\mu g/m^3$)

Monitoring Period	Percentile	Pimlico	South Townsville	Townsville Port	Garbutt	Stuart
2000	50th Percentile	-	14.4	19.8	27.2	-
	90th Percentile	-	25.7	32.9	48.0	-
	Maximum	-	51.6	61.2	70.2	-
2001	50th Percentile	-	19.2	18.4	29.1	-
	90th Percentile	-	31.3	27.8	47.9	-
	Maximum	-	49.8	55.4	55.8	-
2002	50th Percentile	-	17.6	23.7	29.2	-
	90th Percentile	-	26.4	35.1	44.5	-
	Maximum	-	58.9	79.4	64.5	-
2003	50th Percentile	-	16.8	23.8	26.6	-
	90th Percentile	-	22.5	33.8	42.5	-
	Maximum	-	33.8	49.2	52.0	-
2004	50th Percentile	15.7	16.1	22.1	26.5	-

Monitoring Period	Percentile	Pimlico	South Townsville	Townsville Port	Garbutt	Stuart
	90th Percentile	21.3	20.3	30.9	45.8	-
	Maximum	28.1	36.7	43.0	55.9	-
2005	50th Percentile	-	-	22.3	-	-
	90th Percentile	-	-	33.5	-	-
	Maximum	-	-	156.7	-	-
2006	50th Percentile	-	-	21.5	-	-
	90th Percentile			32.2		
	Maximum			127.6		
2007 (Jan – Jun)	50th Percentile	-	-	17.4	-	-
	90th Percentile			26.6		
	Maximum			37.1		

Note: 24-Hour Average Air Quality Goal = 50 µg/m³

Review of the ambient monitoring data at the Townsville Port monitoring station indicates that concentrations of PM_{10} in the Port area are generally comparable to levels throughout much of Townsville. Exceedences of the ambient air quality goal of 50 µg/m³ were noted to occur across most monitoring stations. Review of the Queensland EPA monitoring reports confirms that these instances were related to regional impacts such as dust storms, bush fires and vegetation clearing.

5.4 NUISANCE DUST

5.4.1 Deposition Sampling

Townsville Port Authority undertake routine monitoring of dust deposition at a number of locations around the Port site as identified previously on Figure 9. In addition, a further five monitoring stations were also established by the Project Team to gain a better understanding of nuisance dust levels at the Project Site as discussed in Section 5.2.3 and shown on Figure 10 (Breakwater wall 1, Breakwater wall 2, Casino carpark, Mariners Peninsula and Jezzine Army Barracks).

Table 5.5 presents a summary of total insoluble deposited dust monitoring results for the Townsville Port Authority monitoring stations and those established for the purposes of the Project. As can be seen, limited monitoring data is available for the Breakwater wall 1, Breakwater wall 2 and Casino carpark positions. This is due to significant vandalism of the monitoring stations which prevented data from being collected during these months.

Figure 11 presents a summary of the range of insoluble deposited dust levels measured at each of the monitoring stations. In this figure, the vertical black bars represent the range of values measured at the location with the blue line representing the average measured at each station over the available monitoring data from July 2006 to July 2007.

TABLE 5.5: SUMMARY OF TOTAL INSOLUBLE DEPOSITED DUST RESULTS (mg/m^2/day)

Monitoring Station	2006						2007						
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Rail Loop	30.3	20.0	37.0	79.4	75.0	162.2	100.0	65.4	-	-	42.9	26.5	-
Entrance	18.2	28.6	25.9	38.2	103.6	54.1	42.9	92.3	76.0	20.5	35.7	17.6	-
Admin Bld	9.1	25.7	63.0	32.4	82.1	62.2	314.3	219.2	88.0	45.7	121.4	23.5	-
Breakwater	18.2	17.1	92.6	5.9	17.9	32.4	64.3	223.1	12.0	5.1	21.4	32.4	-
Berth 1	103.0	74.3	92.6	32.4	67.9	56.8	314.3	96.2	80.0	51.3	46.4	97.1	-
Berth 3	51.5	74.3	48.1	94.1	210.7	127.0	78.6	96.2	88.0	38.5	92.9	73.5	-
Berth 4	48.5	68.6	44.4	-	114.3	56.8	28.6	26.9	112.0	43.6	53.6	135.3	-
Berth 6	24.2	25.7	396.3	44.1	200.0	40.5	39.3	80.8	100.0	22.9	28.6	35.3	-
Berth 8	93.9	-	274.1	214.7	257.1	308.1	253.6	173.1	292.0	105.7	-	55.9	-
Berth 10	30.3	25.7	25.9	14.7	28.6	110.8	39.3	100.0	36.0	31.4	35.7	32.4	-
Jetty Rd	-	-	-	-	-	-	-	-	160.0	61.5	146.4	67.6	-
Tully Street	-	-	-	-	-	-	-	-	92.0	28.2	92.9	26.5	-
Ross Street	-	-	-	-	-	-	-	-	72.0	30.8	53.6	26.5	-
Breakwater Wall 1	-	-	-	-	-	-	-	-	-	-	-	81.3	31.3
Breakwater Wall 2	-	-	-	-	-	-	-	-	-	-	-	62.5	34.4
Casino Carpark	-	-	-	-	-	-	-	-	-	41.4	60.7	46.9	18.8
Mariners Peninsula	-	-	-	-	26.7	87.5	18.2	3.2	72.4	72.4	21.4	31.3	15.6
Jezzine Army Barracks	-	-	-	-	40.0	-	66.7	6.1	79.3	34.5	28.6	81.3	31.3

Review of the total insoluble dust deposition monitoring data collected during the period July 2006 – July 2007 indicates that elevated levels of dust deposition are experienced at many of the Port berths. Positions representing dust deposition levels at the perimeter of the Port operations (eg Berth 10, Port Entrance and Tully Street) and at the Project Site (Breakwater Wall 1, Breakwater Wall 2 and Casino Carpark) show significantly lower levels of dust deposition.

Berth 10, the closest of the dust deposition monitoring stations to the Project Site, shows compliance with the Queensland EPA nuisance dust goal (120 mg/m^2/day) for all months. It is also noted that dust deposition levels at the Project Site are likely to be lower than those recorded at the Berth 10 station due to the increased separation distance to Port activities.

Review of the available monitoring data collected at the Project Site (Breakwater wall 1, breakwater wall 2, Casino carpark and Mariners Peninsula) confirms that measured dust deposition rates are well below the EPA nuisance dust goal of 120 mg/m^2/day and are generally comparable with the measured deposition levels at the periphery of the Port (Berth 10 and Ross Street).

Furthermore, review of the measured levels of deposited dust for the background monitoring position (Jezzine Army Barracks), indicates that dust levels at this position are generally higher than those recorded at the monitoring stations near to the Project Site. This indicates that dust is a feature of the environment in Townsville and the Port is not the only source of dust emissions impacting on the Townsville area.

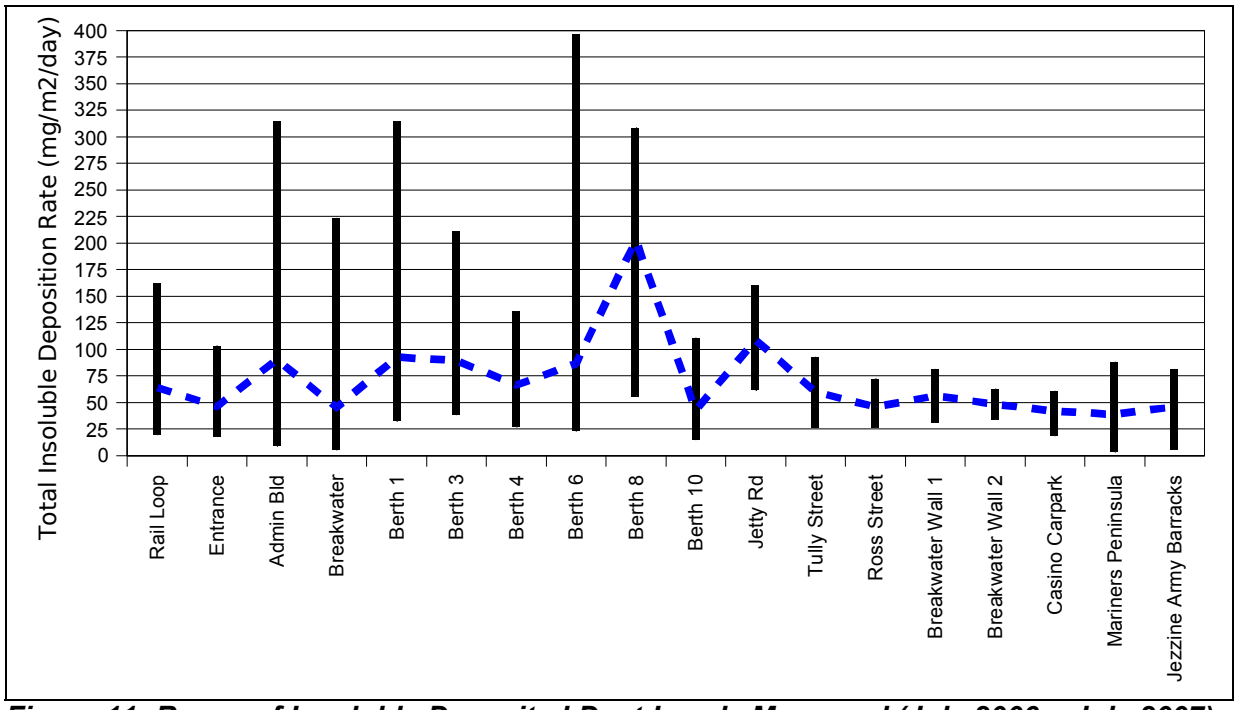

Figure 11: Range of Insoluble Deposited Dust Levels Measured (July 2006 – July 2007)

Table 5.6 presents a summary of combustible deposited dust monitoring results for the Townsville Port Authority monitoring stations. Table 5.7 presents the combustible deposited dust represented as a percentage of the total insoluble dust measured.

TABLE 5.6: MEASURED COMBUSTIBLE DEPOSITED DUST LEVELS (mg/m^2/day)

Monitoring Station	2006						2007					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Rail Loop	18.5	8.9	17.0	35.3	28.6	110.8	60.7	19.2	-	-	17.9	0.0
Entrance	6.1	12.0	11.1	8.8	21.4	32.4	26.1	65.4	48.0	10.8	18.6	8.8
Admin Bld	4.5	8.3	18.5	13.8	14.3	27.0	42.9	126.9	36.0	37.1	67.9	10.3
Breakwater	18.5	11.1	25.9	2.1	5.7	10.8	17.9	57.7	8.4	4.9	9.3	16.2
Berth 1	21.2	11.4	11.1	8.2	17.9	24.3	42.9	57.7	48.0	17.9	11.8	20.6
Berth 3	12.1	11.4	7.4	38.2	32.1	35.1	28.6	34.6	28.0	10.3	17.9	32.4
Berth 4	23.3	14.3	8.1		17.9	16.2	14.6	19.2	60.0	18.7	14.3	17.6
Berth 6	4.5	6.0	3.7	2.9	25.0	8.1	18.2	38.5	28.0	7.4	12.9	8.2
Berth 8	18.2	-	3.7	23.5	32.1	54.1	132.1	73.1	120.0	22.9	-	44.1
Berth 10	10.9	7.1	4.1	2.1	5.7	64.9	29.3	42.3	18.4	16.6	18.2	25.9
Jetty Rd	-	-	-	-	-	-	-	-	36.0	25.6	42.9	11.8

Monitoring Station	2006						2007					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Tully Street	-	-	-	-	-	-	-	-	48.0	3.1	60.7	8.5
Ross Street	-	-	-	-	-	-	-	-	34.8	10.8	14.3	13.8

TABLE 5.7: COMBUSTIBLE MATERIAL AS PERCENTAGE OF TOTAL INSOLUBLE DUST

Monitoring Station	2006						2007						Average
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Rail Loop	61%	44%	46%	44%	38%	68%	61%	29%	-	-	42%	0%	43%
Entrance	33%	42%	43%	23%	21%	60%	61%	71%	63%	53%	52%	50%	48%
Admin Bld	50%	32%	29%	43%	17%	43%	14%	58%	41%	81%	56%	44%	42%
Breakwater	102%	65%	28%	35%	32%	33%	28%	26%	70%	95%	43%	50%	51%
Berth 1	21%	15%	12%	25%	26%	43%	14%	60%	60%	35%	25%	21%	30%
Berth 3	24%	15%	15%	41%	15%	28%	36%	36%	32%	27%	19%	44%	28%
Berth 4	48%	21%	18%	-	16%	29%	51%	71%	54%	43%	27%	13%	35%
Berth 6	19%	23%	1%	7%	13%	20%	46%	48%	28%	33%	45%	23%	25%
Berth 8	19%	-	1%	11%	13%	18%	52%	42%	41%	22%	-	79%	30%
Berth 10	36%	28%	16%	14%	20%	59%	75%	42%	51%	53%	51%	80%	44%
Jetty Rd	-	-	-	-	-	-	-	-	23%	42%	29%	17%	28%
Tully Street	-	-	-	-	-	-	-	-	52%	11%	65%	32%	40%
Ross Street	-	-	-	-	-	-	-	-	48%	35%	27%	52%	41%

Review of the data presented in Table 5.7 confirms that, on average, > 25 % of the insoluble deposited dust collected is combustible material. This combustible material is typically expected to be from organic sources and, as such, the result of dust from the general Townsville environment rather than from sources located at the Port.

Overall, review of the monitoring data for the area indicates that, while dust is a feature of the Townsville environment, exceedences of the Queensland EPA nuisance dust deposition goal are unlikely at the Project Site. Further, where dust levels approach the nuisance criteria at the Project Site, it is likely that these events are typical of other urbanised areas of Townsville hence may result from regional influences rather than solely reflecting the influence of the Port.

5.4.2 Black Dust Investigation

The Environmental Protection Agency has recently published the findings of an investigation of dust complaints from residents living in the Yarrawonga area. The complaints centre around the reported presence of high levels of 'black dust'. There have been community allegations that the black dust is the result of the operation of the Port of Townsville which routinely imports and exports a range of dark mineral materials. The study measured dust fallout and collected dust wipe samples from a number of residential premises in Townsville (see Figure 8).

Table 5.8 presents measured concentrations of deposited insoluble dust at each of the

locations considered in the dust complaint investigation undertaken by the EPA. Figure 12 provides a summary of the range of deposited dust levels measured at each of the monitoring locations over the duration of the study.

TABLE 5.8: SUMMARY OF TOTAL INSOLUBLE DEPOSITED DUST RESULTS (mg/m^2/day)

Monitoring Location	Jul 2005	Aug 2005	Sep 2005	Oct 2005	Nov 2005	Dec 2005	Jan 2006	Feb 2006	Mar 2006	Apr 2006	May 2006	Jun 2006	Annual Average
GBRMPA	32	42	17	42	10	58	29	65	29	74	26	52	40
Colby Court	10	16	50	39	13	97	45	29	55	10	3	23	32
Collesmore Crescent	16	10	3	10	7	13	16	23	13	13	13	16	13
Edinburgh Court	23	10	7	6	7	13	6	6	6	10	26	16	11
Central State School	26	13	17	42	-	-	29	74	68	42	23	48	38

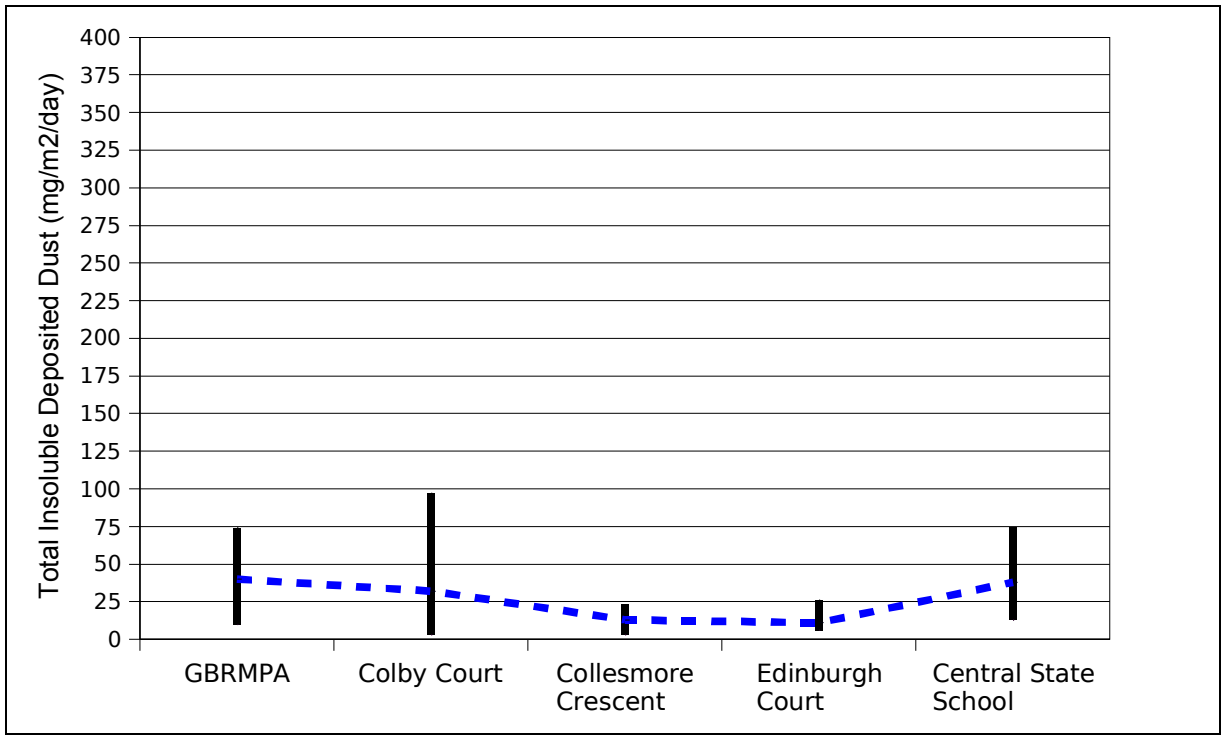

Figure 12: Range of Measured Insoluble Deposited Dust Measured During EPA Dust Investigation

Analysis of the dust fallout samples confirmed that deposited insoluble dust levels at all five monitoring sites were well within the criteria levels of 120 mg/m^2/day. The monthly averages for the Yarrawonga residences ranges from 2 – 80 % of the criteria, the sites between Yarrawonga and the Port 10 – 60 %, and the background site 2 – 80 %. Furthermore, for all samples, the level of combustible matter collected in the samples represented was greater than 50 % for more than half of the samples collected. This indicates that a large portion of

the dust impacting on the monitoring sites was organic matter.

In addition, elemental and microscopy analysis of the samples was undertaken to determine the likely sources of the dust. This included analysis of both the fallout samples and the swab samples collected at the monitoring locations. The results of the microscopy analysis indicated that the samples contained a predominance of mould spores, silica and silicate mineral grains. The analysis report also identified that the mould spores along with some soot particles were the likely cause of the blackness of the dust.

Elemental analysis of the collected samples further supported the conclusion that the majority of dust was from non-industrial sources with the results indicating the presence of soils (a mixture of clays which are primarily sodium/calcium aluminosilicates). Soils are a significant contributor to natural background dust levels. Traces of both lead and zinc were found in three of the surface wipe samples with a further three samples also containing traces of zinc. The source of the metals has not been identified however the EPA are currently undertaking further investigation of these compounds in the Townsville environment. At the time of preparing this assessment, the results of this further investigation were not available. It should also be noted that a single round of project specific deposited dust samples were also analysed for metals. This analysis identified lead in all samples with comparable levels measured both at the Project Site (Breakwater wall) and at the background monitoring position. Given these inconclusive results, it is expected that the additional monitoring currently being undertaken by the EPA will provide further information as to the source and extent of existing concentrations.

5.5 NITROGEN DIOXIDE (NO_2)

Table 5.9 presents a summary of air quality monitoring data for nitrogen dioxide collected at the EPA monitoring station located at Pimlico in Townsville since monitoring commenced in 2004. The monitoring data provides an indication of typical concentrations at a location remote from the Port of Townsville.

Measured concentrations at this station are well below the ambient air quality goal. These concentrations are considered typical of residential areas in Townsville.

TABLE 5.9: SUMMARY OF 1-HOUR AVERAGE NO_2 MONITORING DATA ($\mu g/m^3$)

Monitoring Period	Percentile	Pimlico
2004	50th Percentile	6.2
	90th Percentile	30.8
	Maximum	69.8
2005	50th Percentile	4.1
	90th Percentile	22.6
	Maximum	69.8

Note: 1-Hour Average Air Quality Goal = 246 $\mu g/m^3$

Table 5.10 Presents a summary of measured NO2 concentrations at the Berth 10 monitoring station established for the purposes of assessing existing Port operations on the TOT Project site.

TABLE 5.10: SUMMARY OF MEASURED CONCENTRATIONS AT BERTH 10 STATION

Monitoring Period	Percentile	Berth 10
11 August 2007 – 12 September 2007	50th Percentile 90th Percentile Maximum	5.4 11.7 34.2

The monitoring results presented in Table 5.10 confirm existing NO_2 concentrations at the Berth 10 monitoring station are well within the criteria level of 246 µg/m^3 with a maximum 1 hour average NO_2 concentration recorded during the monitoring period of 34.2 µg/m^3. Furthermore, comparison of the measured concentrations with those recorded at the EPA Pimlico monitoring station indicate similar average concentration to previous years of monitoring.

The measured NO_2 concentration at the monitoring station have been correlated with Port activities for the available measurement period. This comparison confirms that only small increases in concentrations are observed when shipping activities occur at the nearest Berth. The data analysis indicates that measured short term increases in concentrations may be associated with vessels that are docking or docked at Berth 10 (ie within 20 m of the monitoring station). For over half of the monitoring period concentrations of NO_2 are less than 3 % of the ambient criterion. Figures 13 and 14 present measured NO_2 concentrations at the Berth 10 monitoring station during various Port activities for the periods 11/8/07 to 17/8/07 and 18/8/07 – 24/8/07 respectively.

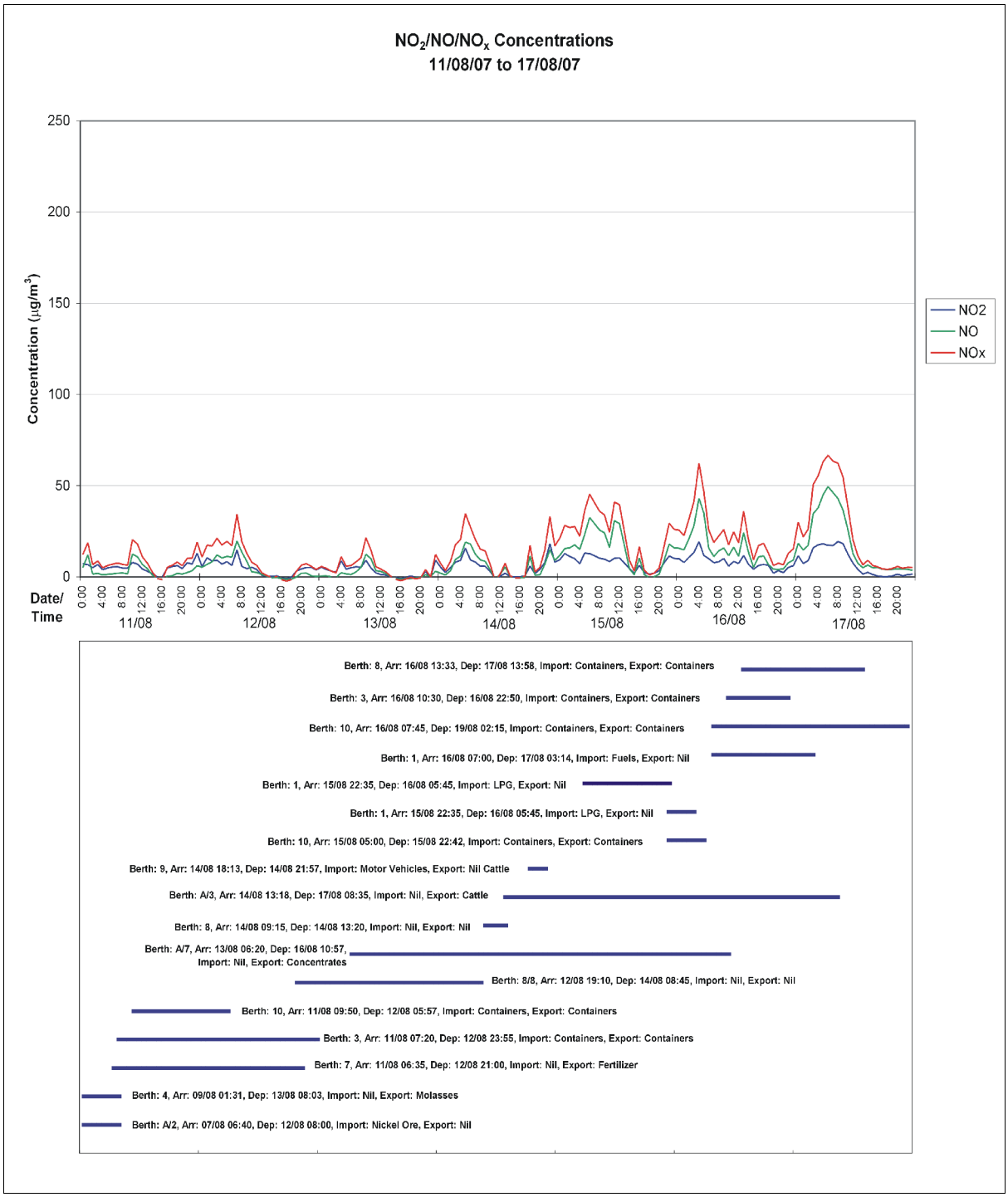

Figure 13*: Measured NO_2 *Concentrations During Normal Port Operations (11/8/07 – 17/8/07)

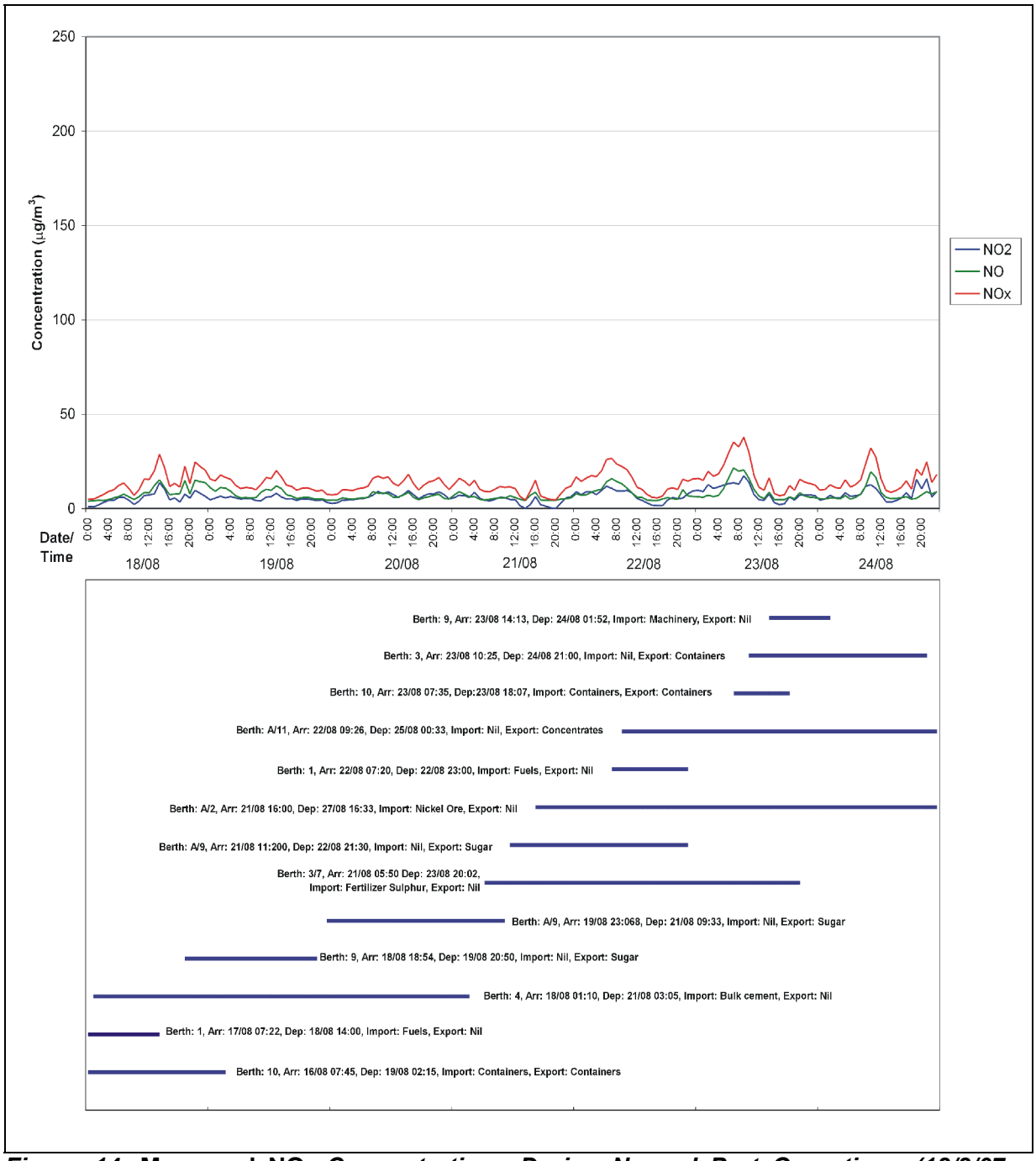

Figure 14*: Measured NO_2 *Concentrations During Normal Port Operations (18/8/07 – 24/8/07)

5.6 SULPHUR DIOXIDE (SO_2)

Table 5.11 presents a summary of air quality monitoring data for sulphur dioxide collected at monitoring stations throughout the Townsville monitoring network since 2000. Measured concentrations are well below the ambient air quality goal of 570 µg/m^3 as a 1 hour average.

These concentrations are considered typical of residential areas in Townsville.

TABLE 5.11: SUMMARY OF 1-HOUR AVERAGE SO_2 MONITORING DATA (µg/m³)

Monitoring Period	Percentile	Pimlico	Stuart
2000	50th Percentile	-	-
	99th Percentile	-	-
	Maximum	-	-
2001	50th Percentile	-	0.0
	99th Percentile	-	5.7
	Maximum	-	31.4
2002	50th Percentile	-	0.0
	99th Percentile	-	5.7
	Maximum	-	65.7
2003	50th Percentile	-	0.0
	99th Percentile	-	2.9
	Maximum	-	22.8
2004	50th Percentile	-	0.0
	99th Percentile	-	5.7
	Maximum	-	17.1
2005	50th Percentile	0.0	0.0
	99th Percentile	2.9	8.6
	Maximum	8.6	68.5

Note: 1-Hour Average Air Quality Goal = 571 µg/m³

Table 5.12 presents a summary of measured SO_2 concentrations at the Berth 10 monitoring station established for the purposes of assessing existing Port operations on the TOT Project site.

TABLE 5.12: SUMMARY OF MEASURED 1-HOUR SO_2 CONCENTRATIONS AT BERTH 10 MONITORING STATION (µg/m³)

Monitoring Period	Percentile	Berth 10
11 August 2007 – 12 September 2007	50th Percentile	0.0
	90th Percentile	5.1
	Maximum	45.9

The monitoring results presented in Table 5.12 confirms that the existing ambient air quality at the Project site complies with the SO_2 criteria of 570 µg/m³ as a 1 hour average by a significant margin. The maximum 1 hour average SO_2 concentration during the period 11 August 2007 – 12 September 2007 was 45.9 µg/m³. This value represents only 8 % of the ambient air quality goal.

Comparison of the measured SO_2 concentration at the monitoring station with Port activities for the period presented in Figures 15 and 16 confirm that there may be a correlation between measured concentrations and shipping activities at Berth 10 (ie, within 20 m of the monitoring station).

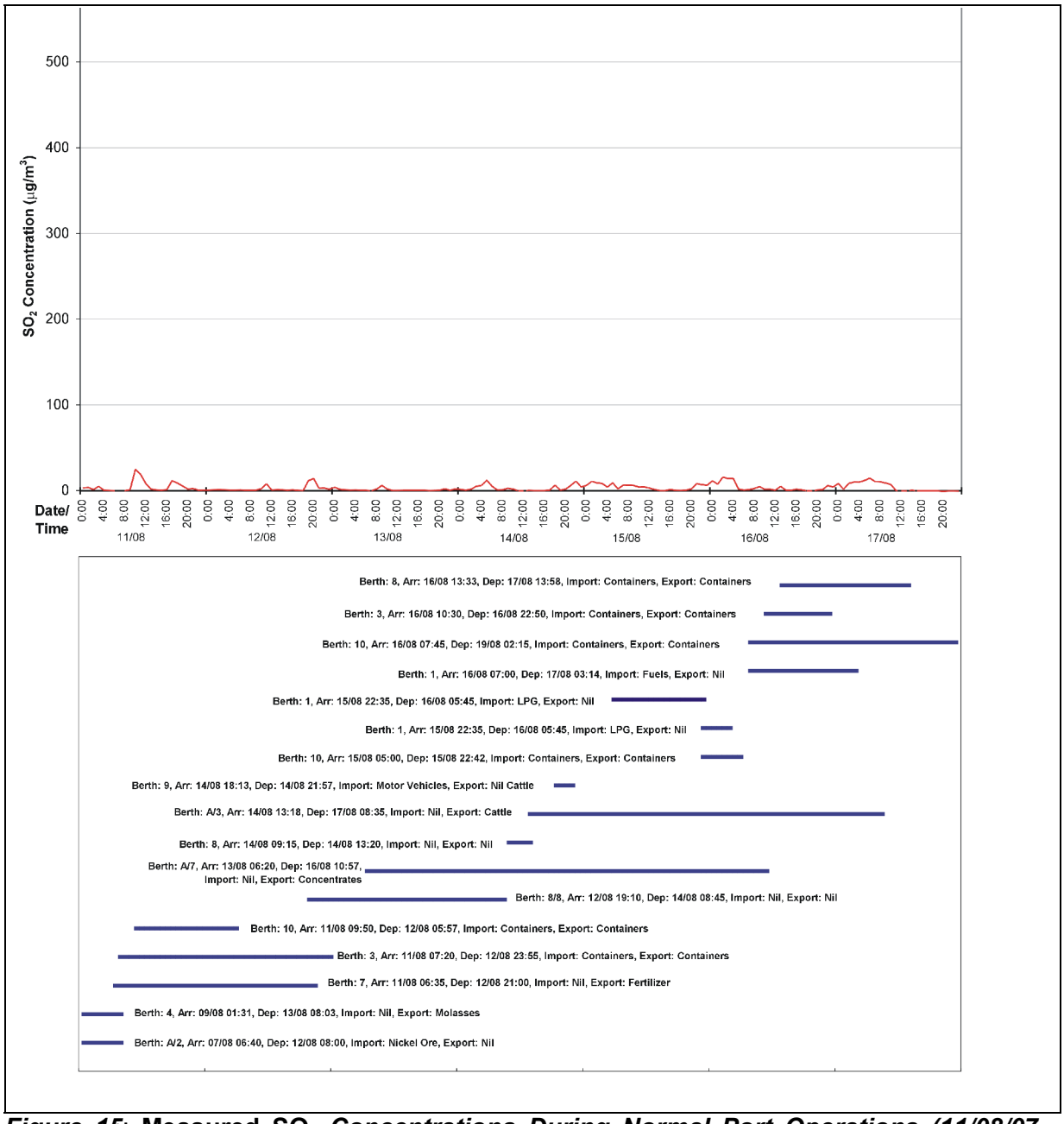

***Figure 15*: Measured SO_2 Concentrations During Normal Port Operations (11/08/07 - 17/08/07)**

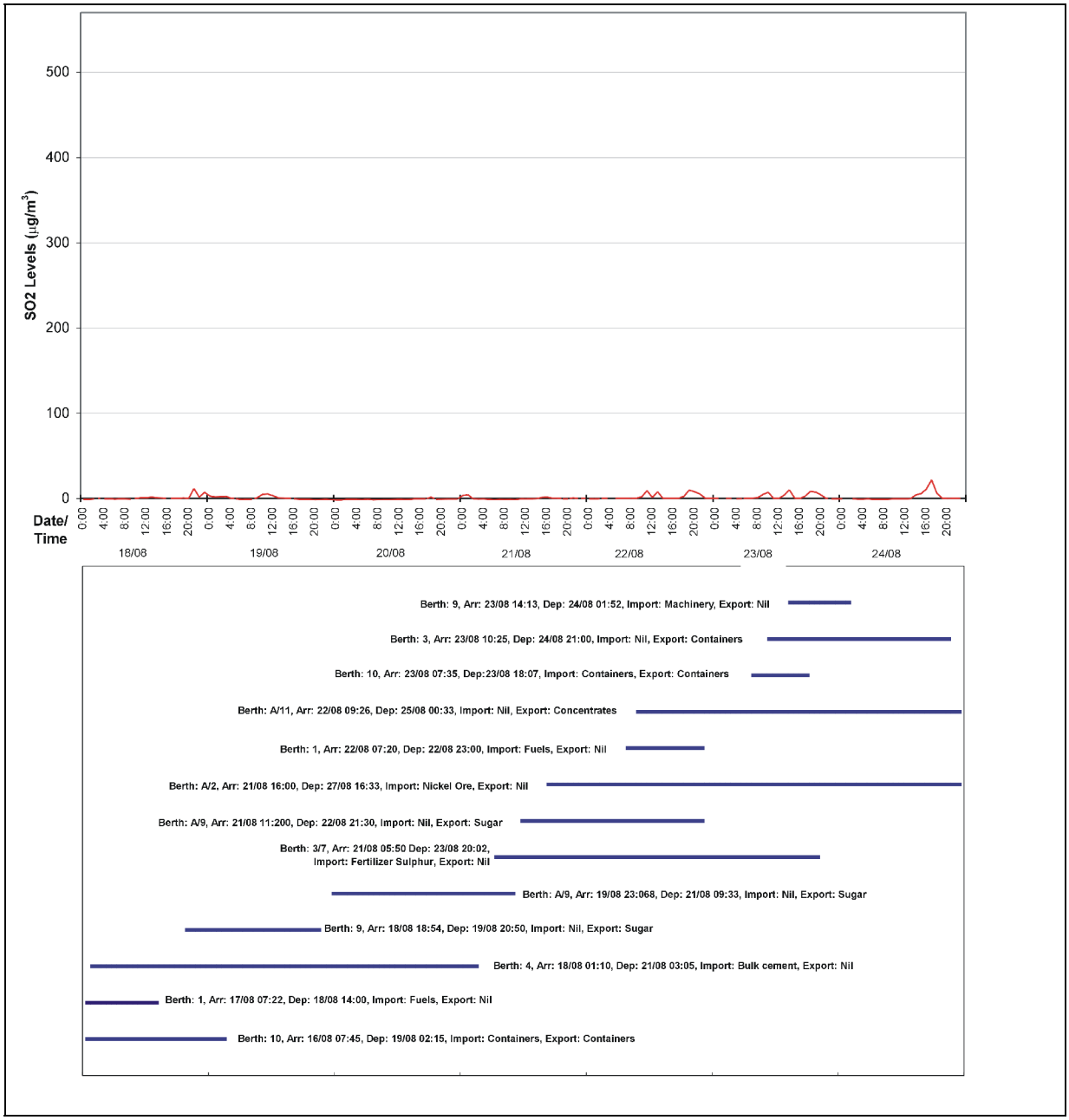

Figure 16: Measured SO_2 Concentrations During Normal Port Operations (18/08/07 - 24/08/07)

5.7 METHANE AND NON-METHANE HYDROCARBONS

Hydrocarbons are currently not measured in Townsville by the EPA. Table 5.13 and Figures 17 and 18 present a summary of monitoring results for hydrocarbon monitoring undertaken during the period ending 12 September 2007.

TABLE 5.13: SUMMARY OF MONITORING RESULTS AT BERTH 10 MONITORING STATION (ppm)

Monitoring Period	Percentile	Berth 10		
		Methane	Non-methane	Total Hydrocarbons
11 August 2007 – 12 September 2007	50th Percentile	1.92	0.00	2.05
	90th Percentile	2.06	0.02	2.21
	Maximum	4.89	1.26	3.64

The continuous hydrocarbon monitoring undertaken at the Berth 10 monitoring station confirms that existing concentrations of non-methane hydrocarbons are low with concentrations at or below the instruments limit of detection for the majority of the time. Review of the concentration profiles for the two weeks of continuous monitoring presented in Figures 17 and 18 confirms little or no variation in hydrocarbon concentrations at the site during various Port activities.

5.8 COMPLIANCE STATUS OF MONITORING DATA

Detailed analysis of the available ambient air quality monitoring datasets (including data collected by the EPA) that are representative of the TOT Project site has been completed. This analysis confirms that the existing ambient air quality meets the appropriate air quality health risk values and criteria by a significant margin with the exception of occasional exeedances of the NEPM PM_{10} threshold. These exceedances are noted by the EPA to be associated with regional events, hence affect the whole of Townsville and the surrounding region and are not specific to the Project site.

The gaseous monitoring data collected at the Port of Townsville as part of this assessment has been further correlated with specific activities occurring at the Port of Townsville. This comparison has demonstrated that emissions from ship movements, docked vessels and loading and unloading activities at the nearest berths to the Project site may result in measurable changes in short term air quality however even during these periods measured concentrations remain at less than 8 % of the relevant ambient air quality criteria. The Berth 10 ambient monitoring position is located at a position that is 175 m closer to the Port of Townsville activities than the Project site. Therefore, ambient air quality at the Project site is expected to be significantly better than measured at Berth 10, if the Port of Townsville represents the dominant emission source for the measured pollutants.

Although the available data supports the conclusion that the ambient air quality at the Project site is suitable, the dataset currently covers a 4 - 6 week period for the pollutants considered. To provide greater certainty that the air quality at the Project site is appropriate, it is recommended that the Berth 10 monitoring is continued for a period suitable for representing seasonal trends and activities at the Port. At this stage the ambient monitoring is programmed

to continue until at least the end of October 2007 however it is recommended that the project specific gaseous and deposited particulate monitoring is continued until a full 12 months of data is available. The additional Project related monitoring data will be presented as a supplement to this report at a later date.

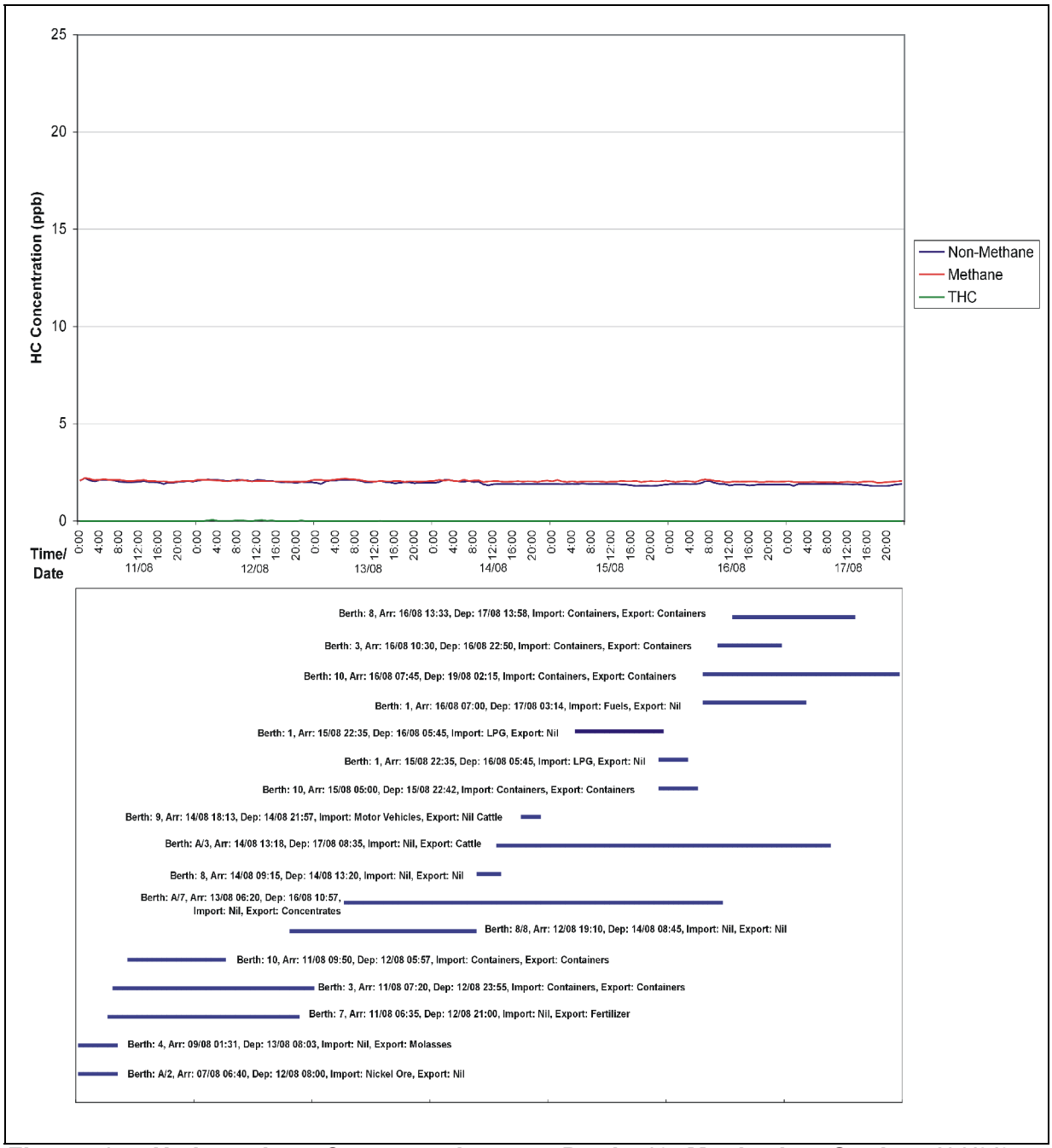

Figure 17: Hydrocarbon Concentrations at Berth 10 Monitoring Station (11/8/07 - 17/8/07)

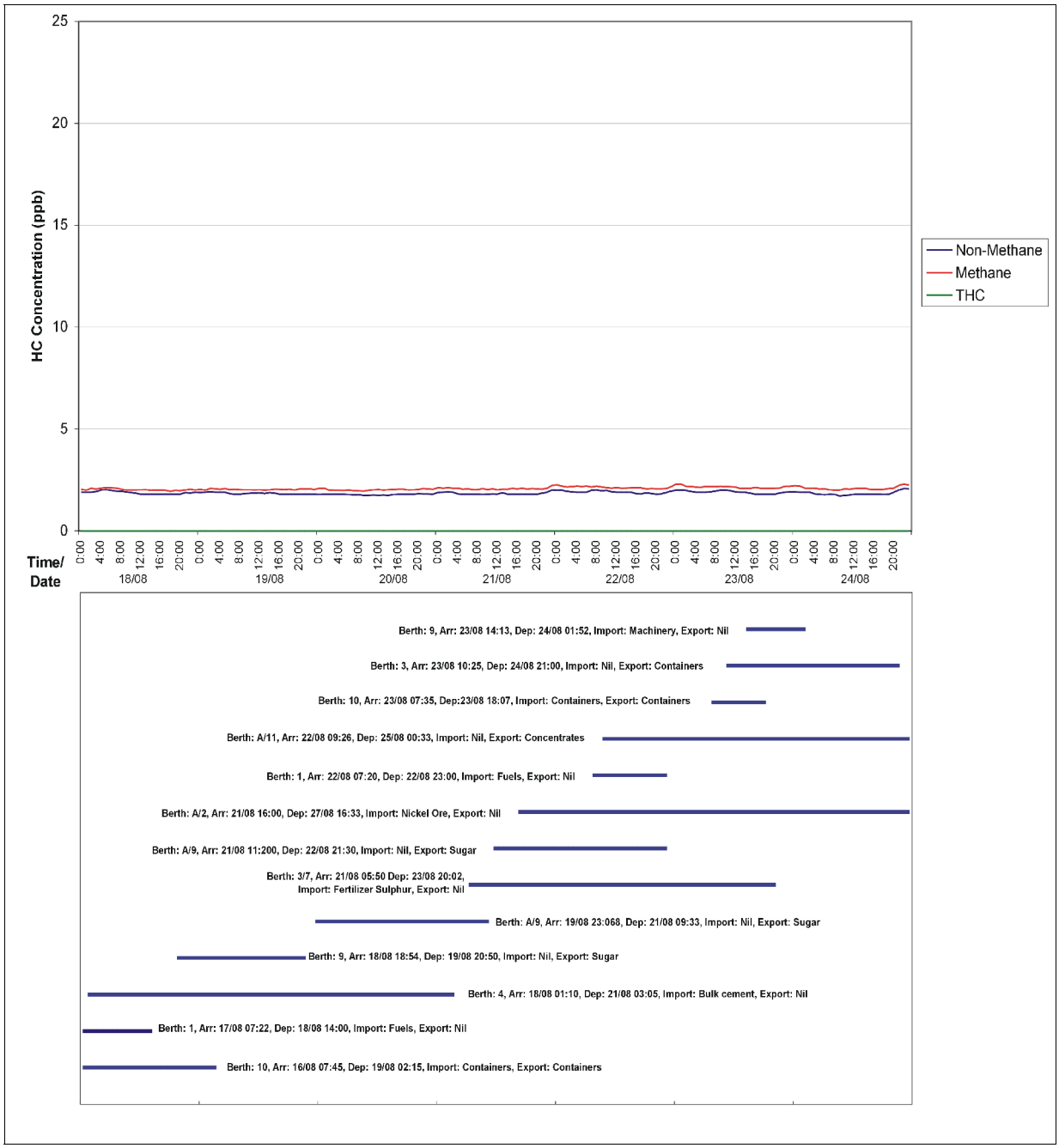

Figure 18: Hydrocarbon Concentrations at Berth 10 Monitoring Station (18/8/07 - 24/8/07)

6 AIR DISPERSION MODELLING METHODOLOGY

6.1 INTRODUCTION

Atmospheric dispersion modelling involves the mathematical simulation of the dispersion of air contaminants in the environment. The modelling utilises a range of information to estimate the dispersion of pollutants released from a source including:

- meteorological data including surface and upper air wind, temperature and pressure profiles, as well as humidity, rainfall, cloud cover and ceiling height information;
- emissions parameters including source location and height, source dimensions and physical parameters (eg exit velocity and temperature) along with pollutant mass emission rates;
- terrain elevations and land use both at the source and throughout the surrounding region; and
- the location, height and width of any obstructions (such as buildings or other structures) that could significantly impact on the dispersion of the plume.

Dispersion modelling provides a means for both the regulators and the proponents of a project to assess the potential implications of future development on existing air quality and, where ambient air quality monitoring data is not available, assess the potential impacts of existing emitting uses (eg industrial operations).

The TOR for the Project require modelling to be undertaken where necessary to predict the impacts of the proposed development site. Significant monitoring of existing emissions to air from the Port at the Project Site has been undertaken and has allowed the assessment of existing Port operations of the Project Site. This ambient monitoring data is unable to provide an assessment of the potential implications of the expansion of the Port in the future or emissions associated with the operation of the TOT. Therefore, dispersion modelling has been undertaken to assess these future operations. In addition, dispersion modelling has also been utilised to assess the potential impacts of existing odour emissions from cattle export activities at the Port as these activities occur infrequently and as such, impacts at the Project Site cannot readily be monitored.

For the purposes of the TOT Project, atmospheric dispersion modelling of future emissions and existing emissions unable to be routinely measured (odour from live cattle export) has been undertaken using the Calpuff modelling package.

The following sections provide an overview of the methodology adopted for the dispersion modelling.

6.2 METEOROLOGICAL MODEL SELECTION

The issue of meteorology is of primary importance for completing valid, realistic atmospheric dispersion modelling of emissions. For any predictive modelling assessment, the ability of the meteorological dataset to sufficiently represent the atmospheric conditions is critical in determining the overall modelling accuracy.

For the assessment of emissions from the Project, the development of a suitable meteorological dataset is particularly important due to the complex meteorological conditions present in the region. This is complicated by the absence of three-dimensional meteorological datasets for the region, with only surface meteorology and some limited upper air meteorological parameters measured.

Given this, the development of a meteorological dataset for the assessment requires the reliance on a prognostic meteorological model. Prognostic models, such as TAPM, allow procedure permits the development of localised meteorological datasets, based on synoptic weather conditions. The model predicts the regional flows important to dispersion, such as sea breezes and terrain-induced flows, against a background of larger-scale meteorology provided by synoptic analyses.

The output of this model, when used with a diagnostic meteorological model, such as Calmet, provides a meteorological dataset, capable of considering the complex flow fields such as the sea breeze circulation with return flow aloft, which is unlikely to be captured in the available observational data, to be introduced into the diagnostic wind field results. An evaluation with CAPTEX tracer data indicated that the better spatial and temporal resolution offered by the hourly prognostic wind fields can improve the performance of the dispersion modeling on regional scales (US EPA, 1995).

The following sections provide details of the data sources and methodology utilised for the prediction of a three dimensional meteorological dataset and wind field for the assessment of contaminant dispersion.

6.3 METEOROLOGICAL MODELLING METHODOLOGY

6.3.1 TAPM Predictions

Predictions of meteorological parameters for the year 2004 for the Townsville region were undertaken using TAPM (Version 3). The model was configured with a series of nested grids chosen to provide an appropriate communication and transfer of information from the broad synoptic to the local scale.

As such, the TAPM predictions of meteorology and dispersion are likely to be consistent with any larger scale temporal and spatial variations arising from synoptic and other complex events associated with land-sea induced influences, as well as from topographical influences on both a regional and local scale.

For the purposes of the predictions TAPM was run in hydrostatic mode utilising the default deep soil moisture content values. The model was configured to use a domain consisting of 30 × 31 × 25 grid points with nesting spacings of 30 km, 10 km, 3 km, 1 km and 0.5 km (see Figure 19).

The model utilised data taken from the gridded terrain data model at 9 second grid spacings provided by Geosciences Australia. The vegetation and soil type datasets were modified from the default selections provided in TAPM to better represent conditions at the Project site. No assimilation of observation meteorological data was included in the TAPM predictions. This was done to prevent conflicts that can occur when attempting to 'nudge' prognostic predictions with actual monitoring data.

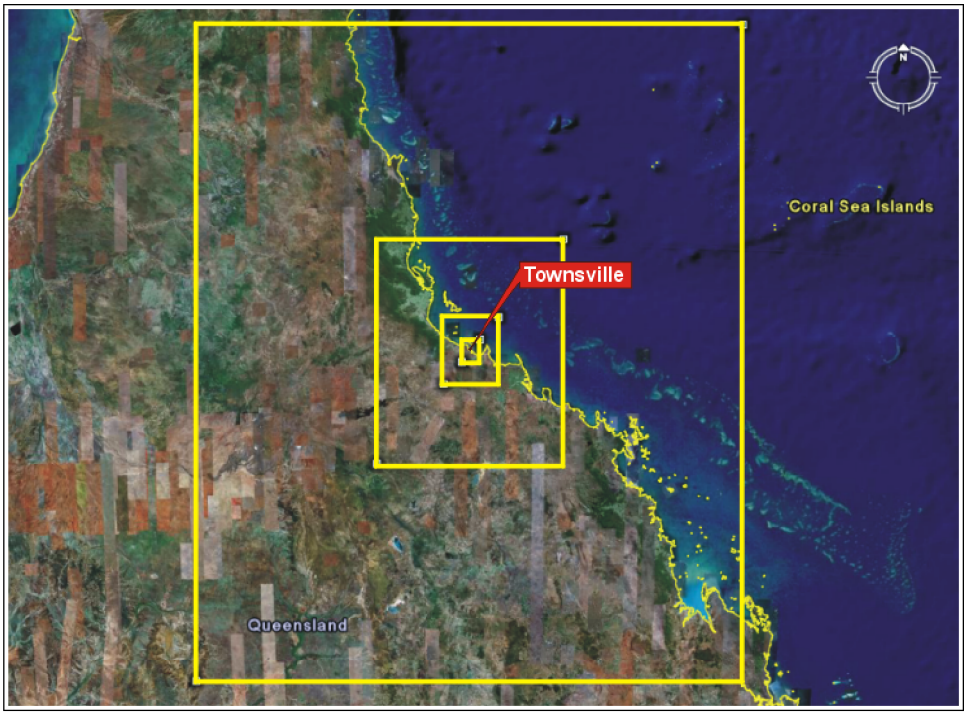

Figure 19: Nested grids used in TAPM predictions

6.3.2 Calmet Predictions

6.3.2.1 Overview

CALMET predictions for the project area were made, using prognostic data only, with the exception of fields known to be unable to be effectively handled by the TAPM predictions, including cloud cover and ceiling height. Predictions utilised the diagnostic analysis module within CALMET and incorporated a range of available meteorological data relevant to the Project area.

The following sections provide an overview of the data utilised in the Calmet modelling, along with details of some of the key parameters selected to establish calculation limits within CALMET.

6.3.2.2 Prognostic Meteorological Data

Prognostic meteorological data for both surface and upper air stations predicted by TAPM were incorporated into Calmet as observational data. Meteorological parameters for a total of 16 stations were exported from TAPM and reformatted for inclusion in the Calmet modelling to provide a good spatial representation of the predicted wind fields. This is particularly important for the incorporation of sea breeze recirculation into the predictions. Figure 20 presents the locations of the dummy meteorological stations included in the Calmet modelling.

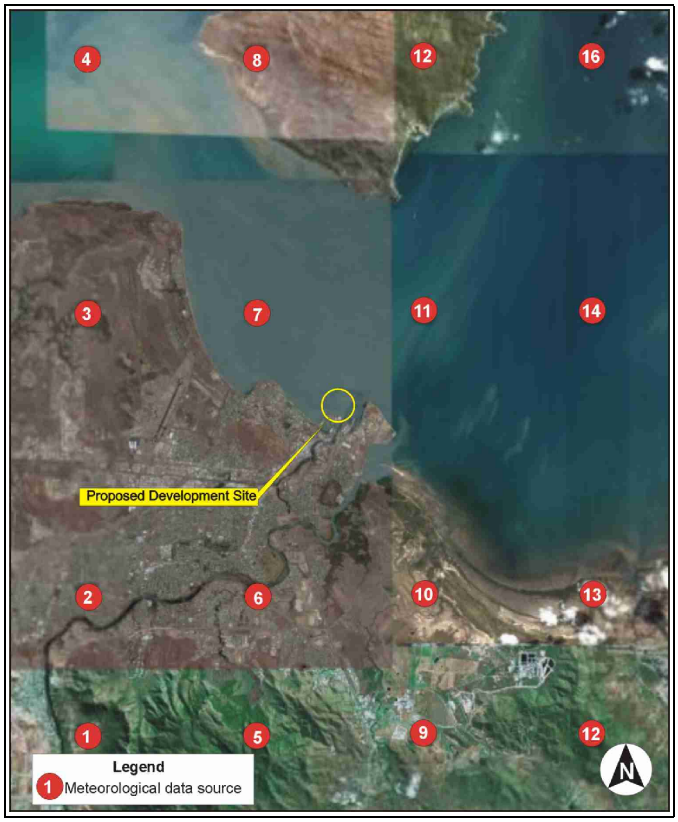

Figure 20: Dummy Meteorological Stations Used in Calmet Predictions

6.3.2.3 Observational Meteorological Data

Observational meteorological data was utilised in the Calmet predictions for those parameters where TAPM predictions are known to be unreliable. In particular, observational datasets for the same time period as considered in the TAPM predictions (1 January – 31 December 2004) were sought for cloud cover, ceiling height and rainfall data.

Discussions with the Port of Townsville confirmed that these parameters were either not measured at the Berth 10 monitoring station (cloud cover and ceiling height) or were unlikely to be reliable (rainfall) due to difficulties with the equipment installed on site. As a result, these parameters were obtained from the nearest Bureau of Meteorology (BoM) monitoring station collecting the required data (Townsville Airport).

For time periods where observational data were missing from the data set or incomplete, appropriate values were substituted according to the generally accepted methodologies defined by the United States Environmental Protection Agency (Atkinson & Lee, 1992). Key features of this approach are as follows.

- If more than two consecutive weeks of data are missing, data from a corresponding period in another year is substituted;
- if a single hour of data is missing, then a value interpolated between the preceding hour and the succeeding valid hour is substituted. If two or more consecutive hours of data are missing, then the values on either side of the data void or data from days of

similar meteorological conditions are reviewed. This is a subjective procedure and values are sometimes adjusted such that they are consistent with other meteorological parameters;

- any obvious patterns in the dataset are continued and values are adjusted accordingly;
- for periods where it is not realistic to substitute values from hours surrounding the void ie, consecutive weeks missing, data from a substitute month or year are used.

6.3.2.4 Vertical Stations

For the purposes of the modelling, CALMET was initialised with a total of 10 vertical layers with layer boundaries at 0 m, 20 m, 50 m, 100 m, 250 m, 500 m, 750 m, 1000 m, 2000 m, 3000 m and 4000 m respectively. The vertical levels used in the modelling were selected to provide the model with the ability to predict the formation of atmospheric conditions near to the ground as well as the sea breeze recirculation expected to occur in the region.

Additional parameterisation allowed for by CALMET includes specification of the minimum and maximum mixing heights. This provides the model with realistic boundaries for calculation of the region of the atmosphere within which contaminants will generally disperse. For the purposes of the project, minimum mixing heights were set to 50 m and maximum mixing heights to 3,000 m.

6.3.2.5 Terrain and Land Use Data

Digital Australian terrain height data on a longitude/latitude grid at 9-second grid spacing (approximately 0.3 km) for a grid domain of 51 km x 35 km encompassing the Townsville region was included in the meteorological modelling. These data are generated and maintained by Geoscience Australia.

Land use data including Australian vegetation and soil type data was sourced from a database provided by CSIRO Wildlife and Ecology. This dataset has a spatial grid spacing of 3-minutes. Modification of the landuse data was undertaken based on aerial photography of the area such that the coastline and recent urban development in the Townsville region was better represented by the model.

Figure 21 presents a view of the terrain included in the modelling domain and Figure 22 presents the adjusted land use data incorporated into the Calmet predictions.

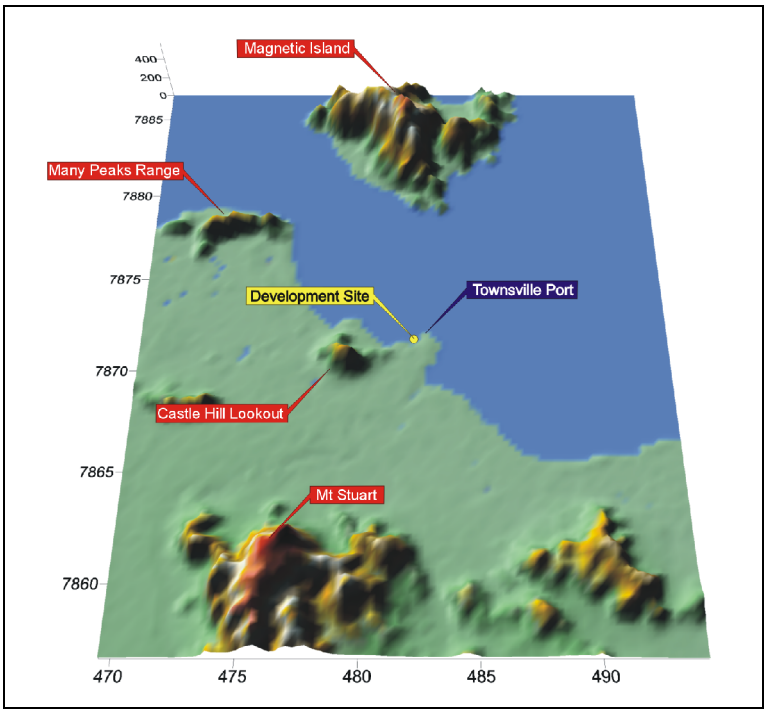

Figure 21: Three-dimensional terrain model utilised in Calmet/Calpuff

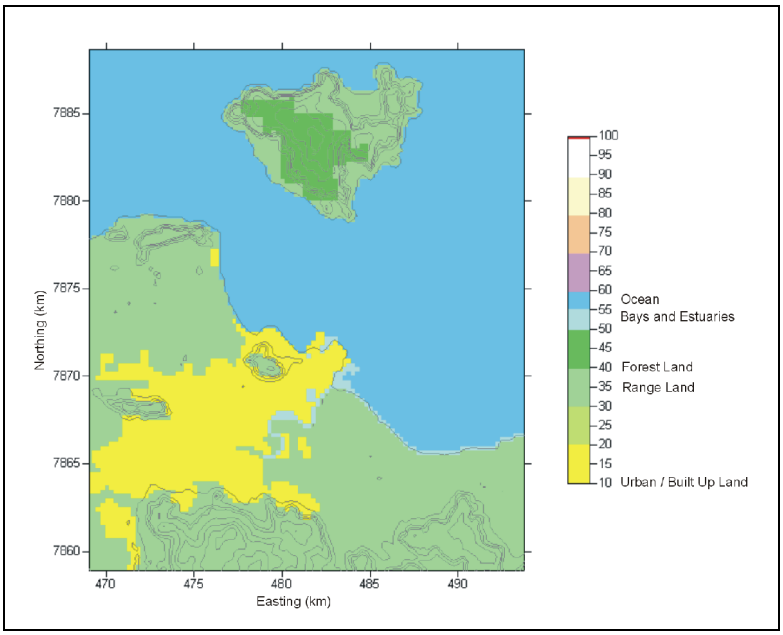

Figure 22: Adjusted land use scheme utilised in Calmet/Calpuff

6.3.3 Model Validation

Validation of Calmet predicted meteorological fields was undertaken using the two sources of available observational meteorological data (i.e. data collected by the Bureau of Meteorology station located at the Townsville Airport and data collected at the Port of Townsville Berth 10 monitoring station). Figures 23a and 23b present a comparison of seasonal wind roses for each of these observational monitoring stations with those predicted by Calmet. As can be

seen from these figures, Calmet appears to be predicting the local wind directions at the Project Site with a reasonable degree of accuracy although some variation is noted in the Autumn and winter predictions at Berth 10 and winter at the Townsville Airport. Wind speed however is noted to be over-predicted by the Calmet modelling for all seasons.

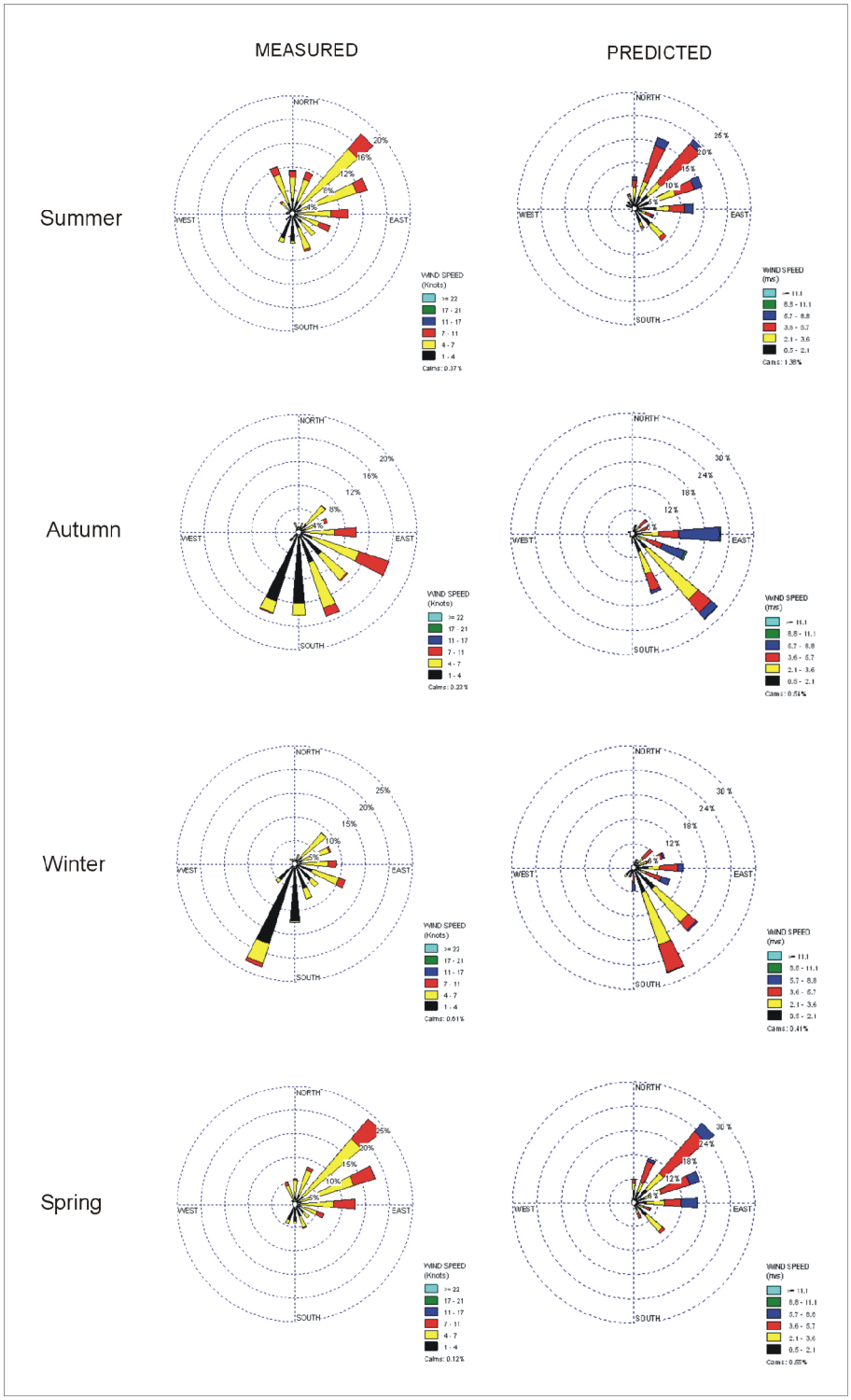

Figure 22: Seasonal windroses for Berth 10 monitoring station

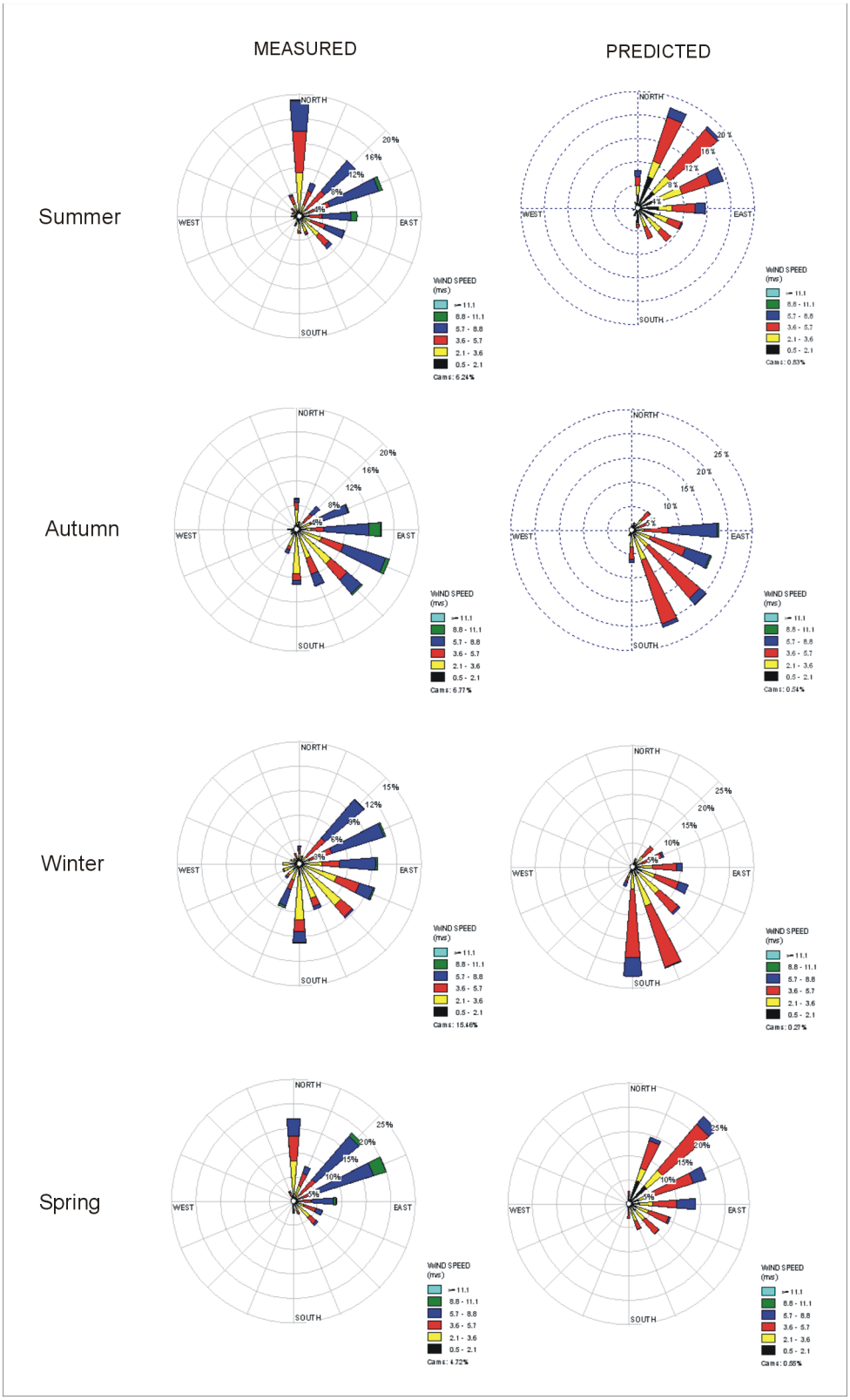

Figure 23: Seasonal windroses for Townsville Airport monitoring station

The amount of turbulence in the ambient air has a major effect upon the rise and dispersion of emissions. The amount of turbulence in the atmosphere is often described using series of six Pasquill stability classes A, B, C, D, E and F (Turner, 1970). Of these, Class A denotes the most unstable or most turbulent conditions and Class F denotes the most stable or least turbulent conditions.

Table 6.1 presents a summary of predicted stability classes at the Project Site for each hour of the day of the 2004 meteorological dataset. Review of this data confirms that night periods are typically defined by calm atmospheric stability (Classes E and F) whereas the morning to afternoon periods (hours 7 – 15) are typically more unstable. This is consistent with the atmospheric stability profile expected in the Townsville region where night periods are generally less turbulent as the available thermal energy reduces. Similarly, the pattern of increased turbulence during the morning and day periods is also as expected where increased solar radiation and the differential heating of the land and water masses result in an increase in the level of turbulence in the atmosphere.

TABLE 6.1: SUMMARY OF PREDICTED PASQUILL STABILITY CLASSES

Hour	Pasquill Stability Class					
	A	B	C	D	E	F
0	0%	0%	0%	5%	32%	63%
1	0%	0%	0%	3%	19%	78%
2	0%	0%	0%	8%	25%	67%
3	0%	0%	0%	8%	25%	67%
4	0%	0%	0%	8%	21%	71%
5	0%	0%	0%	8%	25%	67%
6	0%	0%	21%	51%	10%	17%
7	0%	11%	37%	51%	0%	0%
8	1%	21%	40%	38%	0%	0%
9	0%	28%	29%	43%	0%	0%
10	2%	34%	36%	28%	0%	0%
11	2%	30%	43%	24%	0%	0%
12	1%	25%	49%	24%	0%	0%
13	1%	16%	52%	31%	0%	0%
14	1%	10%	45%	44%	0%	0%
15	0%	2%	46%	52%	0%	0%
16	0%	1%	34%	65%	0%	0%
17	0%	0%	11%	89%	0%	0%
18	0%	0%	0%	39%	30%	30%
19	0%	0%	0%	10%	38%	52%
20	0%	0%	0%	8%	34%	58%

Hour	Pasquill Stability Class					
	A	B	C	D	E	F
21	0%	0%	0%	8%	33%	59%
22	0%	0%	0%	6%	31%	63%
23	0%	0%	0%	3%	23%	73%

6.4 DISPERSION MODELLING METHODOLOGY

Where modelling of emissions is necessary to assess impacts, the terms of reference for the EIS require the use of a predictive model that is able to handle the different atmospheric dispersion characteristics exhibited in the Project area (i.e. sea breezes, strong convection, terrain features, temperature inversions and pollutant re-circulation). Where these features are not able to be effectively assessed by a single dispersion model, a combination of acceptable models will need to be applied and referenced.

For the purposes of the assessment, the Calpuff dispersion model has been utilised. Calpuff is a non-steady state Lagrangian Gaussian puff model able to incorporate effects dispersion effects associated with complex terrain, overwater transport, coastal interaction effects and building downwash.

The CALPUFF modelling system treats emissions as a series of puffs. These puffs are then dispersed throughout the modelling area and allowed to grow and bend with spatial variations in meteorology. In doing so, the model is able to retain a memory of the plume's movement throughout a single hour and from one hour to the next while continuing to better approximate the effects of the complex air flows noted in the project area.

CALPUFF utilises the meteorological processing and prediction model CALMET to provide three dimensional wind field predictions for the area of interest. The final wind field developed by the model (for consideration by CALPUFF) includes an approximation of the effects of local topography, the effects of varying surface temperatures (as is observed in land and sea bodies) and surface roughness (resulting from varied land uses and vegetation cover in an area). The CALPUFF model is able to resolve complex terrain influences on local wind fields including consideration of katabatic flows and terrain blocking along with sea breeze recirculation effects associated with the region.

In particular the model is able to address the following issues considered to be relevant to the assessment of the Project:

- incorporation of the three-dimensional wind field data generated by Calmet to allow the consideration of complex terrain effects associated with the elevated terrain features surrounding the proposed stack location;
- prediction of pollutant concentrations for both ground level and elevated receptors, including flagpole receptors; and
- incorporation of building downwash effects associated with nearby building structures via the use of the PRIME building downwash algorithm;

Post processing of modelled emissions is undertaken using the Calpost package. This allows

the rigorous analysis of pollutant predictions generated by the Calpuff system. In particular Calpost is able to provide an analysis of predicted pollutant concentrations for a range of averaging periods from 1 hour to 1 year.

The Calpuff modelling domain incorporated the calculation domain utilised by Calmet. Gridded receptor positions were including with a scaling factor of 3 providing a gridding receptor point every 167 m both latitudinally and longitudinally.

Predicted contaminant concentrations for each of these receptor grid locations are considered in the air quality assessment.

7 SOURCES OF EMISSIONS

7.1 CONSTRUCTION EMISSIONS

7.1.1 Introduction

Construction of the TOT Project is expected to take approximately three years. This process is to be undertaken in a series of 25 steps with each step utilising a range of equipment and materials. The following sections discuss the steps in the construction process, the equipment to be utilised and the potential for emissions to air.

7.1.2 Steps of Construction Process

The construction of the Project is anticipated to take approximately three years with the TOT precinct being completed in 2010 and the Breakwater Cove precinct being completed in 2011. Table 7.1 provides a summary of each of the steps required for the construction of the TOT Project as detailed in Chapter 3 of the EIS for the Project (City Pacific Limited, 2007).

TABLE 7.1: STEPS OF CONSTRUCTION

Step	Description
1	This step involves construction of an internal access haul road and hardstand area within the site. Includes construction of a trafficable rock bund wall running adjacent to the existing Port Western Breakwater, Northern Breakwater and the hardstand area. The access haul road will be created as a bund to serve as waterproof barriers between the project site and surrounding waterways through incorporation of a water barrier membrane. This stage will use one-tonne rocks to form the base layer of the bund walls. Rock material will be tipped into place either directly from the truck or stored in stockpiles. Stockpiled rock material will be transported into place by excavator, truck or barge within the TOT project site.
2	Includes construction of the Strand Breakwater and extension and remediation of the Northern Breakwater. Corefill material will be placed to form the inner layer of the breakwaters. A HDPE water proofing membrane will be placed against the corefill material where required. Armour rock will be placed to form the outer layers of the breakwaters. Placement of rock material onto the breakwaters will be undertaken by an excavator or loader located on the breakwaters.
3	To encapsulate the site for dewatering, a temporary bund will be constructed between the Strand Breakwater and the termination of the access road in the northwest corner of the site. Additional temporary bunds will be positioned between the Strand Breakwater and the Northern Breakwater to complete the site encapsulation or isolation. Bunds will be constructed of one-tonne rocks and crushed rock.
4	This step will involve the construction of a second trafficable rock haul road bund wall between the access haul road bund constructed during Step 1 and the Port Western Breakwater.

Step	Description
5	Remaining perimeter areas in the northwest corner of the site to be sheet piled to close off the parkland area. Sheet piles will be protected with crushed rock and primary armour rock. A construction rock bund will be placed between the access haul road bund and the Northern Breakwater for creation of a water treatment area.
6	This step will involve the dewatering for the site by installation of spear pumps within the perimeter of the encapsulated area. Dewatering will be undertaken progressively and water will be treated via a series of settlement ponds prior to discharge of water to surrounding waterways.
7	Following dewatering, the soft clay from Canal C and the intended temporary flocculent area will be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks to a temporary storage area in the northern corner of the site. Soft clay from inside the berth pocket area will also be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks to the Future Parkland Area to complete filling to RL2.6m. Geotextile fabric will be laid over the existing soft clay within the future parkland area. Then a 500mm layer of sand will be introduced for wick drain dewatering. The soft clay material excavated from the TOT precinct and will be laid over the sand layer in the Future Parkland Area.
8	The Breakwater Cove Precinct will be progressively excavated, filled and backfilled until completion of land reclamation areas to the required design levels. Temporary clay bunds will be constructed and will be progressively relocated across the site to create “working cells” for excavation of soft clay and stiff clay. Within each working cell, soft clay will be either pushed by dozer or loaded by excavators into Rigid Dump Trucks for either storage or permanent placement in an excavated canal trench. Land reclamation will be created by relocation of excavated stiff clay to landform sites and compaction to a maximum soil moisture content of 20 to 25 %. A pre-cast revetment wall system will then be placed at the perimeter of the landform areas. Engineered fill will then be placed on landform areas to achieve final levels of RL 3.5m.
9	This step requires stiff clay material to be excavated from within the TOT berth pocket and transferred to the terminal building area.
10	Soft clay material will be excavated from Canal B and Landform 3 and placed in Canal C. Engineered fill will be imported and placed in Landform 4 and the TOT Precinct. The Future Parkland Area will then be finished to a final profile.
11	The wharf piling in the terminal wharf area will be constructed from a barge mounted piling rig. Rock armour protection will be placed at the toe of the wharf embankment by clamshell excavator. Wharf pre-cast headstocks and decking will be placed via a land based 40t crane to complete the wharf structure.
12	Stiff clay will be excavated from Canal B and placed in engineered fill to form Landform 3. Landform 4 and TOT precinct will then be finished to a final profile.

Step	Description
13	Stiff clays from below the removed rocks of the Port Western Breakwater and within the berth pocket will be excavated by cutter suction dredge for creation of the swing basin. These materials are considered unsuitable for reuse on site and will be removed to a suitable disposal site
14	Approximately 15,433 m3 of material will be dredged from within the outer access channel entrance. This material will be removed by cutter suction dredge and deposited within the excavation pit in Canal B.
15	Soft clay material will be excavated from Canal A and Landform 2 and be removed to the excavation pit in Canal B. Imported engineering fill will be placed within Landform 3 to achieve a final profile.
16	Bridges within the Breakwater Cove Precinct will be constructed in dry site conditions with piles being driven by conventional means. Rock scour protection will be placed by excavator at the base of the driven piles. Headstocks and decking will be placed on bridges via 40t crane and handrail will be installed at completion of the rock protection works.
17	Stiff clay material from Canal A will be excavated and placed on Landform 2 to fill to RL 2.6m. Landform 3 will then be filled to achieve a final profile.
18	The soft clay layer from within the Marina basin and from Landform 1 will be excavated and relocated to the excavation pit in Canal A. Imported engineering fill will be placed on Landform 2 to fill to a final profile.
19	Bridge 2, which links to Landform 2, will be constructed in dry site conditions using the same process as described in Step 16 above.
20	Stiff clay material will be excavated from the Marina basin and placed on Landform 1. Excavation of stiff clay from the Marina will be placed on the temporary flocculent area to fill to a level of RL 2.6m. Landform 2 will then be finished to a final profile.
21	Imported engineering fill will be placed on Landform 1 to achieve a final profile of RL 3.5m. Approximately 175,000 m^3 of soft clay material that was temporarily stored within the on-site storage areas will be returned to the final disposal areas within the Marina by use of a cutter suction dredge
22	The bridge connection from Mariners Peninsula to the Strand Breakwater will be constructed by driving piles from the water via a piling rig barge. Bridge decking and headstocks will be placed from a barge based 40t crane.
23	Landform 1 and the temporary flocculent area will then be filled to achieve a finished profile.
24	Temporary construction bunds installed during Steps 1, 3 and 4 will be removed progressively by barge mounted clam shell excavators and materials will be deposited adjacent to the Strand and Northern Breakwaters. This will allow water to flow into the project site. Clay bunds at the end of each working cell will then be removed progressively allowing settlement of water and turbidity within canals on a staged basis prior to removal of each successive bund.
25	In the final step, the Bridge connecting Mariners Peninsula to the Strand Breakwater will be completed

As can be seen from the summary of construction steps required for the project presented in Table 7.1, the majority of the construction works involve the construction of rock walls and bunds (using rocks typically > 1 tonne) and excavation of clay materials from the canal areas to fill the reclaimed land to a suitable levels. It is noted that, up to the final profiling stage, the majority of the fill material used on the site will be wet during excavation and working and, as such, emissions from these activities are expected to be minimal.

It is possible that there could be emissions from the site following completion of the final profiling of the reclaimed land areas prior to landscaping. This phase of the project is expected to be relatively short with dust emissions controlled through the use of on-site management measures (such was site watering and restriction of vehicle haul routes). To provide an estimate of the potential impacts of wind erosion of soil from unsealed finished sections of the site, estimates of emissions were made using the methodology detailed in the National Pollutant Inventory Emissions Estimation Technique Manual for Mining (National Pollutant Inventory, 2001a). Table 7.2 provides estimated emissions of dust from the site assuming the entire Project area is exposed to eroding winds. This estimate is considered to represent an over-estimate of potential emissions from the site however is useful for gauging the potential scale of impacts throughout the construction phase of the Project.

TABLE 7.2: ESTIMATED EMISSIONS OF WIND ERODED DUST (KG/HR)

Year	TSP	PM_{10}
1	-[a)]	-[a)]
2	21.6 [b)]	10.8 [b)]
3	21.6 [b)]	10.8 [b)]

[a)] *it is expected that all materials handled during the first year of construction will be either large rock material or excavated clay with high moisture content. As such emissions during this period are expected to be minimal.*

[b)] *assumes the entire Project Site is exposed to eroding winds and covered with material with low moisture content able to be eroded.*

7.1.3 Construction Equipment

In addition to dust generated during the construction of the Project, there is also potential for emissions from the exhausts of the range of equipment to be used in the construction. Details of the expected construction equipment to be operated at the site have been provided as detailed in Table 7.3.

TABLE 7.3: CONSTRUCTION PLANT AND EQUIPMENT

Equipment Type	Year 1	Year 2	Year 3
	Number		
Common Equipment to all Areas			
Sheet Piling	1	0	0
Driven Piles	1	1	1
Barges SLV 500	2	2	2
Dewatering Pump	1	1	1

Equipment Type	Year 1	Year 2	Year 3
	Number		
Pile Breakers	1	2	1
Bulk Earth Works			
100 t Digger	0	2	2
12 G Grader	4	1	1
16 G Grader	0	2	2
30t Excavator	0	1	1
40t Excavator	10	5	2
65t Excavator	2	3	3
825C 4 Wheel Compactor	0	2	2
988 Wheel Loader	2	2	1
Cat 740 40t Articulated Truck	8	7	9
D6 Dozer	3	1	1
D6 LGP Swamp dozer	0	5	7
HD 465 Rigid Dump Truck	0	7	9
Self Propelled Roller	0	1	1
Tandem Water Truck	3	2	3
40 t Crane	0	0	1
Franna Crane	0	1	1
Civil Works			
Excavators	0	0	2
Backhoe	0	0	1
Ditch Witch Trencher	0	0	1
Dozers / Drotts	0	0	2
Grader	0	0	2
Kerb Machine	0	0	1
Water Truck	0	0	2
Sheep foot Roller	0	0	2
Steel Drum Roller	0	0	2
Ridged Dump Trucks	0	0	3
A.C Placing Plant	0	0	1
Moxy Truck	0	0	3
Franna Crane	0	0	1
Terminal Construction Works			
Excavators	0	1	0
Backhoe	0	1	0
Bob Cat	0	0	1
Clamshell Digger / Dragline	0	1	0
Cranes Franna	0	1	1
Cranes 40 t	0	1	1
Scissor Lift	0	1	1

Potential emissions to air from vehicle engines have been calculated based on emission estimation methods published by the Commonwealth Government National Pollutant Inventory (NPI). Estimation techniques have been sourced from the NPI Emission Estimation

Technique Manuals for Combustion Engines (National Pollutant Inventory, 2003).

For determination of boat emission rates, reference has been made to the NPI manual for Maritime Operations (National Pollutant Inventory, 2001b).

Table 7.4 presents a summary of the emission rates adopted for modelling of exhaust emissions during the construction phase of the project. It should also be noted that, as a result of improvements in combustion engine emission controls, the emission factors presented in the Combustion Engines manual are likely to be out of date and therefore are expected to be highly conservative.

TABLE 7.4: ESTIMATED COMBINED EXHAUST EMISSIONS FROM CONSTRUCTION PLANT AND EQUIPMENT (kg/hr)

Year of Project	CO	Formaldehyde	NO_X	PM_{10}	SO_2	VOCs
Year 1	5.534	0.305	13.717	1.008	1.349	1.004
Year 2	8.837	0.491	21.367	1.487	2.145	1.413
Year 3	12.612	0.720	30.047	1.975	3.114	1.717

In addition there is potential for emissions from the materials being hauled by vehicle to and from the site. These emissions are able to be effectively managed through mitigation measures such as covering of all loads containing materials able to be dispersed in the atmosphere and ensuring all unsealed haul routes are effectively watered such that dust emissions can be controlled.

7.2 CATTLE EXPORT EMISSIONS

7.2.1 Summary of Activities

Livestock exports from the Townsville Port are generally limited to live cattle produced in the region. Cattle export markets serviced by the Townsville Port include:

- Brunei;
- Egypt;
- Malaysia;
- Indonesia;
- Philippines;
- Papua New Guinea;
- Vietnam;
- Thailand; and
- the Pacific Islands.

Table 7.5 presents a summary of live cattle exports over the past five years. As can be seen from this table, recent cattle exports are in a significant state of decline with 2005 exports representing less than 1.5 % of the record export levels seen in 2003. Higher Australian cattle prices due to an appreciation of the Australian dollar and strong competition from lower priced buffalo meat in South East Asian markets are reported to be the main contributors to this decline.

TABLE 7.5: CATTLE EXPORT HISTORY FOR TOWNSVILLE PORT

Year	Tonnes of Cattle Exported
2001	40,756 (81,512 head)
2002	38,729 (77,458 head)
2003	82,591 (165,181 head)
2004	8,404 (14,620 head)
2005	1,094 (2,187 head)
2006	6,378 (12,755 head)
2007	14,015 (37,682 head)

Live cattle are exported from Berths 3 and 10 at the Port of Townsville. Cattle are loaded onto vessels at a rate of up to 600 head per hour. Two double deck loading ramps located at Berths 3 and 10 facilitate the unloading of cattle from double deck road trailers.

Emissions from export operations are generally related to odour from the cattle and waste materials on the ships and transport vehicles. Generally, livestock vessels are mechanically ventilated with air from the ships hold emitted via a series of ventilation exhausts.

7.3 Emission Data

There is currently no available published data relating to measured odour emissions from live cattle held on a bulk carrier ship. A previous literature study (Martinec, 1998) of odour emissions from a range of farmed livestock operations however has derived a relationship between odour emissions from sheep and other livestock types. This relationship is then able to be used, in conjunction with measured odour emission rates from a sheep livestock vessel in Western Australia (Vipac, 2000) to estimate emissions from cattle export operations at the Townsville Port.

The results of the monitoring study of emissions from a sheep livestock vessel resulted in a maximum estimated odour emission rate of 1.9 OU/sheep/s. As per the literature study this can then be used to estimate an odour emission rate for a cattle export vessel using the derived odour relationship (1 cattle ≈ 8 sheep). Therefore, assuming all cattle exported in 2005 were transported on a single vessel, a maximum odour emission rate for the vessel would be:

- 1.9 OU / sheep / s * 8 sheep / cattle * 2187 cattle = 33,242 OU/s for a single vessel

Table 7.6 therefore presents a summary of emission characteristics adopted for the assessment of live cattle.

TABLE 7.6: ASSUMED LIVE CATTLE EXPORT EMISSION PARAMETERS

Parameter	Value
Number of Emission Points	2 per ship
Efflux Velocity (m/s)	0.0001[a)]
Source Height (m)	15
Odour Emission Rate (OU/s)	33,242

[a)] *Source modelled as a pseudo point source with minimal vertical plume rise consistent with fugitive emissions from a cattle vessel at berth.*

To provide some validation of these estimated emissions, monitoring of odour during the loading of cattle to a vessel was undertaken on 17 April 2007. During the loading it was not possible to obtain access to the vessel such that monitoring of emissions from the ventilation exhausts could be undertaken. As an alternative measurements of odour concentration were undertaken adjacent to the vessel (Position O1) and at a distance of approximately 175 m downwind of the vessel (Position O2) during loading.

Table 7.7 presents a summary of measured odour concentrations at each of the monitoring positions.

TABLE 7.7: SUMMARY OF MEASURED ODOUR CONCENTRATIONS

Monitoring Position	Odour Concentration (OU)
Position O1	768
Position O1	645
Position O2	980
Position O2	661

Table 7.8 presents a comparison of measured odour concentrations at a distance of 175 m downwind of the vessel with maximum predicted ground level concentrations at a similar distance from a source with the emission characteristics presented in Table 7.6. Review of the predictions presented in Table 7.8 confirm that the measured emission rates are only slightly lower than the maximum predicted by the model. Given this the estimated emission rates from a cattle vessel presented in Table 7.7 are considered appropriate for the assessment.

TABLE 7.8: COMPARISON OF PREDICTED VERSUS MEASURED ODOUR CONCENTRATIONS (OU)

Distance from Source	Maximum Predicted Odour Concentration	Maximum Measured Odour Concentration
175 m	1,020	980

7.4 FUTURE PORT EMISSIONS

7.4.1 Overview

The Townsville region has a population of approximately 160,000 people (combined across the City of Townsville and City of Thuringowa). The Port of Townsville provides a valuable resource for trade in the region and continues to be one of the State's fastest growing Ports. The development of an efficient deep water port in Townsville is seen key factor providing opportunity for major industry and expanded local business in the region.

As a result the Queensland Department of Infrastructure has prepared a Port Strategic Plan for the City of Townsville. The objective of the Port Strategic Plan is to provide a shared vision which decision makers from the responsible government agencies could use to guide

development so as to achieve an effective and sustainable interface between Townsville's port area and the adjacent city area. In this way, the port's operations and efficiencies would be protected and enhanced while the City's urban amenity and functionality would be improved.

Freight is currently moved to and from the port by road and rail through residential areas. Planning is well advanced for the Port Eastern Access Corridor which would enable freight to reach the port from the eastern side of the Ross River, thus largely avoiding city areas. This corridor would eventually cater for transport by road, rail, conveyors and pipes. The road component would link the port directly to the Flinders and Bruce Highways. Conveyors and pipes would be installed in connection with the industrial plants for which they were required. Figure 24 provides an overview of the likely areas of future industrial development within the Townsville region in relation to the project site.

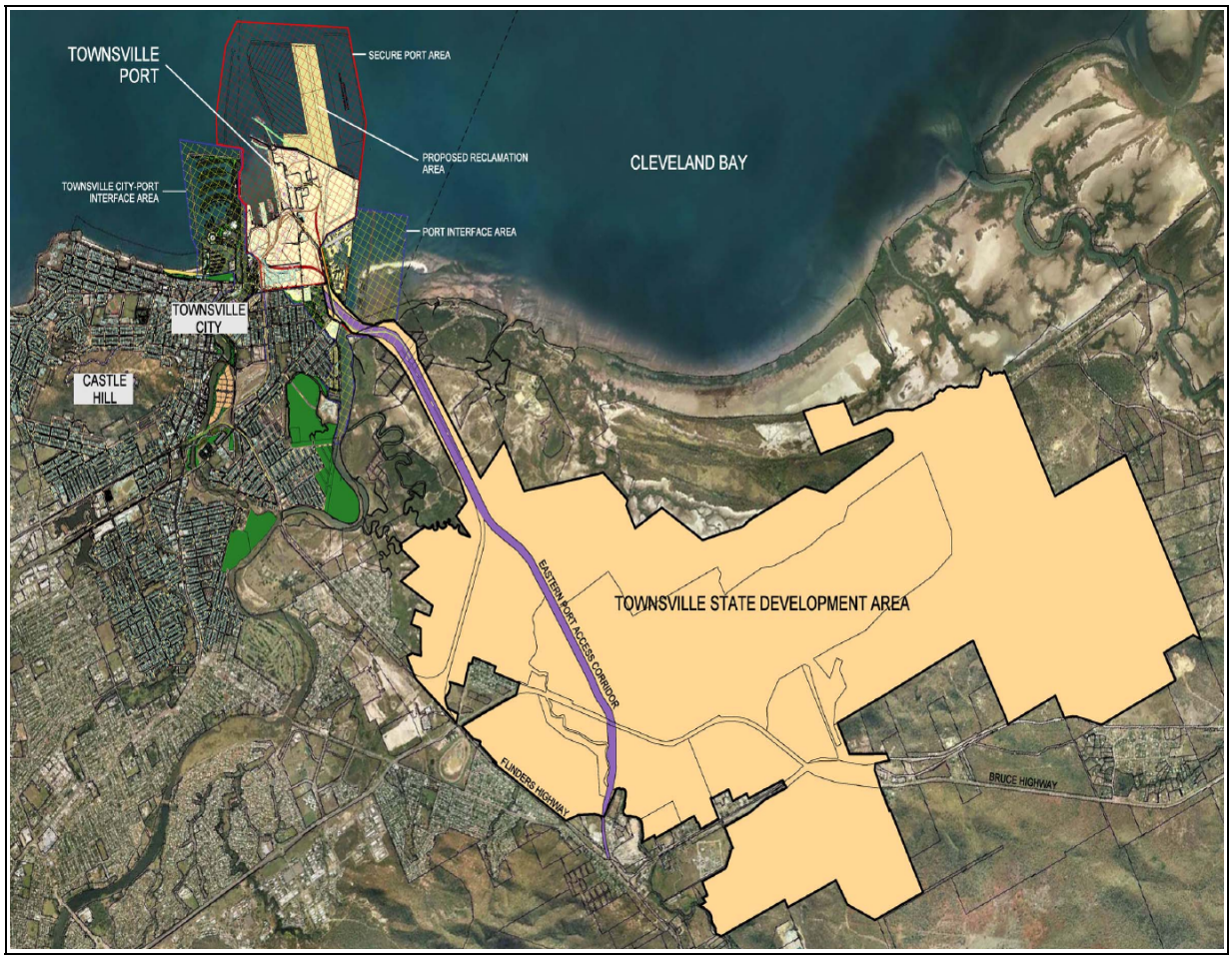

Figure 24: Future development regions in the Townsville Port Area
(Source: Townsville City/Port Strategic Plan, Draft May 2007)

The plan for the Port area identifies a number of precincts where development is expected to occur or uses are expected to change as follows:

- Precinct 1: Marine Industries and Boating Facilities
- Precinct 2: Eastern Port Access Corridor
- Precinct 3: Port Industrial Park

- Precinct 4: South Townsville Village Residential and Marina
- Precinct 5: Ross Creek East Transport and Commercial
- Precinct 6: Palmer Street – Flinders Street East
- Precinct 7: Ross Creek West Tourism and Commercial
- Precinct 8: Surplus Casino Landowners
- Precinct 9: Townsville Ocean Terminal
- Precinct 10: Breakwater Cove

Figure 25 provides the locations of each of the precincts identified in the plan and the following sections provide a summary of the potential sources of emissions of the future developed port and surrounding uses.

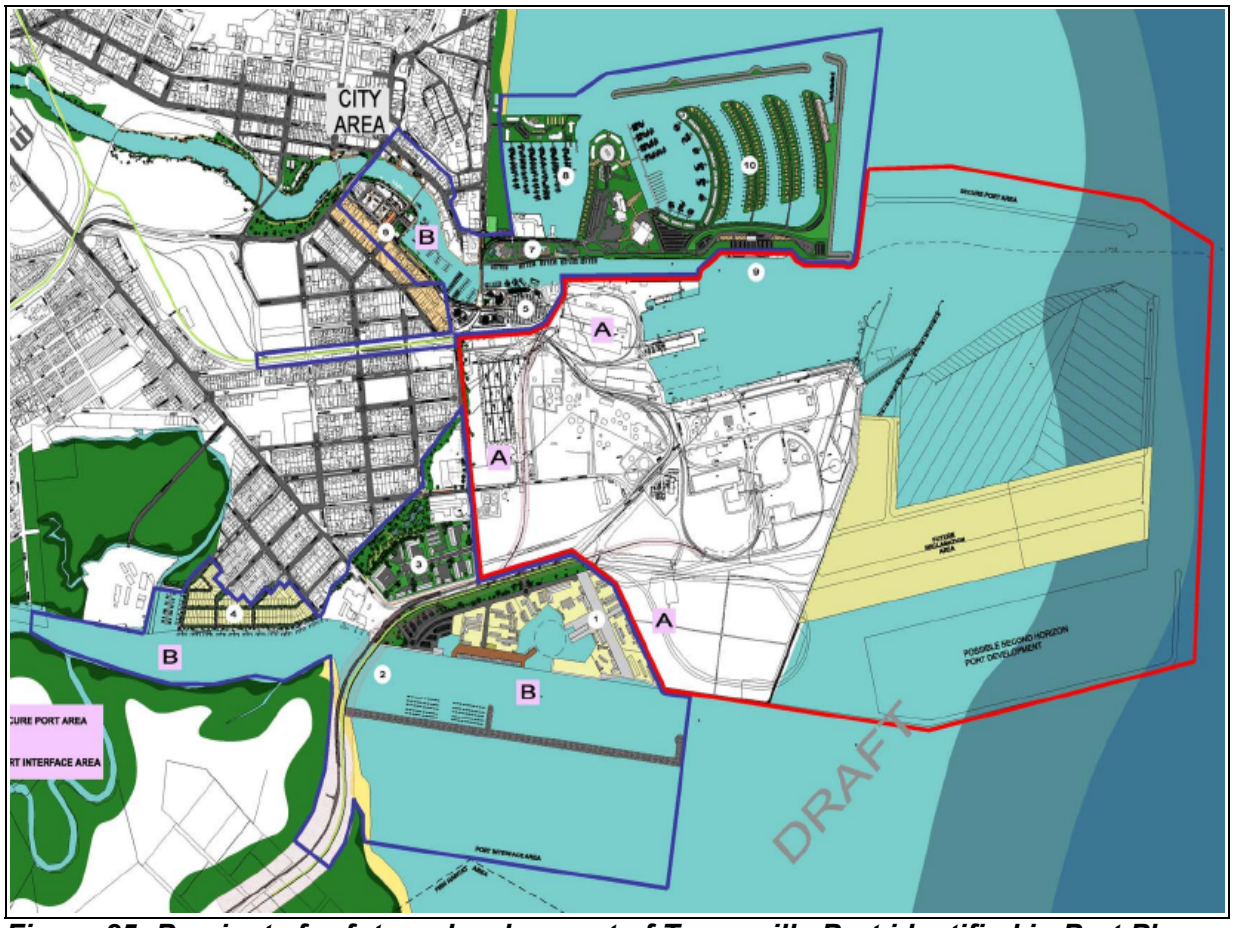

Figure 25: Precincts for future development of Townsville Port identified in Port Plan

The following sections provide an overview of the likely expansion of the Port and the potential emission sources associated with this expansion.

7.4.2 Precinct 1: Marine Industries and Boating Facilities

Precinct 1 would be constructed on a 34 hectare site located on the western bank of the Ross River. The precinct would accommodate marine activities displaced from other areas including parts of the Ross River upstream of the Eastern Port access Corridor (EPAC), the mouth of the Ross River and other parts of South Townsville.

The dominant uses within this precinct are expected to include shipbuilding, ship repair, commercial fishing, recreational boat ramps and marine search and rescue services. Emissions to air from these types of industries include particulate emissions from grit blasting (used for hull cleaning and defouling), heavy metals (include grit materials, welding fume and surface coating emissions from grinding) and styrene (from fibreglass used in shipbuilding and repair).

The location of the proposed Precinct 1 is likely to create a significant buffer (approximately 1500 m) between these potentially emitting uses and the Project Site. Furthermore, existing heavy marine industry activities undertaken in closer proximity to the Project Site are likely to be relocated to the new marine precinct as part of the development of the Port area. This will serve to increase the buffer between these uses and the Project Site.

Therefore, it is unlikely that emissions from these activities would impact on the Project Site in the future and in reality is likely to result in a reduction in emissions impacting on the site through the removal of existing marine industries located on Ross River to the proposed Precinct 1.

7.4.3 Precinct 2: Eastern Port Access Corridor

The Eastern Port Access Corridor (EPAC) is intended to provide a major transport corridor and link running between the Port and the Townsville State Development Area (see Figure 24). The corridor will include both road and rail links to provide a transport route to and from the Port without the need for freight to pass through the built-up city area. In addition it is proposed that conveyor systems would be installed within the corridor to allow the transport of bulk materials to and from the Port as required by major industry.

Emissions from this expansion are to be confined to within the corridor and are expected to include transportation emissions (from heavy vehicles and rail locomotives using the corridor) and minor emissions from conveyor systems installed. Given the location of the EPAC in relation to the Project Site, it is not expected that emissions would result in adverse impacts on the Site.

7.4.4 Precinct 3: Port Industrial Park

The Port Industrial Park is currently under construction and is to be bounded by Archer Street, Benwell Road and Boundary Street (as shown on Figure 25). The park is intended to provide development area for uses that do not require a direct land-sea interface however would benefit due to the proximity to other Port uses.

The strategic plan for this precinct identifies the major uses expected to occupy this precinct as including light industry, warehousing and associated offices. In terms of potential impacts on the Project Site, these uses are expected to be low impact with negligible emissions to air occurring as a result of their operation.

7.4.5 Precinct 4: South Townsville Village Residential and Marina

Precinct 4 as detailed in the Strategic Plan for the Port is to include an urban development along the lines of Townsville's historic small lot residential subdivisions and is to include walkways and marina facilities along the frontage to Ross River.

The residential and marina uses proposed for this precinct are expected to result in negligible

emissions to air and as a result are not anticipated to pose a risk in terms of air quality for the Project Site.

7.4.6 Precinct 5: Ross Creek East Transport and Commercial

Currently the area encompassed by Precinct 5 as described by the Strategic Plan includes a range of marine industry uses (including mechanical and hull repair facilities) along with vehicle and passenger ferry terminals. The strategic plan identifies that the marine industry uses currently occupying this region are to be relocated to a dedicated marine industry precinct (Precinct 1) on the eastern side of the Port. Precinct 5 would then be redeveloped to include a range of commercial office uses, a hotel and a dedicated passenger transit terminal.

As previously discussed, this redevelopment would see the significant sources of emissions to air currently operating in the area located to the eastern side of the Port, thereby increasing the buffer distance to the Project Site (and other sensitive uses) and reducing the potential impacts of emissions from these uses. The proposed uses to be included in the redeveloped Precinct 5 are all low impact in terms of air emissions and as such, when combined with the relocation of the existing marine industries, are expected to result in an improvement in air quality at the Project Site.

7.4.7 Precinct 6: Palmer Street – Flinders Street East

This precinct is located along Ross Creek upstream of the proposed Strand Bridge. Future planned uses for this area include expansion of the short-term accommodation uses currently provided in the area. In addition promenades along Ross Creek are proposed. Given the proposed uses for this area are predominantly residential emissions are expected to be negligible.

7.4.8 Precinct 7: Ross Creek West Tourism and Commercial

This includes the redevelopment of the existing land adjacent to Ross Creek occupied by the recreational boat ramp and passenger ferry terminal. Following relocation of these uses to Precincts 1 and 5 as discussed in Sections 7.3.2 and 7.3.6 above, this parcel of land would be redeveloped to encompass mixed uses such as residential and commercial development with basement carparking facilities. Again, as the proposed uses are low risk in terms of air emissions, consideration of potential impacts associated with this redevelopment is considered to be unnecessary.

7.4.9 Precinct 8: Surplus Casino Landowners

This precinct encompasses the parcel of land to the west of the Casino which was reclaimed during the construction of the Casino. The land is currently being developed to incorporate a range of residential uses including detached dwellings and multiple dwellings of various heights. These uses are located adjacent to the Project Site and are of distance from existing Port activities as the western part of the Project.

Future emissions from this precinct are expected to be minimal following completion of the construction phase.

7.4.10 Precinct 9 and 10: Townsville Ocean Terminal and Breakwater Cove

Precincts 9 and 10 encompass the TOT Project as is being considered in this study. Emissions from the TOT are discussed in Section 7.4.

7.4.11 Other Future Port Development

In addition to the development precincts identified, the Port Strategic Plan identifies an area to the north of the existing Port operations for future reclamation and expansion of the Port (see Figure 25). This area to the north of the existing Berth 1 and is likely to include a range of uses including additional berths, processing, storage and handling facilities similar to those currently occupying the Port. The expanded Port area is to be located at a greater separation distance from the Project Site than existing Port operations. Further, given the orientation of the site, it is unlikely that path of plume dispersion of emissions from the expanded Port area would coincide with that of the existing Port operations to impact on the Project Site.

In general, the risk of emissions from any businesses locating to the expanded Port is likely to be low except where an environmentally relevant activity (ERA) is proposed. Any activities with a potential for air emissions would need to be carefully assessed as part of the ERA licensing process.

As part of this process (as required by the Environmental Protection Act 1994), the proponent for any future ERA (including the expansion of an existing licensed operation), would need to demonstrate that the proposed use was to be constructed and operated in accordance with best practice environmental management. Specifically this requires that:

(1) The best practice environmental management of an activity is the management of the activity to achieve an ongoing minimisation of the activity's environmental harm through cost-effective measures assessed against the measures currently used nationally and internationally for the activity.

(2) In deciding the best practice environmental management of an activity, regard must be had to the following measures—

(a) strategic planning by the person carrying out, or proposing to carry out, the activity;
(b) administrative systems put into effect by the person, including staff training and monitoring and review of the systems;
(c) public consultation carried out by the person;
(d) product and process design;
(e) waste prevention, treatment and disposal.

(3) Subsection (2) does not limit the measures to which regard may be had in deciding the best practice environmental management of an activity.'

Regardless of this the TOR for the TOT project require the Proponent to assess the potential emissions associated with the expanded Port operations to determine the potential for adverse impacts on the Project. As the end uses of the expanded Port are currently unknown, specific risks associated with these future uses can not be determined. Rather, to provide an assessment of the potential future sources and emissions that could utilise the expanded Port areas, an estimate of potential emissions has been based on the industrial activities and emissions from the existing activities at the Port. The basis for derivation of these emissions is discussed in the following sections.

7.4.12 Existing Port Uses

7.4.12.1 Overview

The Townsville Port currently has a total of 9 berths in operation servicing a range of industries including transport of mineral and metal ore and concentrates, sugar, livestock, molasses, fuel products and general freight. Delivery of materials to the berths is achieved via a range of mechanisms including:

- rail;
- road;
- conveyor and
- hopper loader

Table 7.9 and Figure 26 provide a summary of the materials loading activities undertaken at each of the Berths at the Townsville Port.

TABLE 7.9: SUMMARY OF TOWNSVILLE PORT BERTH USAGE

Berth	Berth Usage	Approximate Distance to Proposed Development Site
1	▪ Bulk liquids wharf used by tankers for bulk oil/fuel, gas, and sulphuric acid discharge and by all types of vessels for bunkering	390 m
2	▪ Used for unloading nickel ore. Two gantry cranes can be equipped to unload ore from the vessel into hoppers and feed a conveyor system, which carries the ore to the load site.	580 m
3	▪ Typical cargoes handled over this wharf include lead ingots, refined copper, nickel, and zinc. ▪ Also a general purpose wharf used for containerised cargo, fertilizer imports, and live cattle exports (by rail)	680 m
4	▪ Handles bulk cement, imported from Gladstone by Cement Australia. ▪ Molasses pipeline to this berth capable of loading up to 400 tonnes per hour. ▪ Motor vehicles also imported over this wharf.	710 m
7	▪ Bulk ship loader for mineral concentrates, ores and fertiliser. ▪ Southern Cross Fertilisers also export fertiliser over this wharf.	590 m
8	▪ A multi-user wharf that services the export frozen beef trade with cargoes drawn from freezer stores adjacent to the port. ▪ Also serves as a general-purpose berth, with scrap metal and fertiliser handled over this wharf.	570 m
9	▪ The raw sugar-loading berth. A bulk ship loader	450 m

Berth	Berth Usage	Approximate Distance to Proposed Development Site
	delivers sugar to carriers at the rate of 2,000 tonnes per hour. ▪ Bulk molasses and bunker pipelines also provided. ▪ Fertiliser also discharged at this berth. ▪ Cruise ships also use this wharf from time to time.	
10	▪ Primarily used for containerised trade, general cargo, and livestock. ▪ A stern RORO ramp is also available which enables vehicles to be loaded onto or off a vessel. ▪ Live cattle are exported over this wharf (by road). ▪ Mining materials are exported to Papua New Guinea and Indonesia. ▪ The wharf is also used by the Australian Defence Forces from time to time.	340 m
11	▪ Berth is known as the Outer Berth Mineral Concentrates Loading Facility. Lead and zinc concentrates are placed onto a conveyor system by front-end loader and transported to the 1350 tonnes/hour ship loader.	690 m

In addition to bulk loading and unloading of ships, several industries operate facilities within the Port precinct. The majority of these industries provide freight handling and warehousing for the distribution activities undertaken at the Port although some ship repair and minor petroleum industries also operate in this area.

The following sections provide a summary of the major industries in operation at the Port and in the surrounding area along with a summary of the potential sources of emissions to air.

Figure 26: Port activities in proximity to Project Site

7.4.12.2 Queensland Terminals

Queensland Terminals operate at the Port of Townsville under Queensland Environmental Protection Authority NR0007. The authority covers the stockpiling of materials in bulk and the storage of bulk chemicals. Under the terms of the authority, releases of any emissions (including odorous emissions, dust, particulate and aerosols) are not to result in an environmental nuisance beyond the boundaries of the site.

The company stores sulphuric acid and imports and exports via sea, as well as distributing to the hinterland via road from the Port terminal. Significant emissions to air from these activities relate primarily to the transportation of product to and from the Port (ie road tankers and marine vessels).

7.4.12.3 Southern Cross Fertilisers

Southern Cross Fertilisers operate at the Port of Townsville under Queensland Environmental Protection Authority NR0234. The authority covers the stockpiling of materials in bulk. An additional clause permits the storage of crude oil or petroleum products at the site although a special note identifies that authority for this activity is to cease in 2011.

The facility receives and stores fertiliser by rail from Phosphate Hill and then dispatches it to local and export customers. The facility also receives and stores imported sulphur which is then railed to the company's Mount Isa acid plant.

Under the terms of the authority, releases of any emissions (including odorous emissions, dust, particulate and aerosols) are not to result in an environmental nuisance beyond the boundaries of the site. In addition, the conditions of the authority require the company to provide a range of dust controls to minimise the potential emissions from the site including:

- the rail wagon bottom dump and the rail load out facilities must be designed and constructed to contain dust emissions within the facility;
- all conveying equipment such as conveyors and transfer points must be fitted with dust abatement equipment to prevent dust emissions from the authorised place;
- all material collected from the conveyor system is to be returned to either the conveyor or the storage area in a manner such that there is no release of contaminants to the atmosphere, land or waters.
- trafficable areas must be sealed with bitumen, concrete, road base or an equivalent hard surface, or otherwise maintained in a condition which minimises the release of wind blown or traffic generated dust.
- the tailgates of all trucks leaving the sulphur unloading area for transport to the sulphur storage facility must be securely fixed prior to loading and immediately after unloading to prevent loss of materials.
- Trucks transporting material from the sulphur unloading area must be covered as soon as practicable after loading to prevent wind-blown releases and spillage. The covering must be maintained until immediately before dumping to the sulphur receival hopper.

Emissions from the site are likely to relate primarily dust emissions as a result of the loading and unloading of fertiliser shipments.

7.4.12.4 Shell Company of Australia

Shell Australia operate at the Port of Townsville under Queensland Environmental Protection Authority ENDC00250105B11. The authority covers the stockpiling of materials in bulk and the storage of crude oil or petroleum products at the site. Under this authority, fuel is imported through the Port and then distributed to the North Queensland region by the company.

The environmental authority requires that no emissions from the site are to cause a noxious

or offensive odour beyond the boundaries of the site. Emissions from the bulk storage of fuel is expected to relate primarily to emissions of volatile organic compounds from the bulk storage tanks in use at the Port as identified on Figure 26.

In addition to the bulk fuel importation and distribution, Shell Australia also operates a joint venture bitumen terminal under Environmental Authority ERA NR0448. This authority provides conditions limiting emissions from the site. Tables 7.10 and 7.11 provide a summary of the release limits and types of emissions specified in Schedule B Table 1 and 2 of the environmental authority respectively for this facility.

TABLE 7.10: SCHEDULE B TABLE 1 RELEASE LIMITS

Release Point Number	Source Description	Minimum Release Hight (metres) Above Ground Level	Minimum Efflux Velocity (metres/second) @ Maximum Continuous Rating
F1	Exit of stack from Bitumen Heater	31	5.7
F5	Exit of stack from Oil Heater	31	7.5

TABLE 7.11: SCHEDULE B TABLE 2 RELEASE LIMITS

Release Point Number	Contaminant release	Maximum release concentration at maximum continuous rating	Sampling frequency
F1 and F5	Particulate	250 mg/Nm^3	Six monthly for the first year and annually thereafter
F1 and F5	Oxides of Nitrogen	500 mg/Nm^3	
F1 and F5	Carbon Monoxide	1 g/Nm^3	
F1 and F5	Acid Gases	0.4 g/Nm^3	
F1	Sulphur Dioxide	2.3 g/Nm^3	
F5	Sulphur Dioxide	623 mg/Nm^3	Six monthly for the first year and annually thereafter
F1 and F5	Sulphur Trioxide	0.2 g/Nm^3	

7.4.12.5 Cement Australia

Cement Australia combines Australian Cement and Queensland Cement operations at the port under Environmental Authority 5020000114. The Port of Townsville operation is a distribution terminal for cement, ash, and packaged products. Cement is imported from Gladstone in a powdered form and is pumped through a blue pipeline from Berth 4 to the 30,000 tonne capacity cement storage silo. The silo stands 60 metre high and is 30 metres in diameter.

In addition to the main cement storage silo, there are cement blending facilities in the smaller green silos, automatic bulk rail and road despatch facilities, along with automatic bagging, palletising, and a shrink wrap equipment.

The environmental authority for the operations at the Port require that:

> *'The fabric filter dust collectors must be inspected regularly and maintained to prevent the release of dust beyond the boundaries of the licensed place.*
>
> *The air exhaust from all stationary or mobile containers shall be fitted with an efficient fabric filter dust collector.'*

Emissions of cement dust a likely to relate primarily to the conveyor transport and packaging operations.

7.4.12.6 Xstrata

Xstrata exports zinc and copper concentrates from Berth 7 and lead ingots, containers, and copper cathode from Berth 3 under Environmental Authority NR0054. The company also handles product from other companies including Southern Cross Fertilisers, Osbourne, Mt. Gordon/Birla, Eloise, Thalanga, Kagara, and Ernest Henry mines.

Emissions from the operations at the Port are likely to be limited as the products exported are in a processed form. Furthermore, all bulk storage of product is internal with product stored in the bulk storage sheds identified on Figure 26.

7.4.12.7 Queensland Nickel

QNI discharges between 3.6 and 3.9 million tonnes of nickel ore per annum through the port of Townsville under Environmental Authority 5020000182. It also discharges approx 180,000 tonnes of fuel oil per annum and exports some containers through the Port of Townsville. There is a proposal to increase the production capacity of the Yabulu Refinery, from around 31,200 tonnes per year to 76,000 tonnes per year. This extension is estimated for completion in the first quarter of 2007, at which time nickel concentrate from BHP Billiton's Ravensthorpe mine in WA will be imported through the Port of Townsville.

The Environmental Authority for the operations provide limited requirements for the management of emissions to air. Raw ore product at the Port is stored in open stockpiles and loaded from vessels using overhead crane bucket loaders. Emissions of nickel ore dust from these operations occurs as a result of the bulk loading operations as well as wind erosion of the stockpiles.

7.4.12.8 Sims Metal Limited

Sims Metal operate a recycling facility located in the Port of Townsville under Environmental Authority SR1420. The facility recycles a range of products including post consumer brown goods (TV's, radios and other electronics), computers, car tyres, and refrigerators in an ozone friendly environment. The facility exports up to 7,000 tonne per quarter with the balance being transported by road or container carrier.

The environmental authority for the Sims Metal operations provides a range of conditions designed to limit emissions from the site. In particular, the authority limits the potential for dust emissions from the site by requiring that:

> *'Unsealed trafficable areas must be maintained using all reasonable and practicable measures to minimise the release of windblown dust or traffic generated dust to the atmosphere. Reasonable and practicable measures may include but are not limited to:*
>
> *(i) sealing with bitumen or other suitable material*
> *(ii) keeping of surfaces clean*
> *(iii) use of water sprays*
> *(iv) adoption and adherence to speed limits and*
> *(v) windbreaks*
>
> *Waste oils, leachate, stormwater contaminated by contact with waste materials or effluent resulting from washing trucks, plant or equipment must not be used for dust suppression purposes.*
>
> *All sealed traffic areas must be cleaned as necessary to minimise the release of dust to the atmosphere.*
>
> *Handling, loading, unloading, movement of vehicles and storing of raw materials and products must be carried out in such a manner as to minimise the release of dust to the atmosphere.'*

Emissions from this facility is likely to primarily include dust emissions although some minor emissions of metals is also possible from some activities

7.4.12.9 Australian Marshalling Service

Australian Marshalling Service export round log timber through the Port under Environmental Authority IPCE00230005A11. Timber is stored in unsealed storage yards as identified in Figure 26 prior to export through the Port.

The release of emissions from the facility are limited by the Environmental Authority which requires that:

> *'The release of dust and/or particulate matter resulting from the activity must not cause an environmental nuisance at any dust sensitive place.'*

During site inspections it was noted that dust emissions from the facility were being controlled through the use of a watering truck which was operating in the storage yard. This is likely to significantly reduce the potential for dust emissions from the facility.

7.4.12.10 BP Australia

BP Australia operate at the Port of Townsville under Queensland Environmental Protection Authority NR0453DA. The authority covers the stockpiling of materials in bulk and the storage of crude oil or petroleum products at the site. Under this authority, fuel is imported through the

Port and then distributed to the North Queensland region by the company.

The environmental authority requires that no emissions from the site are to cause a noxious or offensive odour beyond the boundaries of the site. Emissions from the bulk storage of fuel is expected to relate primarily to emissions of volatile organic compounds from the bulk storage tanks in use at the Port as identified on Figure 26.

7.4.12.11 BHP Minerals

BHP Billiton's Cannington mine is the world's largest single mine producer of both silver and lead. BHP Billiton export lead and zinc concentrates through the Port of Townsville to Korea, Europe, and Japan under Environmental Authority NR162. This authority provides conditions limiting emissions from the site.

The authority requires that *'contaminants must only be released to the atmosphere from a release point at a height not less than 4 metres above the roof ridge of any adjacent building or structure but in any case not less than 6 metres above ground level'.* The authority places limits on emissions from the site. Tables 7.12 and 7.13 provide a summary of the release limits specified in Schedule B Table 1 and 2 of the environmental authority respectively.

TABLE 7.12: SCHEDULE B TABLE 1 RELEASE LIMITS

Release Point Number	Source Description	Minimum Efflux Velocity (metres/second)
A1	Rail wagon tipper – dust collector	8
A2, A3, A4	Conveyor transfer points – dust collectors	8

TABLE 7.13: SCHEDULE B TABLE 2 RELEASE LIMITS

Release Point Number	Contaminant release	Maximum release concentration at maximum continuous rating
A1, A2, A3, A4	Particulate	250 mg/Nm^3
A1, A2, A3, A4	Total of antimony, arsenic, cadmium, lead, mercury and vanadium and their respective compounds	10 mg/Nm^3

7.4.12.12 Caltex

Caltex operate at the Port of Townsville under Queensland Environmental Protection

Authority NR361. The authority covers the stockpiling of materials in bulk and the storage of crude oil or petroleum products at the site. Under this authority, fuel is imported through the Port and then distributed to the North Queensland region by the company.

The environmental authority requires that *'the release of contaminants to the atmosphere from Tank 7 must only occur through the vents in the tank roof'*. Emissions from the bulk storage of fuel is expected to relate primarily to emissions of volatile organic compounds from the bulk storage tanks in use at the Port as identified on Figure 26.

7.4.12.13 Queensland Sugar Limited

Queensland Sugar export in excess of one million tonnes of sugar and molasses product through the Port of Townsville each year under Environmental Authority NR0390. The authority requires that *'all external material transfer conveyors except for the wharf and shiploader conveyors, must be roofed and enclosed on two sides'*.

Emissions from the sugar export operations at the facility are expected to relate primarily to dust emissions from the bulk loading activities and conveyor movements of the product.
In addition to the export of sugar, molasses products are also exported through the Port of Townsville. Molasses is transported to the Port by rail and exported through the Berth 9 molasses loading pipeline. Subjective observations made by Townsville Port Authority personnel have identified the potential for odour emissions from the molasses exported via the Port.

A review of literature relating to the manufacture and transport of molasses has not identified any estimates of odour emissions from these products. As a result it was identified that monitoring of odour emissions from the molasses loading operations would be necessary to assess the potential impacts of these operations on the Project site.

To date, monitoring of these emissions has not been possible due to logistic difficulties. It is expected however that the monitoring will be undertaken in the short-term and the results of this monitoring utilised in the assessment of potential impacts.

7.4.12.14 Curtain Brothers

The Curtain Brothers slipway is located on Ross Street in Townsville and is identified on Figure 26. The slipway is operated by Rosshaven Marine and is used for repair and maintenance of ships.

Recently, the slipway has been used as part of the Australian Department of Defence Pacific Patrol Boat Life Extension Program. Discussions with Rosshaven Marine have confirmed that they recently purchased a new boat lift which has been installed at their Fifth Avenue premises. As a result all repairs and maintenance, excepting unusually wide ships, will be completed at the Fifth Avenue premises which is located approximately 2.5 km from the proposed development site in the Precinct 1 area identified for future marine industries in the Strategic Plan.

7.4.13 Future Port Emissions

To provide an estimate of potential emissions from the expanded Port area, an average emission rate for the existing Port operations has been calculated based on the sum of emissions estimated for each of the uses identified in Section 7.2.13 with the exception of odour. Table 7.14 presents estimated emission rates for the expanded Port area.

TABLE 7.14: ESTIMATED EMISSION RATES FOR EXPANDED PORT AREA (kg/hr)

Total Suspended Particulate	PM_{10}	NO_x	SO_2
1.21	0.69	3.14	8.93

7.5 TOWNSVILLE OCEAN TERMINAL EMISSIONS

Emissions to air from the TOT during its operational phase are likely to be limited to emissions from vessels utilising the terminal. When the cruise terminal opens it is estimated that there will be an increase from the current use of 7 – 8 visiting cruise ships a year to approximately 20 cruise ships per year visiting Townsville. In addition, it is expected that up to 40 – 50 military vessels could utilise the facility per year.

Whilst berthed at the TOT, the vessels would primarily operate on auxiliary engines for the various power need of the vessel Table 7.15 presents estimated emissions from cruise ships berthed at the TOT based on information utilised in the assessment of air quality impacts associated with the Portside development in Brisbane (Max Winders & Associates, 2006).

TABLE 7.15 SUMMARY OF ESTIMATED EMISSIONS (g/s)

	Aurora Main Engines			Aurora Auxiliary			Tug Emissions		
	NO_2	SO_2	TSP/ PM_{10}	NO_2	SO_2	TSP/ PM_{10}	NO_2	SO_2	TSP/ PM_{10}
1. Main Engine				-	-	-	-	-	-
- 10% Manoeuvring	24.50	4.06	0.71						
- 3% Idle	17.64	2.49	0.68						
2. Main Engine	-	-	-	-	-	-			
- 85% MCR							9.02	1.50	0.22
- 5% Idle							1.04	0.225	0.04
3. Auxiliary	-	-	-				-	-	-
- 100% Load 5000kW				16.11	2.08	0.36			
- 72% Load 3600 kW				11.60	2.00	0.26			

Source Max Winders & Associates (2006)

These emission rates are based on emissions rates for a large cruise ship vessel (Aurora) along with auxiliary engine emission rates and the rates for two tugs operating. This emission scenario represents a worst case during the arrival and departure of a large cruise ship vessel. For the majority of the time the cruise ship vessels are docked at the TOT emissions will be from the auxiliary engines only.

There is limited information available on emissions from military vessels expected to utilise the TOT. Advice provided by the Royal Australian Navy (RAN, 2007) however indicates that in

general emissions from Navy vessels are expected to be lower than similar sized marine vessels due to the low sulphur content of the fuel used by the Navy vessels. As warships use automotive diesel (approximately 0.5 % sulphur), SO_2 emissions are expected to be significantly lower than merchant ships which typically use marine gas oil (MGO) or heavy fuel oil (HFO) both of which contain approximately 5% sulphur. Given this it is expected that the assessment of emissions from the Aurora (a large passenger vessel) is likely to provide a conservative estimate of the potential emissions and therefore impacts of Navy vessels expected to utilise the TOT.

8 DISPERSION MODELLING

8.1 INTRODUCTION

For the purposes of assessing potential air quality impacts associated with the development of the Project four emissions scenarios have been modelled to consider emissions associated with:

- emissions during the construction phase for the Project;
- emissions from existing cattle export Port operations;
- emissions from potential future Port operations; and
- emissions from the operation of the TOT.

The following sections provide an overview of the sources included in each of the modelling scenarios considered in the assessment and the maximum predicted ground level concentrations for each scenario.

8.2 CONSTRUCTION PHASE

The construction phase modelling considers emissions from all construction activities and equipment operation as discussed in Section 7.1. The modelling predicts maximum ground level concentrations of emitted contaminants including total suspended particulate, PM_{10}, sulphur dioxide and volatile organic compounds. Table 8.1 presents maximum predicted ground level concentrations for each of the contaminants emitted during the construction phase of the Project.

TABLE 8.1: MAXIMUM PREDICTED GROUND LEVEL RECEPTOR CONCENTRATIONS – CONSTRUCTION PHASE – YEAR 1 (µg/m^3)

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
Total Suspended Particulate	1 year	10.4	34.8	45.2	90
PM_{10}	24 hours 1 year	76.0 10.4	37.1 17.4	113.1 27.8	50 50
SO_2	1 hour 24 hours 1 year	103.5 101.7 13.9	45.9 45.9 5.1	149.4 147.6 19.0	571 228 57
NO_2	1 hour 1 year	105.2 14.2	34.1 11.7	139.3 25.9	246 63
VOC	1 hour	77.0	-	77.0	-
Formaldehyde	30 minutes	26.9	-	26.9	100

TABLE 8.2: MAXIMUM PREDICTED GROUND LEVEL RECEPTOR CONCENTRATIONS – CONSTRUCTION PHASE – YEAR 2 (µg/m^3)

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
Total Suspended Particulate	1 year	238.3	34.8	273.1	90
PM_{10}	24 hours 1 year	926.6 126.8	37.1 17.4	963.7 144.2	50 50
SO_2	1 hour 24 hours 1 year	164.5 161.8 22.1	45.9 45.9 5.1	210.4 207.7 27.2	571 228 57
NO_2	1 hour 1 year	163.9 22.1	34.1 11.7	198.0 33.8	246 63
VOC	1 hour	108.4	-	108.4	-
Formaldehyde	30 minutes	43.3	-	43.3	100

TABLE 8.3: MAXIMUM PREDICTED GROUND LEVEL RECEPTOR CONCENTRATIONS – CONSTRUCTION PHASE – YEAR 3 (µg/m^3)

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
Total Suspended Particulate	1 year	243.3	34.8	278.1	90
PM_{10}	24 hours 1 year	963.4 131.9	37.1 17.4	1,000.5 149.3	50 50
SO_2	1 hour 24 hours 1 year	238.8 234.8 32.1	45.9 45.9 5.1	284.7 280.7 37.2	571 228 57
NO_2	1 hour 1 year	230.4 31.0	34.1 11.7	264.5 42.7	246 63
VOC	1 hour	131.7	-	131.7	-
Formaldehyde	30 minutes	63.4	-	63.4	100

Figures 27 – 29 present maximum predicted 24 hour average PM_{10} concentrations as a result of emissions of construction dust during years 1, 2 and 3 of construction respectively. The results of the modelling of emissions during the construction of the TOT Project identifies potential for exceedences of the criteria levels for PM_{10} in all years, TSP in years 2 and 3 and SO_2 and NO_2 in year 3. All other compounds are predicted to comply with the criteria

throughout the construction period. It should be noted however that these predictions assume worst case uncontrolled emissions and as such are likely to represent a significant over-prediction compared to a construction site operating in accordance with an effective environmental management plan.

Given this, the use of on-site mitigation measures is likely to provide an effective means of control for both dust emissions (PM_{10} and TSP) and gaseous emissions (NO_2 and SO_2) from the site.

Figure 27: Maximum Predicted 24-hour Average Ground Level PM_{10} Concentrations – Year 1 of Construction

Figure 28: Maximum Predicted 24-hour Average Ground Level PM_{10} Concentrations – Year 2 of Construction (µg/m³)

Figure 29: Maximum Predicted 24-hour Average Ground Level PM_{10} Concentrations – Year 3 of Construction (µg/m³)

8.3 CATTLE EXPORT

Modelling of odour emissions from existing Port cattle export operations has been undertaken in accordance with the TOR. The modelling predicts 99.5th percentile ground level odour concentrations for comparison with the Queensland EPA nuisance odour criteria. Table 8.4 presents 99.5th predicted ground level odour concentrations for a vessel exporting odour from Berth 3 and Berth 10.

TABLE 8.4: 99.5th PERCENTILE PREDICTED GROUND LEVEL RECEPTOR CONCENTRATIONS – CATTLE EXPORT (ou)

Berth	Averaging Period	99.5th Percentile Predicted Ground Level Concentration	Criteria
Berth 3	1 hour	44.5	2.5
Berth 10	1 hour	10.4	2.5

The results of the air dispersion modelling of existing odour emissions from the Port indicate that a potential for exceedence of the air quality criteria exists as a result of cattle export activities. Odour is associated with nuisance, or amenity impacts and there is not a direct correlation with physical health impacts.

Validation monitoring of estimated emissions from the odour transport vessel indicate that predictions of potential impacts at the Project Site are likely to provide a reasonable degree of accuracy. Therefore, these exceedences could be expected to result in a reduction in amenity at the Project site while cattle export ships are in berth.

8.4 FUTURE PORT OPERATIONS

Predictions of impacts associated with the future expansion of the Port have been undertaken using estimated emission rates calculated based on existing Port uses. Table 8.5 presents maximum predicted ground level cumulative concentrations assuming a similar emission profile to that of the existing Port operations.

TABLE 8.5: MAXIMUM PREDICTED GROUND LEVEL POLLUTANT CONCENTRATIONS FOR FUTURE PORT ACTIVITIES (µg/m^3)

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
Total Suspended Particulate	1 year	3.2	34.8	38.0	90
PM_{10}	24 hours 1 year	4.5 1.9	37.1 17.4	41.6 19.3	50 50

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
SO_2	1 hour 24 hours 1 year	167.9 58.5 24.0	45.9 45.9 5.1	213.8 104.4 29.1	571 228 57
NO_x	1 hour 1 year	59.0 8.4	34.1 11.7	93.1 20.1	246 63

8.5 TOT EMISSIONS

Predictions of impacts associated with the operation of the TOT has been undertaken using estimated emission rates as provided in Section 7.3. Table 8.6 presents maximum predicted ground level cumulative concentrations assuming a large cruise ship is berthed at the TOT. The modelling assumes the ship is berthed continuously throughout the year hence the maximum predicted ground level concentrations represent a worst case assessment.

TABLE 8.6: MAXIMUM PREDICTED GROUND LEVEL POLLUTANT CONCENTRATIONS FOR TOT OPERATIONS (µg/m^3)

Contaminant	Averaging Period	Maximum Predicted Ground Level Concentration	Existing Ambient Concentration	Maximum Predicted Cumulative Concentration	Criteria
PM_{10}	24 hours	5.9	37.1	43	50
SO_2	1 hour 24 hours 1 year	167.7 34.8 3.1	45.9 45.9 5.1	213.6 80.7 8.2	571 228 57
NO_x	1 hour 1 year	110 2.04	34.1 11.7	144.1 13.74	246 63

9 MITIGATION MEASURES

9.1 CONSTRUCTION EMISSIONS

Modelling of emissions from the construction phase of the Project has identified the potential for exceedences of the criteria for dust emissions. Mitigation of these impacts can be undertaken through the adoption of best environmental practice measures as part of the construction process. The following presents a list of mitigation measures that could be adopted in the construction environmental management plan for the Project to minimise the potential for adverse impacts on surrounding landuses:

- Restricted construction vehicles to designated access tracks and a speed limit of no greater than 20 km/hour;
- Operating and maintaining all plant and equipment in accordance in accordance with best practice measures or manufactures instructions to minimise potential exhaust emissions.
- Inclusion of dust control measures (e.g. water spraying, wood chip layers, wind breaks, etc) on all processes that may generate dust (including all exposed areas and access roads).
- Restrict potential dust-generating activities to low wind periods
- Cover all loads such that dust generation is minimised
- Minimise the potential storage time of material stockpiles. Where stockpiles are required to be stored for extended periods stabilise the surface to prevent wind erosion.
- Stabilise completed construction stages as soon as practicable following completion.
- New equipment purchased for construction shall be selected with regard for fuel and energy efficiency.
- Equipment shall be maintained to retain high levels of fuel and energy efficiency.
- Material transport distances shall be minimised by selecting local suppliers to minimise emission of greenhouse gases in transport of materials.
- Disturbed areas within the construction site shall be progressively stabilised as construction of land fingers proceed to minimise airborne dust.

9.2 ODOUR EMISSIONS

In order to achieve compliance with the air quality goals for odour (which requires compliance for 99.5 % of the year), it would be necessary to- ensure live cattle ships are berthed for no more than 2 days per year (approximately equivalent to 0.05 % of the year). This is likely to be unrealistic and could significantly reduce the ability of the Port to provide export facilities for live cattle.

Odour is associated with nuisance, or amenity impacts and there is not a direct correlation with physical health impacts. Therefore, as an alternative to a reduction in cattle exports from the Port, the potential for occasional odour impacts associated with Port operations should be included in the Port Protection Agreement such that all potential owners of Project land would be notified of potential impacts. The Port Protection Code prepared for the Project could also require all residential buildings be fitted with air conditioners capable of recycling internal air such that internal air quality can be controlled within individual premises during cattle export activities. In addition, it is recommended that the Port Authority be requested to notify the general public in the Townsville area and the Project Body Corporate of scheduled cattle export activities and the potential for odour emissions prior to the event.

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APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Term	Definition
Conversion of ppm to mg/m^3	Where R is the ideal gas constant; T, the temperature in kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows: $\mu g\ m^{-3}$ = (P/RT) x Molecular weight x (concentration in ppm) $= \frac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T°C)}$ For the purposes of the air quality assessment all conversions were made at 25°C.
g/s	grams per second
mg/m^3	milligrams (10^{-3}) per cubic metre. Conversions from mg/m^3 to parts per volume concentrations (ie, ppm) are calculated at 25 degrees Celsius as required by the SEPP(AQM).
$\mu g/m^3$	micrograms (10^{-6}) per cubic metre. Conversions from $\mu g/m^3$ to parts per volume concentrations (ie, ppb) are calculated at 25 degrees Celsius.
ppb	parts per billion.
ppm	parts per million.
VOC	Volatile Organic Compounds. These compounds can be both toxic and odorous.
PM_{10}, $PM_{2.5}$, PM_1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
50th percentile	The value exceeded for 0.5 % of the time.
NO_x	Oxides of nitrogen – a suite of gaseous contaminants that are emitted from road vehicles and other sources. Some of the compounds can react in the atmosphere and, in the presence of other contaminants, convert to different compounds (eg, NO to NO_2).

Term	**Definition**
NO_2	Nitrogen dioxide – one of the group of NO_x compounds that can form through chemical interactions in the atmosphere following emission from the source.

APPENDIX B

GREENHOUSE GAS STUDY REPORT

City Pacific Ltd

TOWNSVILLE OCEAN TERMINAL DEVELOPMENT – GREENHOUSE GAS EMISSIONS

September 2007

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Date Issued:	1 October 2007
Prepared by:	Claire Richardson BSc Hons, MAAS.
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Disclaimer:

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Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Air Noise Environment

Pty Ltd is both complete and accurate. It is further assumed that normal activities were being undertaken at the site on the day of the site visit(s).

CONTENTS

EXECUTIVE SUMMARY

There are a number of gases that have been shown to have the potential to result in global warming. These are called 'Greenhouse gases', or GHG. The Townsville Ocean Terminal Project (TOT) has the potential for GHG emissions during both the construction and operational phase. This report presents the information required to address Sections 4.8.1.1 and 4.8.2.1 of the Final Terms of Reference (TOR) for preparation of an Environmental Impact Statement (EIS) for the proposed TOT project.

Estimates of the potential for direct (eg, emissions during energy consumption) and indirect (eg, emissions during energy production) GHG emissions have been completed for the TOT Project (Section 3.2 and 3.3). These estimates indicate an estimated aggregate GHG emission (as $CO_{2\text{-}e}$) of 163,364 tonnes for the construction phase of the project and 51,353 tonnes per annum for the operational phase.

The change in landuse from marine to reclaimed land has also been considered (Sections 3.2.4 and 4.1). The current estimated GHG sequestration for the marine land area to be reclaimed is estimated at 98.25 tonnes per year (as $CO_{2\text{-}e}$). Once the reclaimed land is developed and the proposed landscaped areas to be incorporated in the development are in place, the landscaped areas are expected to result in sequestration rates of more than 108.6 tonnes per year (as $CO_{2\text{-}e}$) for the first 100 years of the project. Thus, the change in landuse is expected to result in a net increase in sequestration for the first hundred years, relative to the existing sequestration rate of the marine area that will be reclaimed.

Opportunities for managing and minimising GHG have been identified for the construction phase of the project (Section 4.2), and are to be implemented through the Construction Environmental Management Plan. These are as follows:

- *Schedule deliveries of construction materials and/or disposal of waste materials to minimise length and number of trips required, by ensuring full loads and sourcing materials locally where practicable.*
- *Carpooling and buses will be used to transport workers to the site;*
- *Ensure that the construction camp is located as close as practicable to the construction site.*
- *Ensure that on-site vehicles are maintained and operated according to manufacturers instructions to maximise efficiency;*
- *Program works to minimise double handling and materials transfer;*
- *Ensure that vehicles are turned off when not in use;*
- *Where possible, select vehicles and equipment that are efficient (eg avoid using older, less energy efficient vehicles);*
- *Where possible, dispose of wastes to local disposal facilities.*

- *Ensure that equipment is appropriately sized for the task;*
- *Turn electrical equipment off when not in use;*
- *Where practicable, purchase electricity from a renewable or lower emissions source;*
- *Ensure that equipment is well maintained.*

In addition, the project team will encourage selection of biofuels and green energy where possible during the construction phase.

A number of initiatives relating sustainable transport have been included in the development proposals. These include:

- *pedestrians – footpaths and walkways are to be provided on footpath areas and within open space zones;*
- *bicycles – bicycle routes shall be accommodated in a combination of ongrade pathways and within road corridors;*
- *bus set down – bus set down areas will service the main thoroughfare to the Breakwater Cove, TOT and open space areas. The set down areas will service the eastern end of the residential peninsulas;*
- *Taxi – taxi set down areas will service both the TOT and Breakwater Cove Precincts.*

Further opportunities for offsetting or reducing GHG emissions during the design and operation of the TOT Project have also been identified for inclusion in the operational plans and final designs for the proposed buildings (Section 4.3). These are as follows:

- *A focus on selection of low energy use designs, particularly utilising natural ventilation where possible.*
- *Installation of low or zero GHG energy sources such as solar, in line with Townsville's status as the first Solar City in Queensland.*
- *Selection of green energy sources, such as electricity sourced from renewable supplies.*
- *Complete energy efficiency analysis of all plant and equipment requirements for the commercial and multi-unit apartment buildings to ensure energy efficiency during operations is maximised.*
- *Select building products from renewable sources where relevant, and/or sources where life cycle analysis indicates that greenhouse gas emissions are lower than for other products.*
- *Consider purchasing off-site sequestration credits to offset GHG emissions from the facility during construction and operation.*

1 INTRODUCTION

1.1 SCOPE OF STUDY

Air Noise Environment Pty Ltd have been commissioned by Hyder Consulting to complete a greenhouse gas (GHG) emissions and management study for a proposed residential development and cruise ship terminal development to be located on reclaimed land on the Townsville breakwater.

The proposed Townsville Ocean Terminal (TOT) Project ('the Project') will be developed opposite the existing Port of Townsville and adjacent to the existing Townsville Hotel and Casino Complex and the Townsville Entertainment Centre. An Environmental Impact Statement (EIS) is required to identify potential benefits and adverse impacts on the social, economic and ecological environments associated with the proposed development.

The Project consists of the following key components:

- The cruise ship terminal, berthing pocket and associated facilities (the TOT precinct);
- Integrated residential waterfront development (Breakwater Cove precinct) and associated facilities.

The TOT precinct will be constructed within the Western Breakwater of the Port of Townsville and will provide dedicated berthing facilities for the cruise shipping industry and visiting navy ships. The Breakwater Cove precinct will be constructed on reclaimed land to the west of the TOT precinct and will provide waterfront residential properties including attached and detached dwellings and apartment buildings.

1.2 TERMS OF REFERENCE

The Queensland Co-ordinator General released draft terms of reference for the EIS (under Part (4) of the Queensland State Development and Public Works Organisation Act 1971) in October 2006.

With respect to greenhouse gas emissions, the specific requirements of the Terms of Reference were defined as follows:

> *'Greenhouse Gas Emissions*
>
> - *provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO_2 equivalent' terms;*
> - *estimate emissions from upstream activities associated with the proposed project, including fossil fuel based electricity consumed; and*
> - *briefly describe method(s) by which estimates were made.*

The Australian Greenhouse Office Factors and Methods Workbook (available via the internet) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

Greenhouse Gas Abatement

This section of the EIS should propose and assess greenhouse gas abatement measures. It should include:

- *a description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transportation of products and consumables, and energy use by the project and maximising the use of renewable energy sources;*

- *an assessment of how the preferred measures minimise emissions and achieve energy efficiency,*

- *a description of any opportunities for further offsetting greenhouse gas emissions through indirect means. and*

- *Direct means of reducing greenhouse gas emissions could include such measures as:*

  - *minimising clearing at the site (which also has imperatives besides reducing greenhouse gas emissions);*
  - *integrating transport for the project with other local industries such that greenhouse gas emissions from are minimised;*
  - *maximising the use of renewable energy sources.*

The environmental management plan in the EIS should include a specific module to address greenhouse abatement. That module should include:

- *commitments to the abatement of greenhouse gas emissions from the project with details of the intended objectives, measures and performance standards to avoid, minimise and control emissions;*

- *commitments to energy management, including undertaking periodic energy audits with a view to progressively improving energy efficiency;*

- *opportunities for offsetting greenhouse emissions, including, if appropriate, carbon sequestration and renewable energy uses; and*

- *commitments to monitor, audit and report on greenhouse emissions from all relevant activities and the success of offset measures.'*

The requirements of the Terms of Reference are addressed in the studies presented in this report, as detailed in Table 1.1. The environmental management plan for Greenhouse Gases is presented separately in the main EIS document.

TABLE 1.1: COMPLIANCE WITH TERMS OF REFERENCE (TOR)

TOR Requirement	Relevant Section of Report	Notes
Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO_2 equivalent' terms	3.2	
Estimate emissions from upstream activities associated with the proposed project, including fossil fuel based electricity consumed;	3.3	
Briefly describe method(s) by which estimates were made	3.1, 3.2 and 3.3	
A description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transportation of products and consumables, and energy use by the project and maximising the use of renewable energy sources	4.2, 4.3 and 4.4	
An assessment of how the preferred measures minimise emissions and achieve energy efficiency	4.2, 4.3 and 4.4	
A description of any opportunities for further offsetting greenhouse gas emissions through indirect means	4.4	
A description of any opportunities for further offsetting greenhouse gas emissions through direct means	4.3	
Environmental management plan	-	Provided separately in the EIS based on the recommendations made in this report.

1.3 THIS REPORT

This report presents the background, methodology and findings of the greenhouse gas emissions and abatement studies completed for the EIS.

All figures referenced in this report are presented in Appendix A.

2 POTENTIAL GREENHOUSE GAS EMISSIONS

2.1 TYPES OF GREENHOUSE GASES

In 1998 Australia's net greenhouse gas emissions (excluding land use changes) totalled 455.9 million tonnes, 13% more than in 1995. Emissions from energy sources contributed 79.6% of these greenhouse gases. Clearly, energy use is the single major source of greenhouse gas emissions and any improvement in energy efficiency will result in a reduced contribution to global warming.

There are a number of gases that have been shown to have the potential to enhance the natural greenhouse effect of the earth's atmosphere (global warming potential or GWP). GWP varies greatly between greenhouse gases, and is normally given in terms of carbon dioxide equivalent (CO_2-e). The major GHG's are as follows.

- The main greenhouse gas is water vapour. This is the most abundant and dominant greenhouse gas, however, human activity has not had any significant direct impact on its concentration in the atmosphere. The enhanced greenhouse effect attributed to human activity is caused by increases of the following gases.

- Carbon dioxide is released as a result of burning oil, gas, coal, wood and organic waste for energy. It is also generated by land clearing activities and in chemical processes. The concentration of CO_2 has risen 30% over the last 200 years and makes the biggest contribution to the enhanced greenhouse effect (64%).

- Methane is the main constituent of natural gas and makes the next biggest (20%) contribution to global warming. It is released into the air when plant or animal matter decomposes, such as in a tip or land fill and also as part of the digestive processes in cattle. Small amounts of methane are released during coal mining, and may also leak out of faulty gas appliances or gas pipelines.

- Nitrous oxide is released by industrial processes, the burning of vegetation and during soil cultivation and the use of agricultural fertilisers. Small amounts are also released when fuels such as coal and gas are burned in air.

- Halocarbons have been used for many years in air conditioners, refrigerators and certain types of fire extinguisher. These compounds have primarily been responsible for the breakdown of the ozone layer as well as contributing to the greenhouse effect. These gases have been phased out of all new cooling equipment but remain in use in older equipment where they can gradually leak out through deteriorated seals. This group of compounds includes hydrofluorocarbons (HFCs), Hydrofluoroethers (HFEs) and Perfluorocarbons (PFCs).

The GWP of common greenhouse gases (GHG) over a 100 year time horizon is given in Table 2.1.

TABLE 2.1: GLOBAL WARMING POTENTIAL (CO_2-e)

Greenhouse Gas	Global Warming Potential (GWP) in CO_2-e
Carbon dioxide	1
Methane	21
Nitrous Oxide	310
Hydrofluorocarbons (HFCs)	150 – 11,700
Perfluorocarbons (PFCs)	6,500 – 9,200
Sulphur hexafluoride (SF_6)	23,900

2.2 EMISSIONS ESTIMATION

2.2.1 Defining the Scope

Estimation of emissions of GHG's considers both direct and indirect sources for different types of activities and operations.

Direct emissions are produced from the site specific activities of a particular organisation/entity.

For example, a construction company with a fleet of plant and equipment would report greenhouse gas emissions from the combustion of diesel by the plant and equipment as direct emissions. Emission factors for calculating direct emissions are generally expressed in the form of a quantity of a given GHG emitted per unit of energy (kg CO_2-e /GJ) or a similar measure. Emission factors are used to calculate GHG emissions by multiplying the factor (eg, kg CO_2/GJ energy in diesel) with activity data (e.g. kilolitres x energy density of diesel used).

Indirect emissions are emissions generated in the wider economy as a consequence of the activities of a particular organisation or entity (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation. The most important category of indirect emissions is from the consumption of electricity. Other examples of indirect emissions from an organisation's activities include upstream emissions generated in the extraction and production of fossil fuels, downstream emissions from transport of an organisation's product to customers, and emissions from contracted/outsourced activities. The appropriate emissions factor for these activities depends on the parts of upstream production and downstream use considered in calculating emissions associated with the activity.

2.2.2 Project Specific Scope

The Townsville Ocean Terminal development involves the potential for greenhouse gas emissions both during the construction and operational phase. As the proponent and developer for the project, City Pacific has the opportunity to address the potential for greenhouse gas emissions from certain elements of the project life cycle.

There are certain project elements (such as construction of homes on the residential lots) that will be completed by the purchaser. For these aspects of the project, City Pacific does not have direct control hence has limited opportunity for managing or reducing GHG's.

Based on review of the project information, the following aspects of the project have been identified for consideration of the potential for GHG's:

Construction phase:

Direct emissions:

- transport of workers;
- transport of materials;
- dredging;
- compaction, preload, removal of preload, preparation;
- construction of buildings and infrastructure; and
- loss of marine habitat.

Indirect emissions

- upstream energy production costs; and
- upstream manufacturing of construction materials.

Operational emissions:

- resident's transport;
- ships at the Ocean Terminal;
- energy consumption for residents, shops, terminal; and
- offsets from landscaping.

The GHG assessment considers the potential for emissions from these aspects of the project, methods for reducing these emissions and opportunities for greenhouse gas offsets.

2.2.3 Australian Greenhouse Office (AGO) Methodologies

The AGO Factors and Methods Workbook[1] provides a source of greenhouse gas emission factors for use by Australian Organisations when reporting greenhouse gas estimates. The emission factors presented in the workbook are designed to be consistent with international and national emissions estimation methodologies including the international reporting framework of the World Resources Institute/World Business Council for Sustainable Development. This framework is known as The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard ('The GHG Protocol').

The methodologies and emissions estimation equations provided in the 2006 edition of the AGO Factors and Methods Workbook have been adopted for this project.

[1] *AGO Factors and Methods Workbook, December 2006, Australian Government Department of the Environment and Heritage, Australian Greenhouse Office.*

2.3 CURRENT STATUS IN THE LOCALITY

2.3.1 Townsville City Council Planning Scheme

Townsville City Plan (2005)[2] identifies strategies for achieving desired environmental outcomes for environmental management, health and safety. Some of these strategies are relevant from a greenhouse gas emission perspective including the following:

- Ensure development incorporates appropriate air, water, noise and light pollution control measures.
- Encourage and facilitate development that incorporates cleaner development principles and implement best practice pollution technology and waste stream reduction.
- Encourage and facilitate the co-location of uses where this will promote a reduction in air pollution emissions.
- Encourage the use of public transport, cycling and walking in order to reduce vehicle emissions.
- Require site layout and building design to incorporate best practice measures for ecological sustainability, including climatically responsive, energy efficient, water sensitive approaches which minimise impacts on non renewable resources, sensitive land and water resources.
- Facilitate the integration of land uses, transit systems and the consolidation of communities to reduce reliance on the private motor vehicle and to conserve energy and promote efficiency.
- Require prudent use of natural resources through the implementation of conservation strategies.

Many of these strategies can only be considered at the detailed design stage of the proposed development. However, broader strategic planning issues such as transport access and facilities associated with the development are a relevant issue at the EIS stage. These aspects of the proposal are commented on from a greenhouse gas perspective in this report.

2.3.2 Solar City Designation

Townsville was named the first Solar City in Queensland, and the second of three in Australia, in September last year. Through the initiative, Townsville City Council, a member of Environs Australia, is set to help cut greenhouse gas emissions by more than 50,000 tonnes, as well as improve energy efficiency and lower residents' energy bills.

The Solar Cities program falls under the Federal Government's climate strategy. The $75.3 million program is designed to demonstrate how solar power, smart meters and energy efficiency can provide a sustainable energy future in urban locations throughout Australia. It involves all levels of government, the private sector and the local community.

[2] *Townsville City Council, Townsville City Plan 2005, Volume 1, Part 3.*

In Townsville, the program will be administered by the Townsville: Queensland Solar City consortium. The Townsville program will involve the installation of solar panels in 500 homes and business, the rollout of 2500 smart meters and 1700 in-house energy display meters and the provision of energy efficiency advice to help thousands of households and businesses save on their electricity bills.

2.3.3 Energy Efficiency Requirements

Townsville City Council clearly specifies that all new residential development must comply with the new building code provisions for energy efficiency. Energy efficiency provisions for housing in the Building Code of Australia (Amendment 13) took effect in Queensland in September 2003, and apply to all Class 1 buildings and sole occupancy Class 2 buildings. These new building codes for energy and water efficiency in new buildings and renovations of toilets and bathrooms within these classes of buildings were implemented on 1 March 2006.

The new building code is intended to increase energy efficiency, increase water efficiency and reduce greenhouse gas emissions. The code applies throughout Queensland and includes the following measures relevant to management of greenhouse gas emissions:

- Forty percent (40%) of total floor area of new homes shall be installed with fluorescent lights or externally ballasted compact fluorescent lights (CFLs)

- New Class 1 buildings are to have hot water supplied by an energy efficient hot water system with low greenhouse gas emissions impact with options including a heat pump or solar hot water system eligible to receive at least 22 Renewable Energy Certificates, or in a building with one of two bedrooms, at least 14 Renewable Energy Certificates, or a gas hot water system with Five Star Energy Rating

The purpose of the new regulations is to reduce greenhouse gas emissions by encouraging the use of good design and construction methods to make houses cooler in summer, reducing the need for air conditioning.

3 EMISSIONS CALCULATIONS

3.1 METHODOLOGY

The potential sources of GHG identified in Section 2.2.2 are considered in the following sections. Details of the assumptions made and methodologies assumed for the calculations are identified for each source of GHG emissions.

3.2 ESTIMATION OF DIRECT EMISSIONS

3.2.1 On-Site Construction Activities

The major on-site construction activities with a potential for emission of GHG are associated with construction plant. Details of the expected construction equipment to be operated at the site have been provided as detailed in Table 3.1.

TABLE 3.1: CONSTRUCTION PLANT AND EQUIPMENT

Equipment Type	**Year 1**	**Year 2**	**Year 3**
	Number		
Common Equipment to all Areas			
Sheet Piling	1	0	0
Driven Piles	1	1	1
Barges SLV 500	2	2	2
Dewatering Pump	1	1	1
Pile Breakers	1	2	1
Bulk Earth Works			
100 t Digger	0	2	2
12 G Grader	4	1	1
16 G Grader	0	2	2
30t Excavator	0	1	1
40t Excavator	10	5	2
65t Excavator	2	3	3
825C 4 Wheel Compactor	0	2	2
988 Wheel Loader	2	2	1
Cat 740 40t Articulated Truck	8	7	9
D6 Dozer	3	1	1
D6 LGP Swamp dozer	0	5	7
HD 465 Rigid Dump Truck	0	7	9
Self Propelled Roller	0	1	1
Tandem Water Truck	3	2	3
40 t Crane	0	0	1
Franna Crane	0	1	1
Civil Works			

Equipment Type	**Year 1**	**Year 2**	**Year 3**
	Number		
Excavators	0	0	2
Backhoe	0	0	1
Ditch Witch Trencher	0	0	1
Dozers / Drotts	0	0	2
Grader	0	0	2
Kerb Machine	0	0	1
Water Truck	0	0	2
Sheep foot Roller	0	0	2
Steel Drum Roller	0	0	2
Ridged Dump Trucks	0	0	3
A.C Placing Plant	0	0	1
Moxy Truck	0	0	3
Franna Crane	0	0	1
Terminal Construction Works			
Excavators	0	1	0
Backhoe	0	1	0
Bob Cat	0	0	1
Clamshell Digger / Dragline	0	1	0
Cranes Franna	0	1	1
Cranes 40 t	0	1	1
Scissor Lift	0	1	1

To provide an estimate of GHG emissions from operation of this plant on site, the following assumptions have been made:

- Hours of operation for the construction works are 7 am to 4 pm Monday to Friday and 8 am to 12 pm Saturdays.

- All plant is assumed to be operational for 100 % of the available construction hours.

The AGO Factors and Methods Workbook (2006)[3] provides GHG emissions per litre of fuel. Construction plant are assumed to be equivalent to heavy trucks using diesel fuel for the purpose of these calculations, operating at a speed of 10 kph. The fuel consumption data for barges has been based on, Table 3.2 presents the $CO_{2\text{-}e}$ emissions for on-site operation of construction plant.

[3] *Australian Government, Department of Environment and Heritage, Australian Greenhouse Office, AGO Factors and Workbook, December 2006.*

TABLE 3.2: GHG EMISSIONS FOR ON-SITE PLANT

Year of Project	Number of Construction Plant	Fuel Consumption Rate (L/km)	Total Fuel Consumed (L)	$CO_{2\text{-}e}$ Emission (t) per kL	$CO_{2\text{-}e}$ Emission (tonnes)
1	36 2 (barges)	0.55[1] 5.75[2]	504,504 292,832	3.0 3.3	1,514 966
2	52 2 (barges)	0.55[1] 5.75[2]	728,728 292,832	3.0 3.3	2,186 966
3	76 2 (barges)	0.55[1] 5.75[2]	1,065,064 292,832	3.0 3.3	3,195 966
				Total:	**9,794**

[1] *Australian Bureau of Statistics, Survey of Motor Vehicle Use in Australia, 2003.*
[2] *Estimates for Total Fuel Consumption in Transporting Grain from Iowa to Major Grain Countries by Alternative Modes and Routes, C. Philip Baumel, Charles R. Hurburgh, and Tenpao Lee, 2006.*

3.2.2 Import of Material

Import of materials to the site is a significant component of the construction phase due to the large areas of reclaimed land incorporated into the development. Based on the preferred construction methodology, Table 3.3 summarises the quantities of materials that are expected to be imported for the project.

TABLE 3.3: SUMMARY OF IMPORTED MATERIALS

Material	Quantity	Source	Mode of Delivery
Quarried material (rock, engineering fill and sand)	1,662,062 m^3	Quarry	1,389,918 m^3 by road 272,144 m^3 by road and barge
Revetment Precast Panels	12,530 m^3	Casting site	All by road
Geotextile fabric	70,574 m^2	Local supplier	All by road
Membranes	29,692 m^2	Local supplier	All by road
Sheet piles	205 lm	Casting site	All by road

The source locations for the materials are not fully established at this stage of the project. Quarry material is expected to be sourced from Pinnacle Quarry, Marthon Quarry and/or Roseneath Quarry. Cast product, geotextile fabrics and membranes are expected to be sourced locally, probably from suppliers within the Townsville City Council or Thuringowa City Council area. Expected trip lengths (one-way) for supply of materials from these locations are as follows (refer to Figure 1):

- Pinnacle Quarry to site: 24 km.
- Marthon Quarry to site: 40.4 km.
- Roseneath Quarry to site: 19 km.
- General local supplies: 5 km.

To be conservative, for the quarried material, all deliveries are assumed to be from Marthon Quarry.

Where materials are transported partly by road, partly by barge, the road trip length is shortened by approximately 3 km. The barge trip to the site is approximately 4 km (one way) from the Riverside Marine site (at Eighth Avenue) where material will be loaded.

The construction methodology prepared for the project nominates the total number of quarried material deliveries for the project as 51,088. Delivery details for other materials have not been provided, but have been estimated based on typical loading rates. It is noted that the deliveries associated with other materials will be relatively low in comparison to the haul of quarried material, hence the adoption of estimates for these deliveries is not likely to significantly affect the overall outcome of the calculations.

Based on the available information for the construction programme, the total travel distances for supply of the imported materials have been estimated as shown in Table 3.4.

TABLE 3.4: DISTANCES FOR IMPORT OF MATERIALS BY ROAD

Material	Trip Length (km) (return)	Number of Trips (return)	Total Distance (km)
Quarried material	80.8[1] 74.8[2]	42,722 8,365	3,452,011 625,708
Revetment Precast Panels	10	1,566	15,663
Geotextile fabric	10	1,412	14,115
Membranes	10	594	5,938
Sheet piling	10	52	513
		Total:	**4,113,948**

[1] *Road delivered only*
[2] *Road and barged.*

The AGO Factors and Methods Workbook (2006)[4] provides fuel consumption rates by vehicle type and GHG emissions per litre of fuel. Assuming that the haul trucks are equivalent to heavy trucks using diesel fuel, Table 3.5 presents the $CO_{2\text{-}e}$ emissions for material haul by road.

[4] *Australian Government, Department of Environment and Heritage, Australian Greenhouse Office, AGO Factors and Workbook, December 2006.*

TABLE 3.5: GHG EMISSIONS FOR MATERIAL HAUL BY ROAD

Distance travelled (km)	Fuel Consumption Rate (L/km)[1]	Total Fuel Consumed (L)	CO_{2-e} Emission (t) per kL	CO_{2-e} Emission (tonnes)
4,113,948	0.55	2,262,671	3.0	6,788

[1] *Australian Bureau of Statistics, Survey of Motor Vehicle Use in Australia, 2003.*

Similar calculations have been completed for the additional transport of a portion of the quarried material by barge. The fuel consumption rate for the 500 tonne barge has been estimated as 5.75 litres per km. Results of the calculations are presented in Tables 3.6 and 3.7.

TABLE 3.6: DISTANCES FOR IMPORT OF MATERIALS BY BARGE

Material	Trip Length (km) (return)	Load Size	Number of Trips (return)[1]	Total Distance (km)
Quarry Rock	8	500 tonne	218	1,742

[1] *Assuming a rock mass of 2.5 kg per m^3.*

TABLE 3.7: GHG EMISSIONS FOR MATERIAL HAUL BY BARGE

Distance travelled (km)	Fuel Consumption Rate (L/km)[1]	Total Fuel Consumed (L)	CO_{2-e} Emission (t) per kL	CO_{2-e} Emission (tonnes)
1,742	5.74	9,998	3.3	33

[1] *Estimates for Total Fuel Consumption in Transporting Grain from Iowa to Major Grain Countries by Alternative Modes and Routes, C. Philip Baumel, Charles R. Hurburgh, and Tenpao Lee, 2006.*

3.2.3 Off-Site Construction Activities

Apart from import of materials, the other major off-site source of GHG emissions during construction is associated with transport of workers to the site. Details of likely numbers of construction workers is not presently available, therefore estimates have been made based on the number of items of construction plant to be provided on site.

It is assumed that each item of plant will have an operator, and there will be additional requirements for supervisory staff and for other trades people throughout the project. To provide an indication of likely numbers of construction personnel, it is assumed that the work force is equivalent to the number of plant on site multiplied by 10. It is assumed that all personnel travel from Townsville City Centre to the work site, a distance of 10 km return.

The AGO Factors and Methods Workbook (2006)[5] provides fuel consumption rates by vehicle type and GHG emissions per litre of fuel. Workers vehicles are assumed to be comprised of 50 % light petrol vehicles and 50 % light commercial diesel vehicles (eg, utility vehicles).

[5] *Australian Government, Department of Environment and Heritage, Australian Greenhouse Office, AGO Factors and Workbook, December 2006.*

Table 3.8 presents the CO_{2-e} emissions for transport of construction workers to and from the site on the basis of these assumptions.

TABLE 3.8: GHG EMISSIONS FOR TRANSPORT OF WORKERS

Year of Project	Number of Workers (Vehicle Fuel)	Fuel Consumption Rate (L/km)[1]	Total Fuel Consumed (L)	CO_{2-e} Emission (t) per kL	CO_{2-e} Emission (tonnes)
1	(Petrol) (Diesel)	0.14 0.15	81,273 88,920	2.6 3.0	211 267
2	(Petrol) (Diesel)	0.14 0.15	115,493 126,360	2.6 3.0	300 379
3	(Petrol) (Diesel)	0.14 0.15	166,823 182,520	2.6 3.0	434 548
				Total:	**2,139**

[1] *Australian Bureau of Statistics, Survey of Motor Vehicle Use in Australia, 2003.*

3.2.4 Landuse Related Changes

The proposed development is to be located on reclaimed land. Thus, the area to be developed is currently part of the marine environment. In terms of potential for greenhouse gas emissions, the following issues are relevant to the marine environment:

- the capacity of the ocean to sequester carbon dioxide;
- the loss of aquatic animals, particularly algae, that can act as carbon sinks;
- loss of sea vegetation, particularly on the seabed, that can also act as carbon sinks; and
- coverage of the surface sediments, which act as a significant carbon sink.

In the case of the TOT project, the landfill that is to take place will simply displace the ocean. Furthermore, no changes in temperature of the surrounding water are expected to occur as a result of the project. Therefore, on this basis, the ability of the ocean to sequester carbon dioxide is not likely to be affected.

Similarly, although there is potential for some loss of vegetation that could affect populations of aquatic organisms, overall the effect of the landfilling is likely to be a displacement of species.

The potential loss of sea bed vegetation and coverage of the sediments are more significant issues, and estimations of the carbon emissions associated with these changes have been completed on the basis of published data. These calculations have assumed that the area to be filled is equivalent to pristine marine habitat. This is a conservative assumption, as the development site is located in close proximity to the Port of Townsville. Because of this the existing marine environment is likely to be degraded to a certain extent due to the commercial shipping activities in the area.

Based on the plans of the proposed development, the area to be filled is a total of 32.25 Ha. In terms of calculating carbon dioxide emissions, the Australian Greenhouse Office does not publish emissions estimation techniques for loss of marine vegetation and sediments. The

available emissions estimation techniques relate to land based habitats[6,7]. Overseas data has been published[8], and has been adopted for the calculation of sea bed emissions due to the absence of methods that have been specifically developed for Australian conditions.

Duarte et al estimate carbon burial rates for non-vegetated ocean sediments as well as vegetated habitats. These estimates indicate that the carbon burial rates are significantly higher for vegetated habitats than non-vegetated, hence the higher burial rates have been adopted. Burial rates are nominated for three habitats – mangroves, salt marsh and sea grass. For the TOT project, the seagrass classification is the only habitat with potential relevance hence burial rates for this type of vegetation have been assumed. The nominated burial rate for sea grass is 83 g C m^{-2} y^{-1}. Table 3.9 presents the calculated CO_2 sequestration rate per year that will be lost, based on this burial rate.

TABLE 3.9: GREENHOUSE GAS EMISSIONS FROM LANDUSE CHANGE

Marine Habitat Area to be Infilled (m^2)	Carbon Burial Rate (g C m^{-2} y^{-1})	Tonnes Carbon Buried per Year	Tonnes CO_2 emissions per Tonne Carbon	Current CO_2 Sequestration Rate for Habitat Area (Tonnes per Year)
322,550	83	26.77	3.67	98.25

3.3 ESTIMATION OF INDIRECT EMISSIONS

3.3.1 Building Construction

The proposed commercial and residential buildings at the development are also a significant source of upstream greenhouse gas emissions. The proposed layout for the development comprises areas of multi-unit dwellings, mixed use commercial and residential, lots for attached and detached dwellings and the separate Ocean Terminal precinct which is solely commercial. The upstream greenhouse gas emissions associated with construction of these buildings has been calculated.

The Project Architect (Buchan Group) have provided details of the expected floor areas of the proposed multi-unit dwellings and commercial areas as follows:

- Multi-unit dwellings: 59,300 m^2.
- Retail: 11,075 m^2.
- Ocean Terminal: 1,000 m^2.

[6] *National Carbon Accounting System, Greenhouse Gas Emissions from Land Use Change in Australia: An Integrated Application of the National Carbon Accounting System, Australian Greenhouse Office, 2003.*
[7] *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2005, Land Use, Land Use Change and Forestry, National Greenhouse Gas Inventory Committee, Department of the Environment and Heritage, Australian Greenhouse Office.*
[8] *C M Durarte, J J Middelburg, and N Caraco, Major role of marine vegetation in the oceanic carbon cycle, Biogeosciences, 2, 1-8, 2005, European Geosciences Union.*

A significant portion of the development area comprises lots that will be sold for the purposes of constructing detached or semi-detached dwellings. The number of allotments proposed is as follows:

- Waterfront lots for detached dwellings: 219.
- Waterfront lots for semi-detached dwellings: 47.

As the size of dwellings to be constructed on these lots depends upon the purchaser, estimates of the likely floor areas have been made. These estimates have been based on data from the Australian Bureau of Statistics for average dwelling sizes in Queensland[9].

In Queensland, the average floor area for new dwellings constructed in 2002/03 was 232.8 m^2. This average floor area is likely to underestimate the floor area for the lots at the development site. This is because waterfront lots of this type are premium development sites, and the size of dwellings constructed on these lots is likely to be significantly higher than the average in Queensland. Therefore, to provide an estimate of the likely dwelling sizes, the average for Queensland has been increased by 50 % for the semi-detached dwellings and by 100 % for the detached dwellings. This results in the following floor areas:

- 219 detached dwellings @ 465.6 m^2 = 101,966 m^2.
- 47 semi-detached dwellings @ 349.2 m^2 = 16,412 m^2.

This gives an estimated total floor area for the individual lots of 118,378 m^2.

Calculations of indirect greenhouse gas emissions for construction of these buildings has been calculated on the basis of published data relating to the embodied energy in various types of building[10]. Embodied energy is defined as the energy required to directly or indirectly manufacture a product. In the case of a building, this includes the direct energy used for on-site construction activities, plus the indirect energy embodied in the building materials themselves. Table 3.10 presents the estimated GHG due to indirect emissions associated with the building construction stage of the project.

TABLE 3.10: GREENHOUSE GAS EMISSIONS FROM BUILDING CONSTRUCTION

Building Type	Floor Area (m^2)	Greenhouse Gas Emission Rates (Tonnes per m^2)	Tonnes GHG
Dwellings on Individual Lots	118,378	0.754	89,257
Multi-Unit Dwellings	59,300	0.748	44,356
Commercial (Retail)	11,075	0.89	9,857
Commercial (Ocean Terminal)	1,000	1.14	1,140

[9] *Average Floor Area of New Dwellings, Published in Building Approvals, Australia, 2003.*
[10] *Lifecycle Energy Consumption and Greenhouse Gas Emissions Estimates and Projections for Queensland Building, Construction and Associated Industries Sector, report for The Built Environment Research Unit, Building Division, Public Works Department, Queensland, February 2000.*

3.3.2 Operational Emissions from Buildings

During the operational phase of the project, indirect greenhouse gas emissions will primarily relate to the energy used in operating the proposed commercial and residential buildings at the development.

Using the same data relating to floor areas, the potential annual greenhouse gas emissions from the buildings at the development has been calculated. The Australian Greenhouse Gas Office indicates that typical households emit 14 tonnes of CO_{2e} per annum. On the basis that the proposed dwellings will be 'premium' type properties it is likely that the majority will have air conditioning and higher than average energy usage. Therefore, it is assumed that the households at the development site could have 50 % higher emissions than a typical Australian household. On this basis, the GHG emissions per annum for the operation of the new dwellings is calculated as follows:

- Number of dwellings (households): 214 apartments plus 266 dwellings = 480
- GHG emission rate per household: 14 tonnes CO_{2-e} per annum.
- Total emission rate: 10,800 tonnes CO_{2-e} per annum.

GHG emissions estimations for the commercial premises have been based on published estimates of emissions for energy consumption[11,12]. The GHG emissions estimates for the commercial uses do not include emissions from transport. This information is not readily available, and the greenhouse gas estimates for households include an estimate of transport a component of which would relate to leisure activities including shopping. On this basis, for the purposes of the project the calculations are based solely on energy use. These emission estimates are presented in Table 3.11.

TABLE 3.11: GREENHOUSE GAS EMISSIONS – COMMERCIAL BUILDING OPERATION

Building Type	Floor Area (m^2)	Greenhouse Gas Emission Rates (Tonnes per m^2)	Tonnes GHG per Annum
Commercial (Retail)	11,075	3.19	35,329
Commercial (Ocean Terminal)	1,000	4.1	4,100

3.3.3 Cruise Ship Emissions

When the cruise terminal opens, it is estimated that there will be an increase from the current use of 7 – 8 visiting cruise ships a year to approximately 20 cruise ships. per year visiting Townsville. The number of military vessels using the facility is not confirmed but it is likely that increase from approximately 30 vessels to 40 to 50 military vessels would use the facility every year. For the purposes of estimating GHG emissions, it is assumed that an additional 13

[11] *Strategic Study of Household Energy and Greenhouse Issues, Prepared by Sustainable Solutions Pty Ltd for the Australian Greenhouse Office, June 1998.*
[12] *Lifecycle Energy Consumption and Greenhouse Gas Emissions Estimates and Projections for Queensland Building, Construction and Associated Industries Sector, report for The Built Environment Research Unit, Building Division, Public Works Department, Queensland, February 2000.*

cruise ships and 20 defence ships will utilise the facility with an average docking period of 2 days.

Whilst berthed at the Ocean Terminal, the vessels would primarily operate on auxiliary engines for the various power needs of the vessel. Based on data published by the US EPA, the auxiliary power fuel consumption is assumed to be 5 % of fuel consumption enroute.

Table 3.12 presents the estimated GHG emissions for docked cruise ships and defence vessels, per year.

TABLE 3.12: GHG EMISSIONS FOR CRUISE AND DEFENCE SHIPS

Number of Ships per Year	Number of Hours per Year	Fuel Consumption Rate (L/hr)[1]	Total Fuel Consumed (L)	CO_{2-e} Emission (kg) per kL	CO_{2-e} Emission (t) per Year
12 Cruise	624	223.13	139,231	3.0	418
20 Defence	960	223.13	214,201	3.3	707

[1] *United States Environment Protection Agency, Analysis of Commercial Marine Vessels and Fuel Consumption Data, EPA420-R-00-002, February 2000.*

3.4 SUMMARY OF AGGREGATE EMISSIONS

Based on the data presented in previous sections, Tables 3.13, 3.14 and 3.15 present a summary of the overall GHG emissions estimated to be associated with the proposed TOT project.

TABLE 3.13: GHG EMISSIONS FOR CONSTRUCTION PHASE

Source/Activity	CO_{2-e} Emission (tonnes)
On-site construction plant	9,794
Materials haul by road	6,788
Materials haul by barge	33
Transport of workers	2,139
Building construction	144,610
Total:	**163,364**

TABLE 3.13: GHG EMISSIONS FOR OPERATIONAL PHASE

Source/Activity	CO_{2-e} Emission (tonnes/yr)
Domestic Emissions	10,800
Commercial Energy Consumption	39,429
Ships at berth	1,124
Total:	**51,353**

TABLE 3.15: GHG EMISSIONS – LANDUSE RELATED

Source/Activity	$CO_{2\text{-}e}$ Emission (tonnes/yr)
Loss of marine land	98.25

4 GREENHOUSE GAS ABATEMENT

4.1 GREENHOUSE GAS OFFSETS

A detailed landscape plan has been prepared for the proposed development and incorporates significant areas of vegetation as shown on Figure 2. The areas of vegetation to be provided have been calculated as 2.99 Ha. The types of vegetation that are to be provided are predominantly native species and a mixture of trees, shrubs and groundcover is to be planted.

The Kyoto Protocol defines forest as '*a minimum area of land of 0.05-1.0 Ha with tree crown cover (or equivalent stocking level) of more than 10 – 30 % with trees with a potential to reach a height of 2 – 5 m at maturity*'. Review of the landscape plans for the project confirms that:

- The total vegetated area is a total of 2.99 Ha. Whilst this total area is somewhat fragmented into the various landscaped areas, there are a number of contiguous areas of landscaping to be provided that will exceed 0.05 Ha at the development.

- A significant portion of the proposed planting comprises trees with a potential height at maturity well in excess of 2 m (eg, Hoop Pine and Banyan Fig).

- The stocking level for the trees is such that in excess of 10 % of the majority of landscaped areas will be covered by canopy when the trees reach maturity.

On this basis, and in the absence of available emission factors for ornamental landscaped areas, carbon dioxide sequestration rates have been calculated on the basis of data for native forests[13]. Sequestration rates are greatest for juvenile planting, hence rates have been calculated for a range of maturity levels to provide an indication of the range of sequestration rates that may occur.

Table 4.1 presents the calculated CO_2 sequestration rate per year for the landscaped areas when initially planted, and when they reach maturity.

[13] *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2005, Land Use, Land Use Change and Forestry, National Greenhouse Gas Inventory Committee, Department of the Environment and Heritage, Australian Greenhouse Office.*

TABLE 4.1: CARBON DIOXIDE SEQUESTRATION RATES FOR LANDSCAPED AREAS

Landscaped Area to be Provided (Ha)	Carbon Sequestration Rate (t C Ha y^{-1})	Tonnes Carbon Sequestered per Year	Tonnes CO_2 emissions per Tonne Carbon	Future CO_2 Sequestration Rate for Landscaped Area (Tonnes per Year)
29.9	4.24 (Yr 1 – 10)	126.8	3.67	465.3
29.9	2.8 (Yr 11 – 30)	83.7	3.67	307.3
29.9	0.99 (Yr 31 – 100)	29.6	3.67	108.6
29.9	0.18 (Yr 100 - 200)	5.4	3.67	19.75

The sequestration rates presented in Table 4.1 indicate that the CO_2 sequestration in landscaped areas at the development will fully offset the loss of the marine habitat as a CO_2 sink for the first hundred years of the project. In the initial 30 years as the vegetation establishes, there will be a net increase in CO_2 sequestration based on these calculations.

It is noted that there will also be additional CO_2 sequestration by additional planting by owners of the individual dwelling allotments. Assuming an area of 25 m^2 per lot was provided, approximately a further 0.6 ha of vegetation would be provided that would act as a further means of greenhouse gas sequestration.

4.2 MINIMISING GHG EMISSIONS DURING CONSTRUCTION

Mitigation options to be implemented during construction to reduce GHG emissions will focus on minimisation of fuel and energy use. Measures that are proposed include the following:

- Schedule deliveries of construction materials and/or disposal of waste materials to minimise length and number of trips required, by ensuring full loads and sourcing materials locally where practicable.
- Carpooling and buses will be used to transport workers to the site;
- Ensure that the construction camp is located as close as practicable to the construction site.
- Ensure that on-site vehicles are maintained and operated according to manufacturers instructions to maximise efficiency;
- Program works to minimise double handling and materials transfer;
- Ensure that vehicles are turned off when not in use;

- Where possible, select vehicles and equipment that are efficient (eg avoid using older, less energy efficient vehicles);
- Where possible, dispose of wastes to local disposal facilities.
- Ensure that equipment is appropriately sized for the task;
- Turn electrical equipment off when not in use;
- Where practicable, purchase electricity from a renewable or lower emissions source;
- Ensure that equipment is well maintained.

In addition, the project team will encourage selection of biofuels and green energy where possible during the construction phase.

These greenhouse gas minimisation measures will be incorporated in the final construction program design, contract documentation and site induction procedures as appropriate.

4.3 MINIMISING GHG EMISSIONS DURING OPERATIONS

A number of initiatives relating sustainable transport have been included in the development proposals. These include:

- pedestrians – footpaths and walkways are to be provided on footpath areas and within open space zones;
- bicycles – bicycle routes shall be accommodated in a combination of ongrade pathways and within road corridors;
- bus set down – bus set down areas will service the main thoroughfare to the Breakwater Cove, TOT and open space areas. The set down areas will service the eastern end of the residential peninsulas;
- Taxi – taxi set down areas will service both the TOT and Breakwater Cove Precincts.

For operation of commercial and residential buildings, it is recommended that the project incorporates design recommendations that include the following:

- A focus on selection of low energy use designs, particularly utilising natural ventilation where possible.
- Installation of low or zero GHG energy sources such as solar, in line with Townsville's status as the first Solar City in Queensland.
- Selection of green energy sources, such as electricity sourced from renewable supplies.

- Complete energy efficiency analysis of all plant and equipment requirements for the commercial and multi-unit apartment buildings to ensure energy efficiency during operations is maximised.

- Select building products from renewable sources where relevant, and/or sources where life cycle analysis indicates that greenhouse gas emissions are lower than for other products.

- Consider purchasing off-site sequestration credits to offset GHG emissions from the facility during construction and operation.

5 CONCLUSIONS AND RECOMMENDATIONS

Estimation of greenhouse gas emissions (GHG) for the proposed project have been completed. These are as follows:

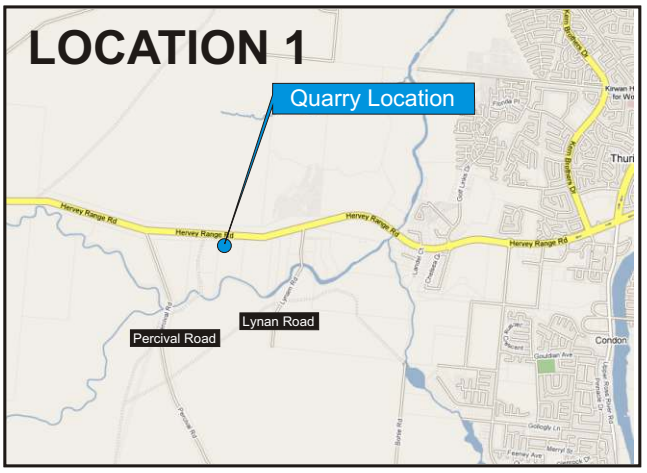
- 161,462 tonnes GHG for construction related activities;
- 383,750 tonnes GHG per year for operational activities.

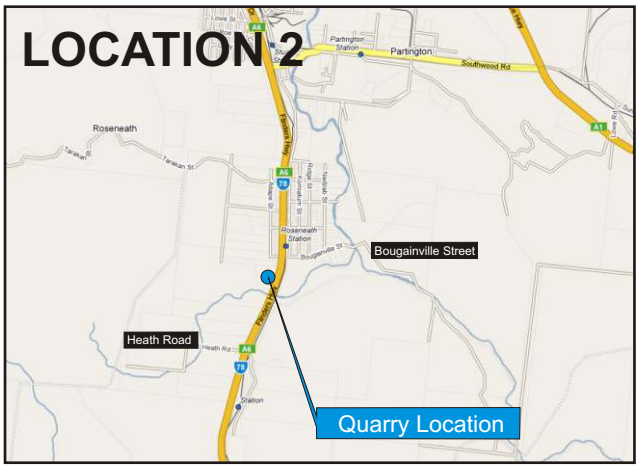
In addition, a loss of GHG sequestration capability equivalent to 98.25 tonnes GHG per year has been estimated for loss of marine habitat. This is abated by GHG sequestration associated with the proposed landscaping on the site. This is estimated to result in sequestration of > 100 tonnes per year for the first hundred years following planting, thus fully offsetting the emissions associated with the loss of marine habitat.

A series of mitigation and abatement measures to reduce the estimated emissions for the construction and operational phases have been presented. The possibility of purchasing carbon credits to offset the balance of emissions associated with the project should also be considered.

APPENDIX A

FIGURES





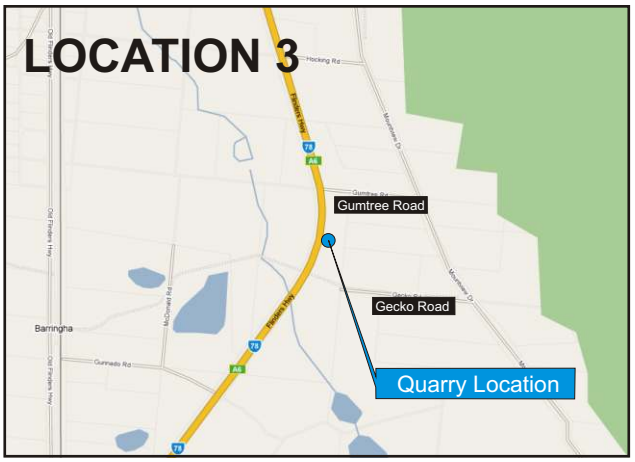


Figure 1: Quarry Locations

P:\1496\Report\Figure 1.cdr

Air Noise Environment

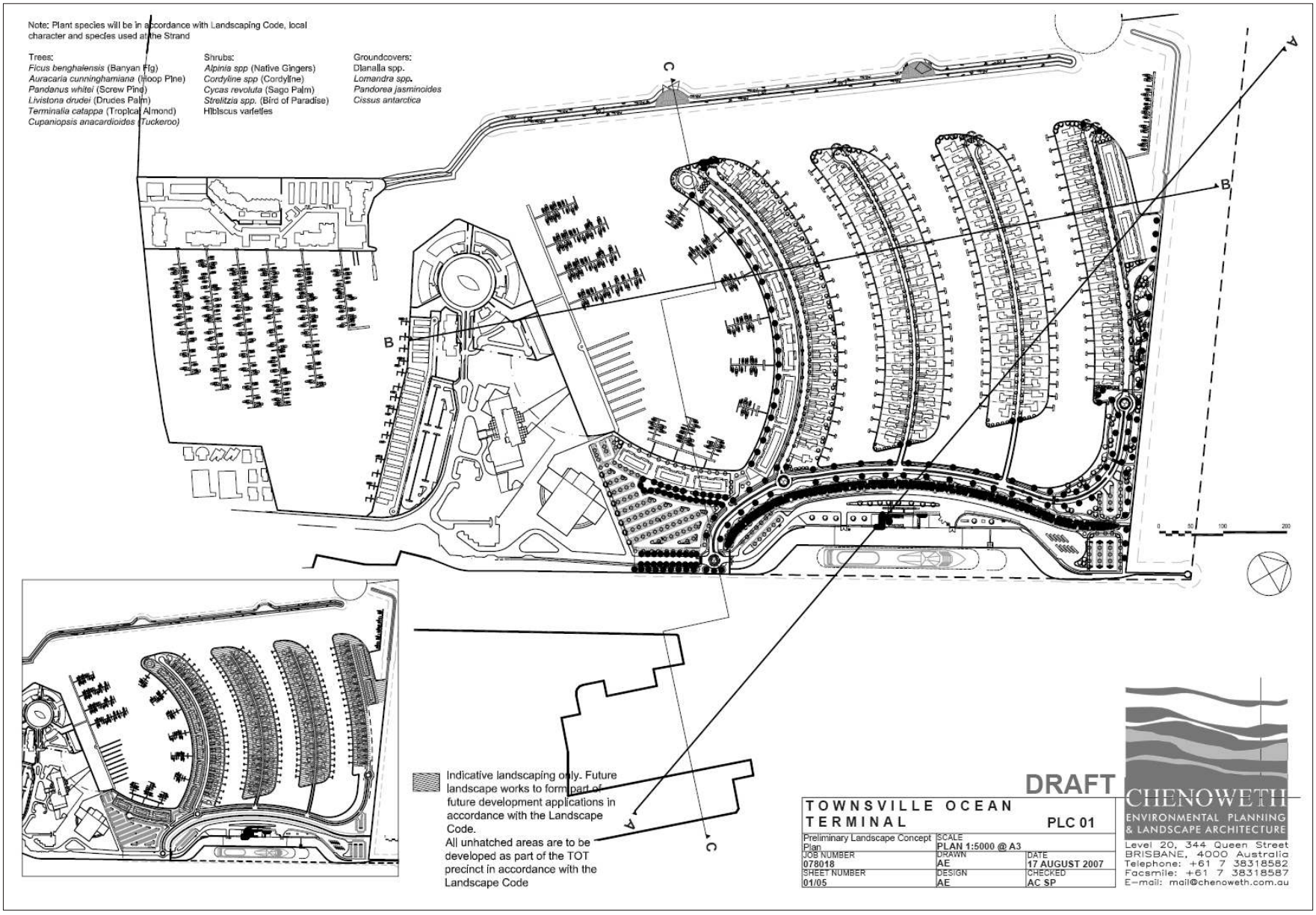


Figure 2: Preliminary Landscape Concept Plan

APPENDIX C

EXAMPLE SHIPPING SCHEDULE

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
EUROPEAN HIGHWAY	4	Motor Vehicles	NIL	01/01/2007 07:10	01/01/2007 11:15	Discharge Cargo	Monson Agencies Aust
CHEKIANG	A/3	Containers	Containers Refined Copper	01/01/2007 08:46	02/01/2007 02:42	Discharge/Load	Oceania Maritime Serv
TROPIC SUNSEEKER	10	NIL	NIL	01/01/2007 14:45	02/01/2007 06:55	Take on Bunkers	-
NAMHAE GAS	A/1	LPG	NIL	01/03/2007 06:05	01/03/2007 15:40	Discharge Cargo	Oceania Maritime Serv
ECO PROGRESS	3	Concentrates	NIL	01/04/2007 14:15	03/04/2007 12:00	Discharge Cargo	Monson Agencies Aust
MATIRA	9	NIL	Sugar	01/05/2007 07:55	02/05/2007 18:25	Load Cargo	Inchcape Shipping Serv
JASMINE	1	NIL	Fuels	01/06/2007 01:58	02/06/2007 12:31	Discharge Cargo	Inchcape Shipping Serv
LAKE ARUFURA	11	NIL	Concentrates	01/06/2007 10:58	02/06/2007 09:50	Load Cargo	Barwil Agencies
NEW CREATION	9	NIL	Sugar	01/06/2007 18:27	02/06/2007 20:47	Load Cargo	Inchcape Shipping Serv
DARYA GYAN	A/9	Nil Cargo	Sugar	01/08/2006 05:17	02/08/2006 17:50	Load Cargo	Inchcape Shipping Serv
DIAMOND GLORY	A/2	Nickel Ore	NIL	01/08/2006 05:50	02/08/2006 07:55	Discharge Cargo	Barwil Agencies
DESTINO DOS	A/7	NIL	Concentrates	01/08/2006 11:00	02/08/2006 11:27	Load Cargo	Monson Agencies Aust
ADVANCE II	1	Fuels	NIL	01/08/2006 14:02	02/08/2006 08:47	Discharge Cargo	Barwil Agencies
GETALDIC	A/7	Nil Cargo	Fertilizer	01/09/2006 06:42	04/09/2006 12:58	Load Cargo	Townsville Shipping Ag
TRANSFRIENDSHIP	A/11	Nil Cargo	Concentrates	01/09/2006 18:40	04/09/2006 12:32	Load Cargo	Barwil Agencies
TARSUS	7	Nil Cargo	Concentrates	01/10/2006 10:55	04/10/2006 07:15	Load Cargo	Townsville Shipping Ag
PALMERSTON	1	Fuels	Fuels	01/10/2006 12:06	02/10/2006 06:05	Discharge Cargo	Inchcape Shipping Serv
LEVANTGRACHT	A/3	NIL	Zinc Ingots	01/10/2006 13:40	03/10/2006 16:00	Load Cargo	McArthur Shipping & Ag
OB	4	Nil Cargo	Nil Cargo	01/11/2006 06:25	01/11/2006 11:03	Take on Bunkers	Inchcape Shipping Serv
HMAS KANIMBLA	10/9/10	Nil Cargo	Nil Cargo	01/11/2006 08:12	03/11/2006 04:00	Visit	Patrick Defence Logistic

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
HMAS TARAKAN	1	Nil Cargo	Nil Cargo	01/11/2006 09:00	02/11/2006 10:00	Visit	-
WORLD TRADER 1	9	Nil Cargo	Sugar	01/12/2006 09:22	02/12/2006 14:30	Load Cargo	Inchcape Shipping Serv
LIZZIE KOSAN	A/1	LPG	NIL	02/01/2007 06:26	02/01/2007 12:05		Oceania Maritime Serv
SILVER CLOUD	9	Passenger Vessel	Passenger Vessel	02/01/2007 07:20	02/01/2007 18:03	Visit	Barwil Agencies
NOR SEA	8	NIL	General Cargo	02/02/2007 12:10	04/02/2007 12:06	Load Cargo	Monson Agencies Aust
BALTIMAR BOREAS	10	Containers	Containers	02/02/2007 12:35	02/02/2007 22:50	Discharge/Load	Strang International Pty
PACIFIC VENUS	9	NIL	Passenger Vessel	02/02/2007 14:33	02/02/2007 22:23	Visit	Barwil Agencies
FENG HUANG ZUO	1	Fuel Oil	NIL	02/02/2007 20:45	04/02/2007 22:05	Discharge Cargo	Barwil Agencies
LIZZIE KOSAN	1	LPG	NIL	02/04/2007 11:34	02/04/2007 17:55	Discharge Cargo	Oceania Maritime Serv
VOGE EVA	4	NIL	Scrap	02/05/2007 04:30	04/05/2007 03:56	Load Cargo	McArthur Shipping & Ag
SEPIK COAST	A/10	Containers	Containers	02/05/2007 06:20	02/05/2007 21:59	Discharge/Load	Consort Express Lines
GLORIOUS HALO	2	Nickel Ore	NIL	02/05/2007 13:22	04/05/2007 07:55	Discharge Cargo	Barwil Agencies
GENERAL VILLA	A/8/7	Sulphur	Fertilizer	02/06/2007 08:17	04/06/2007 23:07	Discharge Cargo	Townsville Shipping Ag
ALCEM CALACA	4	Bulk Cement	NIL	02/06/2007 11:45	04/06/2007 08:55	Discharge Cargo	Cement Australia (Shi
ARCADIA HIGHWAY	3	Motor Vehicles	NIL	02/07/2006 04:50	02/07/2006 11:00	Discharge Cargo	Monson Agencies Aust
BOUGAINVILLE COAST	10/10	Containers	Containers	02/07/2006 19:27	03/07/2006 19:55	Discharge/Load	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	NIL	02/08/2006 04:00	03/08/2006 19:48	Discharge Cargo	Cement Australia (Shi
THE WORLD	9	NIL	NIL	02/09/2006 10:55	03/09/2006 18:05	Lay Up	Barwil Agencies
MERIDIAN HALO	A/2	Nickel Ore	Nil Cargo	02/09/2006 17:40	05/09/2006 19:05	Discharge Cargo	Barwil Agencies
NEPTUNE SCAN	10/8/9	General Cargo	Nil Cargo	02/10/2006 22:10	18/10/2006 17:55	Discharge Cargo	McArthur Shipping & Ag

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CAPE DONINGTON	3	Containers	Containers	02/12/2006 20:02	05/12/2006 06:12	Discharge/Load	Toll International Pty Ltd
OCEAN STAR	9	NIL	Sugar	02/12/2006 21:49	03/12/2006 21:50	Load Cargo	Inchcape Shipping Serv
BLUE STAR	9	NIL	NIL	03/01/2007 07:17	03/01/2007 13:34	Visit	Townsville Shipping Ag
BOUGAINVILLE COAST	10	Containers	Containers	03/02/2007 06:25	04/02/2007 06:07	Discharge/Load	Consort Express Lines
IKAN SEMBAK	A/2	Nickel Ore	NIL	03/02/2007 12:00	06/02/2007 17:20	Discharge Cargo	Barwil Agencies
DS MANATEE	9	NIL	Sugar	03/02/2007 12:45	06/02/2007 10:31	Load Cargo	Inchcape Shipping Serv
DONG CHANG HAI	9	NIL	Sugar	03/03/2007 11:10	04/03/2007 10:22	Load Cargo	Inchcape Shipping Serv
MAGIC WAVE	8	Motor Vehicles	NIL	03/03/2007 16:12	04/03/2007 04:57	Discharge/Load	Barwil Agencies
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	03/04/2007 09:12	03/04/2007 12:55	Visit	Coral Princess Cruises
ALCEM CALACA	4	Bulk Cement	NIL	03/04/2007 10:05	05/04/2007 09:57	Discharge Cargo	Cement Australia (Shi
SUNRISE MISEN	A/7	NIL	Concentrates	03/05/2007 06:36	03/05/2007 22:50	Load Cargo	Barwil Agencies
KINNA	1	LPG	NIL	03/05/2007 12:51	03/05/2007 18:05	Discharge Cargo	Oceania Maritime Serv
DIAMOND GLORY	2	Nickel Ore	NIL	03/07/2006 11:20	04/07/2006 18:00	Discharge Cargo	Barwil Agencies
VEGA LEADER	9	Motor Vehicles	NIL	03/08/2006 08:07	03/08/2006 14:45	Discharge Cargo	Oceania Maritime Serv
ERNST OLDENDORFF	11	NIL	Concentrates	03/08/2006 22:18	04/08/2006 13:30	Load Cargo	Barwil Agencies
CAPE DONINGTON	3	Containers	Containers	03/09/2006 00:06	03/09/2006 20:00	Discharge/Load	Toll International Pty Ltd
BALTIMAR BOREAS	10	NIL	NIL	03/11/2006 04:55	03/11/2006 17:20		Strang International Pty
GLORIOUS HALO	2	Nickel Ore	Nil Cargo	03/11/2006 16:55	05/11/2006 19:08	Discharge Cargo	Barwil Agencies
TIEN HAU	8	Fertilizer	Nil Cargo	03/11/2006 19:21	09/11/2006 02:00	Discharge Cargo	Oceania Maritime Serv
KING HALO	2	Nickel Ore	NIL	03/12/2006 06:00	06/12/2006 06:42	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
PACIFIC EXPLORER	3	Containers	NIL	04/01/2007 22:15	05/01/2007 07:52	Load Cargo	Oceania Maritime Serv
CAPE DELFARO	3	Containers General Cargo	NIL	04/04/2007 11:32	05/04/2007 10:22	Discharge Cargo	Toll International Pty Ltd
THOR KIS	10	NIL	Machinery	04/06/2007 00:30	05/06/2007 22:53	Load Cargo	Townsville Shipping Ag
SELENDANG KASA	3	Concentrates Nil Cargo	NIL	04/06/2007 06:20	05/06/2007 10:15	Discharge Cargo	Barwil Agencies
GOLDEN KAORI	A/4	NIL	Caustic Soda	04/06/2007 11:25	04/06/2007 21:55	Discharge Cargo	Oceania Maritime Serv
IVORY ARROW	9	NIL	Motor Vehicles	04/06/2007 18:07	05/06/2007 05:05	Take on Bunkers	Monson Agencies Aust
C. EMERALD	A/9	NIL	Sugar	04/07/2006 06:04	06/07/2006 08:30	Load Cargo	Inchcape Shipping Serv
PACIFIC FALCON	3	Containers	Concentrates	04/08/2006 14:35	05/08/2006 08:48	Discharge/Load	Oceania Maritime Serv
PRINCES HIGHWAY	9	Motor Vehicles	Motor Vehicles	04/09/2006 04:40	04/09/2006 11:02	Discharge Cargo	Monson Agencies Aust
ALCEM CALACA	4	Bulk Cement	Nil Cargo	04/09/2006 05:45	05/09/2006 15:30	Discharge Cargo	Cement Australia (Shi
RESOLVE	1	Fuels	NIL	04/09/2006 06:58	05/09/2006 22:33	Discharge/Load	Barwil Agencies
CAPE DARNLEY	3	Containers	NIL	04/09/2006 09:04	04/09/2006 19:00	Discharge/Load	Consort Express Lines
SEA HOPE	A/7/3	Nil Cargo	Concentrates Timber	04/09/2006 14:26	10/09/2006 13:23	Load Cargo	Townsville Shipping Ag
MADANG COAST	10	Containers	Containers	04/10/2006 06:58	04/10/2006 20:20	Discharge/Load	Toll International Pty Ltd
TOUCAN ARROW	7	Nil Cargo	Fertilizer	04/10/2006 14:24	05/10/2006 04:55	Load Cargo	Barwil Agencies
TEAM ANJA	1	Fuel Oil	Fuel Oil	04/11/2006 08:12	05/11/2006 05:20	Discharge Cargo	Barwil Agencies
SAMPOGRACHT	A/9	NIL	Zinc Ingots	04/12/2006 00:03	07/12/2006 03:53	Load Cargo	McArthur Shipping & Ag
KINNA	1	LPG	NIL	04/12/2006 09:25	04/12/2006 20:19	Discharge Cargo	Oceania Maritime Serv
BOUGAINVILLE COAST	10	Containers	Containers	04/12/2006 11:05	05/12/2006 05:07	Discharge/Load	Consort Express Lines
PACIFIC CONQUEST	8/3/4	NIL	NIL	04/12/2006 23:05	09/12/2006 05:15	Discharge/Load	Fodico Pty Ltd

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
DELFA	A/7	NIL	Fertilizer	05/02/2007 06:00	09/02/2007 08:10	Load Cargo	Barwil Agencies
SOFRANA BLIGH	8	NIL	Zinc Ingots	05/02/2007 11:45	06/02/2007 08:02	Load Cargo	Townsville Shipping Ag
HELIX	1	Fuels	Fuels	05/02/2007 20:11	06/02/2007 13:30	Discharge/Load	Barwil Agencies
CAPE MORETON	3	NIL	Containers General Cargo	05/03/2007 03:37	07/03/2007 14:35	Load Cargo	Toll International Pty Ltd
BOUGAINVILLE COAST	10	Containers	Containers	05/03/2007 06:02	06/03/2007 18:15	Discharge/Load	Consort Express Lines
CAPE DELFARO	3	Containers	Refined Copper	05/05/2007 07:20	06/05/2007 02:55	Discharge/Load	Toll International Pty Ltd
PENGUIN ARROW	7	NIL	Fertilizer	05/05/2007 11:07	08/05/2007 01:05	Load Cargo	Barwil Agencies
USS JOHN PAUL JONES	8/7/A/7	NIL	NIL	05/06/2007 08:50	12/06/2007 11:28	Visit	Patrick Defence Logistic
USS PAUL HAMILTON	9	NIL	NIL	05/06/2007 09:36	10/06/2007 08:57	Visit	Patrick Defence Logistic
CORAL PRINCESS II	4	Passenger Vessel	Passenger Vessel	05/06/2007 09:56	05/06/2007 11:10	Visit	Coral Princess Cruises
CAPE DARNLEY	A/3	General Cargo	NIL	05/06/2007 12:25	06/06/2007 16:55	Discharge Cargo	Toll International Pty Ltd
JASMINE HALO	2	Nickel Ore	NIL	05/07/2006 05:30	08/07/2006 04:10	Discharge Cargo	Barwil Agencies
CICLOPE	8/3	Fertilizer Sulphur	NIL	05/07/2006 09:20	07/07/2006 10:57	Discharge Cargo	Oceania Maritime Serv
FAIRLANE	8	NIL	General Cargo	05/08/2006 14:40	06/08/2006 14:05	Load Cargo	Oceania Maritime Serv
KING HALO	A/2	Nickel Ore	Nil Cargo	05/09/2006 21:40	09/09/2006 03:51	Discharge Cargo	Barwil Agencies
STAR MIZUHO	3	Fertilizer	Nil Cargo	05/10/2006 02:47	05/10/2006 19:20	Discharge Cargo	Oceania Maritime Serv
WILLOW POINT	11	Nil Cargo	Concentrates	05/10/2006 07:30	06/10/2006 11:00	Load Cargo	Barwil Agencies
TEAM ANJA	1	Fuels	Fuels	05/10/2006 09:53	06/10/2006 11:35	Discharge Cargo	Barwil Agencies
PREDATOR	7	Nil Cargo	Concentrates	05/10/2006 11:43	06/10/2006 07:12	Load Cargo	Monson Agencies Aust
ALCEM CALACA	4	Bulk Cement	Nil Cargo	05/10/2006 16:30	08/10/2006 04:12	Discharge Cargo	Cement Australia (Shi

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
ALCEM CALACA	4	Bulk Cement	Nil Cargo	05/11/2006 07:48	07/11/2006 11:25	Discharge Cargo	Cement Australia (Shi
LIZZIE KOSAN	1	LPG	LPG	05/11/2006 15:18	06/11/2006 02:30	Discharge Cargo	Oceania Maritime Serv
CAPE DONINGTON	3	Containers General Cargo	Containers	05/11/2006 18:28	06/11/2006 18:20	Discharge Cargo	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	NIL	05/12/2006 05:37	07/12/2006 03:00	Discharge Cargo	Cement Australia (Shi
CORAL PRINCESS II	8	NIL	NIL	05/12/2006 09:45	05/12/2006 14:45	Visit	Coral Princess Cruises
GAZELLE COAST	10	Containers	Containers	05/12/2006 12:10	06/12/2006 05:05	Discharge/Load	Consort Express Lines
ALCEM CALACA	4	Bulk Cement	Nil Cargo	06/01/2007 06:00	08/01/2007 12:50	Discharge Cargo	Cement Australia (Shi
CORAL PRINCESS	4	Passenger Vessel	Passenger Vessel	06/02/2007 09:28	06/02/2007 13:20	Visit	Coral Princess Cruises
KINNA	A/1	LPG	NIL	06/02/2007 15:23	06/02/2007 21:55	Discharge Cargo	Oceania Maritime Serv
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	06/03/2007 09:45	06/03/2007 13:00	Visit	Coral Princess Cruises
USCG POLAR SEA	9	Nil Cargo	Nil Cargo	06/03/2007 09:48	10/03/2007 09:50	Visit	Patrick Defence Logistic
IVS HUNTER	3/8	Concentrates	Zinc Ingots	06/04/2007 12:49	12/04/2007 10:03	Discharge/Load	Monson Agencies Aust
TASMAN CHALLENGER	3/A	Containers General Cargo	Containers	06/05/2007 05:10	06/05/2007 20:50	Discharge/Load	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	NIL	06/05/2007 06:25	08/05/2007 00:30	Discharge Cargo	Cement Australia (Shi
SITEAM ANJA	1	Fuels	Fuels	06/05/2007 11:20	07/05/2007 15:30	Discharge/Load	Barwil Agencies
GOLDEN YUKI	9	NIL	Molasses	06/05/2007 17:27	07/05/2007 23:55	Load Cargo	Oceania Maritime Serv
MARIA BULKER	A/9	NIL	Sugar	06/07/2006 10:40	07/07/2006 16:45	Load Cargo	Inchcape Shipping Serv
BOSAVI	A/CBM/S	NIL	NIL	06/07/2006 14:49	22/07/2006 17:20	Discharge/Load	Coral Sea Shipping Lin
NEW AMBITION	A/9	NIL	Sugar	06/08/2006 05:00	07/08/2006 07:45	Load Cargo	Inchcape Shipping Serv
BOW WEST	4	NIL	Tallow	06/08/2006 08:15	07/08/2006 12:21	Load Cargo	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
POS LEADER	8	Fertilizer Fertilizer	NIL	06/08/2006 16:20	08/08/2006 03:00	Discharge Cargo	Oceania Maritime Serv
NAMHAE GAS	A/1	LPG	LPG	06/09/2006 05:45	06/09/2006 11:00	Discharge Cargo	Oceania Maritime Serv
PACIFIC CONDOR	3	Concentrates Tyres	Containers General Cargo	06/09/2006 06:50	07/09/2006 06:10	Discharge/Load	Oceania Maritime Serv
BOSSET CHIEF	1	Nil Cargo	Fuel Oil	06/09/2006 14:02	07/09/2006 11:40	Load Cargo	Strang International Pty
GLOBAL ALLIANCE	9	Nil Cargo	Sugar	06/09/2006 16:52	07/09/2006 11:00	Load Cargo	Inchcape Shipping Serv
ANNOU G. O.	A/2	Nickel Ore	Nil Cargo	06/10/2006 06:34	08/10/2006 08:53	Discharge Cargo	Barwil Agencies
BRO ALEXANDRE	A/1	Fuel Oil	Fuel Oil	06/10/2006 17:03	07/10/2006 07:22	Discharge Cargo	Inchcape Shipping Serv
MAERSK WELKIN	9	Motor Vehicles	Motor Vehicles	06/11/2006 01:11	06/11/2006 08:10	Discharge Cargo	Oceania Maritime Serv
PALMERSTON	1	Fuel Oil	Fuels	06/11/2006 04:43	06/11/2006 19:45	Discharge/Load	Inchcape Shipping Serv
NEW DIAMOND	9	Nil Cargo	Sugar	06/11/2006 10:15	07/11/2006 06:50	Load Cargo	Inchcape Shipping Serv
TEAM ANJA	1	Fuels	Fuel Oil	06/12/2006 00:47	06/12/2006 22:15	Discharge Cargo	Barwil Agencies
IRIS HALO	A/2	Nickel Ore	Nil Cargo	06/12/2006 08:40	08/12/2006 22:10	Discharge Cargo	Barwil Agencies
MV WILGA	8	NIL	NIL	07/01/2007 06:50	07/01/2007 18:05	Visit	Oceania Maritime Serv
NEW CONCORD	9	NIL	Sugar	07/01/2007 13:30	08/01/2007 15:20	Load Cargo	Inchcape Shipping Serv
ADVANCE II	1	Fuels	NIL	07/02/2007 00:16	07/02/2007 16:35	Discharge Cargo	Barwil Agencies
PACIFIC CONDOR	3	Containers Tyres	Containers	07/02/2007 20:30	08/02/2007 15:56	Discharge Cargo	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	NIL	07/02/2007 22:08	10/02/2007 12:29	Load Cargo	Cement Australia (Shi
EMERALD HALO	2	Nickel Ore	NIL	07/03/2007 09:48	11/03/2007 08:03	Discharge Cargo	Barwil Agencies
BREEZE ARROW	A/7	NIL	Fertilizer	07/03/2007 11:38	10/03/2007 09:06	Load Cargo	Barwil Agencies
IVS KITE	A/3	Concentrates	Nil Cargo	07/03/2007 16:50	11/03/2007 19:15	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
BAY RANGER	9	Nil Cargo	Sugar	07/04/2007 04:08	08/04/2007 16:27	Load Cargo	Inchcape Shipping Serv
PAPUAN COAST	10	NIL	Containers	07/04/2007 10:59	11/04/2007 22:20	Discharge/Load	Consort Express Lines
GAN-VOYAGER	1	Fuels	NIL	07/04/2007 14:30	08/04/2007 06:00	Discharge Cargo	Barwil Agencies
DENEB PRIMA	3	NIL	Cattle	07/06/2007 10:02	11/06/2007 03:42	Load Cargo	Barwil Agencies
HMAS TOBRUK	10/1/A/8	NIL	NIL	07/06/2007 11:40	16/06/2007 07:18	Discharge/Load	Patrick Defence Logistic
BARRINGTON	1	NIL	Fuels	07/06/2007 13:35	08/06/2007 09:00	Discharge Cargo	Inchcape Shipping Serv
NAMHAE GAS	1	LPG	NIL	07/07/2006 08:40	07/07/2006 16:20	Discharge Cargo	Oceania Maritime Serv
HMAS DARWIN	8	NIL	NIL	07/07/2006 09:45	10/07/2006 09:58	Visit	Royal Australian Navy
ANDROS	7	NIL	Concentrates Concentrates	07/07/2006 15:35	10/07/2006 12:00	Load Cargo	Townsville Shipping Ag
CLIPPER LAKE	3/4	NIL	Timber	07/08/2006 03:44	16/08/2006 15:57	Load Cargo	Geelong Shipping Serv
NAMHAE GAS	1	LPG	NIL	07/08/2006 04:46	07/08/2006 12:48	Discharge Cargo	Oceania Maritime Serv
PACIFIC HAWK	10	Barge in Tow Machinery	NIL	07/08/2006 06:42	08/08/2006 06:25	Load Cargo	Townsville Shipping Ag
TEAM MERKUR	A/9	Nil Cargo	Molasses	07/09/2006 12:50	11/09/2006 23:05	Load Cargo	Inchcape Shipping Serv
LOOIERSGRACHT	A/7	Nil Cargo	Concentrates	07/09/2006 15:06	08/09/2006 07:55	Load Cargo	Barwil Agencies
GOLDEN CRAIG	4	Caustic Soda	Nil Cargo	07/09/2006 22:40	08/09/2006 05:00	Discharge Cargo	Oceania Maritime Serv
MERIDIAN ACE	9	Motor Vehicles	Motor Vehicles	07/10/2006 16:07	07/10/2006 21:45	Discharge Cargo	Inchcape Shipping Serv
CORAL PRINCESS II	9	Passenger Vessel	Passenger Vessel	07/11/2006 09:00	07/11/2006 13:00	Visit	Coral Princess Cruises
HAKULA	11	Concentrates	Concentrates	07/11/2006 22:08	08/11/2006 14:00	Load Cargo	Barwil Agencies
GOLDEN CRAIG	8	NIL	Tallow	07/12/2006 01:45	07/12/2006 16:00	Load Cargo	Oceania Maritime Serv
PACIFIC ADVENTURER	3	Containers	Containers Refined Copper	07/12/2006 11:10	08/12/2006 05:20	Discharge/Load	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
STAR BIRD	10	Containers	Containers	08/01/2007 20:50	09/01/2007 00:50	Discharge/Load	Oceania Maritime Serv
BBC ECUADOR	8	NIL	General Cargo	08/02/2007 18:00	11/02/2007 01:52	Load Cargo	McArthur Shipping & Ag
SENATOR	A/11	NIL	Concentrates	08/03/2007 10:47	09/03/2007 11:00	Load Cargo	Barwil Agencies
YAYOI EXPRESS	1	Fuels Fuels	NIL	08/03/2007 14:16	09/03/2007 07:05	Discharge Cargo	Barwil Agencies
EMERALD HALO	2	Nickel Ore	NIL	08/04/2007 19:02	11/04/2007 19:10	Discharge Cargo	Barwil Agencies
LIBRA LEADER	9	Motor Vehicles	NIL	08/05/2007 03:40	08/05/2007 13:19	Discharge Cargo	Oceania Maritime Serv
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	08/05/2007 09:35	08/05/2007 12:45	Visit	Coral Princess Cruises
CCNI ANCUD	3/7/11	Concentrates	Concentrates	08/05/2007 23:13	14/05/2007 21:35	Discharge/Load	Monson Agencies Aust
GLORIOUS HALO	2	Nickel Ore	NIL	08/06/2007 02:26	10/06/2007 11:35	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	NIL	Bulk Cement	08/06/2007 10:55	10/06/2007 12:40	Discharge Cargo	Cement Australia (Shi
PACIFIC FALCON	8	Containers	Containers	08/06/2007 11:38	10/06/2007 05:58	Discharge/Load	Oceania Maritime Serv
HMAS BETANO	8/1/4	NIL	NIL	08/06/2007 12:00	12/06/2007 07:57		Department of Navy
HMAS BALIKPAPAN	8/1/4	NIL	NIL	08/06/2007 12:15	12/06/2007 08:00		Department of Navy
OCEAN PRELUDE	A/2	Nickel Ore	NIL	08/07/2006 06:30	11/07/2006 12:00	Discharge Cargo	Barwil Agencies
PALMERSTON	1	Fuels	NIL	08/07/2006 07:35	08/07/2006 23:59	Discharge Cargo	Inchcape Shipping Serv
SEPIK COAST	10	Containers	Containers	08/07/2006 15:35	09/07/2006 05:55	Discharge/Load	Consort Express Lines
GEMPORT-3	7	NIL	Concentrates	08/08/2006 11:03	09/08/2006 19:05	Load Cargo	Townsville Shipping Ag
GOLDEN YASAKA	A/4	Caustic Soda	Nil Cargo	08/10/2006 06:32	08/10/2006 14:17	Discharge Cargo	Oceania Maritime Serv
CICLOPE	3	Sulphur	Nil Cargo	08/10/2006 08:25	10/10/2006 03:00	Discharge Cargo	Barwil Agencies
CHEKIANG	3	Containers	General Cargo	08/10/2006 16:42	09/10/2006 09:02	Discharge/Load	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
MADANG COAST	10	Containers	Containers	08/11/2006 06:43	08/11/2006 23:15	Discharge/Load	Consort Express Lines
AMBER WAVE	7	Nil Cargo	Fertilizer	08/11/2006 07:47	09/11/2006 09:03	Load Cargo	Oceania Maritime Serv
PACIFIC DHOW	4	Nil Cargo	Tallow	08/11/2006 09:13	09/11/2006 05:45	Load Cargo	Oceania Maritime Serv
MAGNETIC ISLE	A/2	Nickel Ore	Nil Cargo	08/11/2006 22:20	12/11/2006 08:37	Discharge Cargo	Barwil Agencies
CARAVOS HORIZON	A/3	NIL	NIL	08/12/2006 07:30	08/12/2006 12:20	Take on Bunkers	Barwil Agencies
PERSEUS LEADER	9	Motor Vehicles	NIL	08/12/2006 11:36	08/12/2006 17:44	Discharge Cargo	Oceania Maritime Serv
CORAL PRINCESS	8	Nil Cargo	Passenger Vessel	09/01/2007 09:40	09/01/2007 14:30	Visit	Coral Princess Cruises
SEPIK COAST	A/10	Containers	Containers	09/01/2007 10:50	10/01/2007 07:55	Discharge/Load	Consort Express Lines
ASTRAL ACE	9	Motor Vehicles	NIL	09/01/2007 14:42	09/01/2007 19:30	Discharge Cargo	Inchcape Shipping Serv
POS BRAVE	A/7	NIL	Fertilizer	09/02/2007 10:16	10/02/2007 08:51	Load Cargo	Townsville Shipping Ag
GRAND PHOENIX	3	Motor Vehicles	NIL	09/04/2007 06:10	09/04/2007 18:06	Discharge Cargo	Monson Agencies Aust
JASMINE	1	Fuels	NIL	09/04/2007 17:10	11/04/2007 03:15	Discharge Cargo	Inchcape Shipping Serv
CAPE CONWAY	A/3	Containers	Containers General Cargo	09/04/2007 19:55	13/04/2007 15:00	Load Cargo	Toll International Pty Ltd
HMAS MANOORA	10	NIL	NIL	09/06/2007 18:10	11/06/2007 19:53		Department of Navy
PACIFIC CONQUEST	9	Nil Cargo	Nil Cargo	09/07/2006 06:20	09/07/2006 11:40	Visit	Fodico Pty Ltd
SONGA ANABEL	4	NIL	Molasses	09/07/2006 15:33	13/07/2006 10:03	Load Cargo	Inchcape Shipping Serv
BARRINGTON	1	Fuels	NIL	09/08/2006 15:10	10/08/2006 11:00	Discharge Cargo	Inchcape Shipping Serv
PACIFIC FREEDOM	11	Nil Cargo	Concentrates	09/09/2006 00:40	09/09/2006 15:10	Load Cargo	Barwil Agencies
BARRINGTON	1	Fuel Oil	Fuel Oil	09/09/2006 06:30	09/09/2006 23:30	Discharge Cargo	Inchcape Shipping Serv
BOSAVI	3	NIL	NIL	09/09/2006 06:40	09/09/2006 14:30		Coral Sea Shipping Lin

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CAPE YORK 2	9	Nil Cargo	Sugar	09/10/2006 00:12	09/10/2006 21:24	Load Cargo	Inchcape Shipping Serv
LIZZIE KOSAN	1	LPG	LPG	09/10/2006 12:00	09/10/2006 17:30	Discharge Cargo	Oceania Maritime Serv
ORION LEADER	2	Motor Vehicles	Nil Cargo	09/10/2006 16:55	10/10/2006 00:18	Discharge Cargo	Oceania Maritime Serv
SONGA ANABEL	9	Nil Cargo	Molasses	09/10/2006 23:40	15/10/2006 20:45	Load Cargo	Inchcape Shipping Serv
SOPHIA	7	Nil Cargo	Concentrates	09/11/2006 10:51	12/11/2006 07:05	Load Cargo	Townsville Shipping Ag
EMERALD HALO	A/2	Nickel Ore	Nil Cargo	09/12/2006 00:27	13/12/2006 00:50	Discharge Cargo	Barwil Agencies
LALINDE	3/10/7	Sulphur	Fertilizer	09/12/2006 07:44	13/12/2006 08:45	Discharge/Load	Barwil Agencies
HAKULA	7	NIL	Fertilizer	10/01/2007 01:00	10/01/2007 13:09	Load Cargo	Townsville Shipping Ag
MANDARIN ARROW	A/7	NIL	Fertilizer	10/01/2007 14:45	12/01/2007 20:00	Load Cargo	Barwil Agencies
BARRINGTON	1	Fuels	NIL	10/01/2007 23:18	11/01/2007 16:57	Discharge Cargo	Inchcape Shipping Serv
SHENG MU	11	NIL	Concentrates	10/02/2007 10:43	11/02/2007 16:58	Load Cargo	Barwil Agencies
PENGUIN ARROW	7	NIL	Fertilizer	10/02/2007 14:35	12/02/2007 17:55	Load Cargo	Barwil Agencies
JASMINE	A/1	Fuels	NIL	10/03/2007 05:30	11/03/2007 17:15	Discharge/Load	Inchcape Shipping Serv
TINOS	A/7	NIL	Concentrates	10/03/2007 11:25	12/03/2007 01:16	Load Cargo	Townsville Shipping Ag
HMAS HUON	9	NIL	NIL	10/03/2007 12:11	11/03/2007 07:20		Patrick Defence Logistic
CORAL PRINCESS	9	Passenger Vessel	Passenger Vessel	10/04/2007 09:40	10/04/2007 13:23	Visit	Coral Princess Cruises
ALCEM CALACA	A/4	Bulk Cement	NIL	10/04/2007 10:59	12/04/2007 05:55	Discharge Cargo	Cement Australia (Shi
ACV ARNHEM BAY	4/10/S/T/	NIL	NIL	10/05/2007 14:10	23/05/2007 08:55	Lay Up	Australian Customs Ser
BARRINGTON	1	Fuels	NIL	10/05/2007 19:00	11/05/2007 09:40	Discharge Cargo	Inchcape Shipping Serv
DUSITA NAREE	3	NIL	Concentrates	10/05/2007 21:30	12/05/2007 11:05	Load Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
HMAS KANIMBLA	8	NIL	NIL	10/06/2007 10:50	13/06/2007 07:30		Department of Navy
PRABHU YUVIKA	9	NIL	Sugar	10/06/2007 22:17	12/06/2007 05:43	Load Cargo	Inchcape Shipping Serv
PACIFIC CONQUEST	4	NIL	NIL	10/06/2007 23:10	11/06/2007 01:16	Discharge/Load	Fodico Pty Ltd
STADT CUXHAVEN	3/10	General Cargo	Containers	10/07/2006 07:18	15/07/2006 17:57	Discharge/Load	Toll International Pty Ltd
ASTRO VENUS	9	Motor Vehicles	NIL	10/07/2006 18:08	10/07/2006 21:45	Discharge Cargo	Oceania Maritime Serv
BOUGAINVILLE COAST	10	Containers	Containers	10/08/2006 07:10	11/08/2006 08:45	Discharge/Load	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	NIL	10/08/2006 22:27	12/08/2006 12:51	Discharge Cargo	Cement Australia (Shi
EUPHONY ACE	2	Motor Vehicles	Motor Vehicles	10/09/2006 08:23	10/09/2006 12:48	Discharge Cargo	Inchcape Shipping Serv
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	10/10/2006 09:30	10/10/2006 13:00	Visit	Coral Princess Cruises
AVEDON CALYPSO	2	Nickel Ore	Nil Cargo Nil Cargo	10/10/2006 20:40	12/10/2006 02:55	Discharge Cargo	Barwil Agencies
GOLDEN DENISE	9	NIL	Molasses	10/12/2006 06:56	11/12/2006 21:48	Load Cargo	Oceania Maritime Serv
PENGUIN ARROW	7	NIL	Fertilizer	10/12/2006 08:57	12/12/2006 17:55	Load Cargo	Barwil Agencies
BOW DE RICH	1	Nil Cargo	Sulphuric Acid	10/12/2006 15:24	12/12/2006 08:55	Load Cargo	Barwil Agencies
CAPE DELFARO	3	Containers	Refined Copper	11/02/2007 01:15	13/02/2007 12:00	Discharge/Load	Toll International Pty Ltd
MADANG COAST	A/10	Containers	Containers	11/02/2007 06:40	11/02/2007 17:58	Discharge/Load	Toll International Pty Ltd
ARCADIA HIGHWAY	9	Motor Vehicles	NIL	11/02/2007 14:30	11/02/2007 20:22	Discharge Cargo	Monson Agencies Aust
PACIFIC DISCOVERER	4	Containers General Cargo	Nil Cargo	11/03/2007 10:15	11/03/2007 22:00	Discharge/Load	Oceania Maritime Serv
CCNI CHAGRES	A/11	NIL	Concentrates	11/04/2007 05:50	12/04/2007 10:40	Load Cargo	Monson Agencies Aust
MARIA BULKER	9	NIL	Sugar	11/04/2007 10:24	12/04/2007 15:25	Load Cargo	Inchcape Shipping Serv
GLORIOUS HALO	A/2	Nickel Ore	NIL	11/04/2007 21:30	15/04/2007 20:12	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
HANJIN BOMBAY	9	NIL	Sugar	11/05/2007 01:06	11/05/2007 23:23	Load Cargo	Inchcape Shipping Serv
GREAT RIVER	A/7/8	NIL	Concentrates Zinc Ingots	11/05/2007 07:43	15/05/2007 01:08	Load Cargo	Townsville Shipping Ag
PACIFIC INVESTIGATOR	A/10/A/3/	NIL	NIL	11/05/2007 08:55	15/05/2007 06:35		Perrott Salvage &
GRAND COSMO	2	Motor Vehicles	NIL	11/05/2007 11:40	11/05/2007 17:09	Discharge Cargo	Inchcape Shipping Serv
GOA	A/11	NIL	Concentrates	11/06/2007 06:10	12/06/2007 20:08	Load Cargo	Monson Agencies Aust
STAR CAPELLA	A/9	NIL	Sugar	11/07/2006 05:12	12/07/2006 09:53	Load Cargo	Inchcape Shipping Serv
IRIS HALO	A/2	Nickel Ore	NIL	11/07/2006 20:03	14/07/2006 15:15	Discharge Cargo	Barwil Agencies
HMAS PIRIE	9	NIL	NIL	11/08/2006 09:37	14/08/2006 08:02	Visit	Royal Australian Navy
HMAS SUCCESS	8	NIL	NIL	11/08/2006 10:40	15/08/2006 09:50	Repairs	Royal Australian Navy
EUROPEAN HIGHWAY	3	Motor Vehicles	Motor Vehicles	11/09/2006 17:15	11/09/2006 22:30	Discharge Cargo	Monson Agencies Aust
BOUGAINVILLE COAST	10	Containers	Containers	11/10/2006 14:45	12/10/2006 16:04	Discharge/Load	Toll International Pty Ltd
PACIFIC FALCON	3	Containers Tyres	Containers	11/11/2006 08:24	12/11/2006 06:00	Discharge/Load	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	NIL	11/12/2006 05:05	13/12/2006 07:56	Discharge Cargo	Cement Australia (Shi
STORM RANGER	A/3/7	Nil Cargo	Concentrates Lead Ingots	11/12/2006 09:23	15/12/2006 03:56	Load Cargo	Townsville Shipping Ag
CAPE DELGADO	3	Containers	Containers	12/01/2007 00:03	13/01/2007 14:53	Discharge/Load	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	NIL	12/01/2007 22:37	15/01/2007 08:58	Discharge Cargo	Cement Australia (Shi
GRETKE OLDENDORFF	A/7	NIL	Concentrates	12/03/2007 03:20	12/03/2007 23:49	Load Cargo	Townsville Shipping Ag
PACIFIC CHAMP	A/7	NIL	Concentrates	12/04/2007 12:06	13/04/2007 19:54	Load Cargo	Monson Agencies Aust
EASTERN HIGHWAY.	A/9	Motor Vehicles	NIL	12/04/2007 17:45	12/04/2007 23:55	Discharge Cargo	Monson Agencies Aust
MARIE O	A/9	NIL	Sugar	12/05/2007 01:20	12/05/2007 23:21	Load Cargo	Inchcape Shipping Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
STAR BIRD	10	Containers	NIL	12/05/2007 02:23	12/05/2007 05:25	Discharge Cargo	Oceania Maritime Serv
BOUGAINVILLE COAST	10	Containers	Containers	12/05/2007 07:15	12/05/2007 22:03	Discharge/Load	Consort Express Lines
CAPE DARNLEY	3	Containers	NIL	12/05/2007 13:00	15/05/2007 08:45	Discharge Cargo	Toll International Pty Ltd
PACIFIC CONDOR	3	Containers	Containers	12/05/2007 17:18	13/05/2007 18:20	Discharge/Load	Oceania Maritime Serv
GAZELLE COAST	A/10	Containers	Containers	12/06/2007 05:03	13/06/2007 08:10	Discharge/Load	Consort Express Lines
EMERALD HALO	2	Nickel Ore	NIL	12/08/2006 10:52	15/08/2006 13:25	Discharge Cargo	Barwil Agencies
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	12/09/2006 09:58	12/09/2006 13:23	Visit	Coral Princess Cruises
LUMINOUS HALO	A/2	Nickel Ore	Nil Cargo	12/09/2006 13:20	15/09/2006 03:00	Discharge Cargo	Barwil Agencies
CAPE DELGADO	3	Nil Cargo	Containers	12/10/2006 01:00	13/10/2006 06:56	Load Cargo	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	Nil Cargo	12/10/2006 01:55	13/10/2006 20:50	Discharge Cargo	Cement Australia (Shi
ARCADIA HIGHWAY	2	Motor Vehicles	Motor Vehicles	12/10/2006 11:32	13/10/2006 05:30	Discharge Cargo	Monson Agencies Aust
BOSAVI	RC	Nil Cargo	General Cargo	12/10/2006 13:00	13/10/2006 13:07	Load Cargo	Coral Sea Shipping Lin
ASIAN HOPE (1)	9	NIL	Sugar	12/11/2006 05:30	13/11/2006 01:50	Load Cargo	Inchcape Shipping Serv
AVEDON CALYPSO	A/2	Nickel Ore	Nil Cargo	12/11/2006 13:40	14/11/2006 01:00	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	Nil Cargo	12/11/2006 23:47	15/11/2006 09:50	Discharge Cargo	Cement Australia (Shi
POSITIVE LEADER	9	Motor Vehicles	NIL	12/12/2006 14:27	12/12/2006 19:45	Discharge Cargo	Oceania Maritime Serv
LIZZIE KOSAN	1	LPG	NIL	13/01/2007 07:58	13/01/2007 13:08	Discharge Cargo	Oceania Maritime Serv
STOLT LILY	1	NIL	Sulphuric Acid	13/01/2007 21:24	14/01/2007 17:55	Load Cargo	Barwil Agencies
CORAL PRINCESS	8	NIL	NIL	13/02/2007 08:20	13/02/2007 13:02	Visit	Coral Princess Cruises
CLIPPER TRUST	2	Nickel Ore	NIL	13/03/2007 04:03	14/03/2007 15:10	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
STADACONA	4	Bulk Cement	NIL	13/03/2007 06:10	19/03/2007 02:02	Discharge Cargo	Inchcape Shipping Serv
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	13/03/2007 09:36	13/03/2007 13:00	Visit	Coral Princess Cruises
HMAS TOBRUK	10	Army Equipment	NIL	13/03/2007 09:50	13/03/2007 13:15	Discharge Cargo	Patrick Defence Logistic
PACIFIC GUARDIAN	A/9	Fertilizer Fertilizer	NIL	13/04/2007 02:13	15/04/2007 22:55	Discharge Cargo	Oceania Maritime Serv
PACIFIC CHALLENGER	A/3	Containers	Containers	13/04/2007 17:00	15/04/2007 00:10	Discharge/Load	Oceania Maritime Serv
GOLDEN AKANE	1	NIL	Sulphuric Acid	13/05/2007 04:40	14/05/2007 02:08	Load Cargo	Townsville Shipping Ag
ALCEM CALACA	4	Bulk Cement	NIL	13/05/2007 20:15	15/05/2007 12:56	Discharge Cargo	Cement Australia (Shi
CLIPPER TRUST	2	Nickel Ore	NIL	13/05/2007 20:36	15/05/2007 06:10	Discharge Cargo	Barwil Agencies
WESTERN FLYER	A/10	NIL	NIL	13/06/2007 09:46	14/06/2007 20:05		Strang International Pty
HANJIN BOMBAY	9	NIL	Sugar	13/06/2007 12:45	14/06/2007 12:04	Load Cargo	Inchcape Shipping Serv
PACIFIC CONQUEST	8	NIL	NIL	13/06/2007 17:45	16/06/2007 03:37	Discharge/Load	Fodico Pty Ltd
DYVI PUEBLA	3	NIL	Motor Vehicles	13/06/2007 23:00	14/06/2007 04:50	Discharge Cargo	Monson Agencies Aust
VASILIY BURKHANOV	3	General Cargo	NIL	13/08/2006 07:23	15/08/2006 16:25	Discharge/Load	Townsville Shipping Ag
GREAT SUMMIT	3	Concentrates	Concentrates	13/09/2006 13:45	14/09/2006 16:06	Discharge Cargo	Barwil Agencies
JUBILEE	15	NIL	NIL	13/10/2006 07:00	13/10/2006 18:00	Visit	Palm Island Barge Serv
BALTIMAR BOREAS	10	Containers	General Cargo	13/10/2006 09:38	13/10/2006 17:36	Load Cargo	Strang International Pty
EDISONGRACHT	7	Nil Cargo	Concentrates Concentrates	13/10/2006 10:12	14/10/2006 11:55	Load Cargo	Barwil Agencies
GOLDEN DENISE	A/8/4	Caustic Soda	Molasses Molasses	13/11/2006 08:05	16/11/2006 04:00	Discharge/Load	Oceania Maritime Serv
CHANG QIANG	3	Concentrates	Nil Cargo	13/11/2006 10:36	15/11/2006 02:14	Discharge Cargo	Barwil Agencies
SEA BAILO	9	Nil Cargo	Sugar	13/11/2006 22:27	14/11/2006 21:15	Load Cargo	Inchcape Shipping Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
AVEDON CALYPSO	A/2	Nickel Ore	Nil Cargo	13/12/2006 03:04	14/12/2006 15:00	Discharge Cargo	Barwil Agencies
PACIFIC CONQUEST	4	NIL	NIL	13/12/2006 18:30	14/12/2006 09:15		Fodico Pty Ltd
LAKE ARUFURA	8	Fodder	Nil Cargo	14/01/2007 06:22	14/01/2007 22:46	Discharge Cargo	McArthur Shipping & Ag
GENERAL VILLA	3	Sulphur	NIL	14/02/2007 09:10	16/02/2007 04:50	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	NIL	14/02/2007 15:16	16/02/2007 11:59	Discharge Cargo	Cement Australia (Shi
PACIFIC EXPLORER	3	Containers	Containers Refined Copper	14/03/2007 07:35	14/03/2007 22:00	Discharge/Load	Oceania Maritime Serv
NIU AILAN COAST	10	Containers	Containers	14/03/2007 08:25	15/03/2007 20:02	Discharge/Load	Consort Express Lines
IVORY ARROW	9	Motor Vehicles	NIL	14/03/2007 09:10	14/03/2007 19:00	Discharge Cargo	Monson Agencies Aust
RV KILO MOANA	8	NIL	NIL	14/03/2007 10:25	15/03/2007 07:55	Visit	Oceania Maritime Serv
IKAN SEMBAK	2	Nickel Ore	NIL	14/03/2007 17:47	17/03/2007 04:04	Discharge Cargo	Barwil Agencies
BOUGAINVILLE COAST	A/10/10	Containers	Containers	14/04/2007 05:15	15/04/2007 06:06	Discharge/Load	Consort Express Lines
PLOVER ARROW	A/7	NIL	Fertilizer	14/04/2007 07:19	16/04/2007 09:38	Load Cargo	Barwil Agencies
MARIA BULKER	9	NIL	Sugar	14/05/2007 01:41	15/05/2007 04:25	Load Cargo	Inchcape Shipping Serv
KINNA	1	LPG	NIL	14/05/2007 03:55	14/05/2007 11:56	Discharge Cargo	Oceania Maritime Serv
HMAS TOWNSVILLE	10	NIL	NIL	14/05/2007 17:30	15/05/2007 07:10	Lay Up	Department of Navy
DUSITA NAREE	A/11	NIL	Concentrates	14/05/2007 23:25	16/05/2007 12:57	Load Cargo	Barwil Agencies
LIZZIE KOSAN	1	NIL	LPG	14/06/2007 00:55	14/06/2007 07:05	Discharge Cargo	Oceania Maritime Serv
IRENE OLDENDORFF	A/7	NIL	Concentrates	14/06/2007 06:34	15/06/2007 10:00	Load Cargo	Barwil Agencies
GRAND COSMO	3	NIL	Motor Vehicles	14/06/2007 09:00	14/06/2007 17:30	Discharge Cargo	Inchcape Shipping Serv
ALCEM CALACA	4	NIL	Bulk Cement	14/06/2007 11:40	16/06/2007 06:11	Discharge Cargo	Cement Australia (Shi

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
TEAM ANJA	1	Fuels	NIL	14/07/2006 08:35	15/07/2006 04:25	Discharge Cargo	Barwil Agencies
PACIFIC LOGGER	A/9	NIL	Sugar	14/07/2006 14:42	15/07/2006 11:50	Load Cargo	Inchcape Shipping Serv
CONTINENTAL HIGHWAY	9	Motor Vehicles	NIL	14/08/2006 14:30	14/08/2006 23:20	Discharge Cargo	Monson Agencies Aust
BOUGAINVILLE COAST	10	Containers	Containers	14/09/2006 00:45	15/09/2006 07:05	Discharge/Load	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	Nil Cargo	14/09/2006 07:49	15/09/2006 21:00	Discharge Cargo	Cement Australia (Shi
PACIFIC FAITHFULL	A/7/3	Nil Cargo	Concentrates Timber	14/10/2006 14:00	17/10/2006 10:30	Load Cargo	Monson Agencies Aust
PREDATOR	A/11	Nil Cargo	Concentrates Concentrates	14/10/2006 18:12	17/10/2006 19:00	Load Cargo	Monson Agencies Aust
DANUBE HIGHWAY	2	Motor Vehicles	Motor Vehicles	14/11/2006 04:58	14/11/2006 13:00	Discharge Cargo	Monson Agencies Aust
CORAL PRINCESS II	10	Passenger Vessel	Passenger Vessel	14/11/2006 09:50	14/11/2006 13:05	Visit	Coral Princess Cruises
ANNOU G. O.	A/2	Nickel Ore	Nil Cargo	14/11/2006 17:08	17/11/2006 23:10	Discharge Cargo	Barwil Agencies
RUI CHANG HAI	A/9/3	Nil Cargo	Timber	14/11/2006 23:22	22/11/2006 18:02	Load Cargo	Geelong Shipping Serv
BOUGAINVILLE COAST	10	Containers	Containers	14/12/2006 07:22	14/12/2006 17:25	Discharge/Load	Consort Express Lines
GLORIOUS HALO	A/2	Nickel Ore	Nil Cargo	14/12/2006 16:47	16/12/2006 18:40	Discharge Cargo	Barwil Agencies
SILVER CLOUD	9	Nil Cargo	Nil Cargo	15/01/2007 08:32	15/01/2007 18:55	Visit	Barwil Agencies
BOUGAINVILLE COAST	10	Containers	Containers	15/02/2007 08:40	15/02/2007 18:57	Discharge/Load	Consort Express Lines
INGOLSTADT	9	Motor Vehicles	NIL	15/02/2007 15:20	15/02/2007 20:50	Discharge Cargo	Monson Agencies Aust
GENERAL DELGADO	3	Fertilizer Fertilizer Sulphur	NIL	15/03/2007 05:30	18/03/2007 21:50	Discharge/Load	Barwil Agencies
PACIFIC ADVENTURER	3	Containers General Cargo	NIL	15/04/2007 02:45	15/04/2007 16:10	Discharge Cargo	Oceania Maritime Serv
SUN RIVER	1	Fuel Oil	NIL	15/04/2007 18:28	18/04/2007 00:27	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
BECRUX	3	NIL	Cattle	15/04/2007 19:28	18/04/2007 07:06	Load Cargo	Barwil Agencies
CLIPPER TRUST	A/2	Nickel Ore	NIL	15/04/2007 22:15	17/04/2007 10:35	Discharge/Load	Barwil Agencies
IRIS HALO	A/2	Nickel Ore	NIL	15/05/2007 08:15	17/05/2007 17:15	Discharge Cargo	Barwil Agencies
EASTERN HIGHWAY.	9	Motor Vehicles	NIL	15/05/2007 21:05	16/05/2007 06:34	Discharge Cargo	Monson Agencies Aust
GOLDEN KAORI	4	Caustic Soda	Molasses	15/07/2006 23:36	17/07/2006 02:55	Discharge Cargo	Oceania Maritime Serv
IRIS HALO	A/2	Nickel Ore	NIL	15/08/2006 15:35	17/08/2006 23:00	Discharge Cargo	Barwil Agencies
SIBULK QUALITY	7	NIL	Fertilizer	15/08/2006 18:20	18/08/2006 05:00	Load Cargo	Barwil Agencies
OLGA	7	Nil Cargo	Concentrates	15/09/2006 04:50	15/09/2006 20:20	Load Cargo	Barwil Agencies
JASMINE HALO	A/2	Nickel Ore	Nil Cargo	15/09/2006 06:30	17/09/2006 13:00	Discharge Cargo	Barwil Agencies
NAMHAE GAS	1	LPG	LPG	15/09/2006 14:35	15/09/2006 23:50	Discharge Cargo	Oceania Maritime Serv
TRITON STORK	3	Fertilizer	Nil Cargo	15/09/2006 19:45	18/09/2006 03:08	Discharge Cargo	Oceania Maritime Serv
OCEAN PRELUDE	A/2	Nickel Ore	Nil Cargo	15/10/2006 05:30	18/10/2006 06:36	Discharge Cargo	Barwil Agencies
PACIFIC DHOW	4	Nil Cargo	Molasses	15/10/2006 22:45	17/10/2006 07:53	Load Cargo	Oceania Maritime Serv
PACIFIC VOYAGER	A/3	Containers General Cargo	Containers	15/11/2006 04:35	15/11/2006 22:50	Discharge/Load	Oceania Maritime Serv
TASMAN SEA	7	Concentrates	Nil Cargo	15/11/2006 06:50	15/11/2006 23:26	Load Cargo	Townsville Shipping Ag
KINNA	1	LPG	NIL	15/12/2006 00:22	15/12/2006 06:45	Discharge Cargo	Oceania Maritime Serv
MOUNT FISHER	A/8	NIL	Scrap	15/12/2006 06:06	18/12/2006 00:26	Load Cargo	Inchcape Shipping Serv
CHENGTU	3	Containers	Containers	16/01/2007 12:52	18/01/2007 08:56	Discharge/Load	Swire Shipping
GOLDEN KAORI	8	NIL	Molasses	16/01/2007 19:41	17/01/2007 22:45	Load Cargo	Oceania Maritime Serv
HMAS KANIMBLA	10	NIL	NIL	16/02/2007 09:51	19/02/2007 12:30	Visit	Department of Navy

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
HMAS LABUAN	4	NIL	NIL	16/02/2007 12:47	19/02/2007 12:15	Load Cargo	Department of Navy
HMAS BRUNEI	4	NIL	NIL	16/02/2007 12:59	19/02/2007 12:15	Load Cargo	Royal Australian Navy
HMAS WEWAK	4	NIL	NIL	16/02/2007 13:15	19/02/2007 12:15	Load Cargo	Royal Australian Navy
EDUARD OLDENDORFF	A/7	NIL	Concentrates	16/04/2007 14:10	18/04/2007 22:13	Load Cargo	Townsville Shipping Ag
HELIX	1	Fuels	Fuels	16/05/2007 05:42	16/05/2007 14:45	Discharge Cargo	Barwil Agencies
CLIPPER LAKE	3	Sulphur	NIL	16/05/2007 08:20	19/05/2007 22:00	Discharge Cargo	Barwil Agencies
LAUREL ISLAND	4	NIL	NIL	16/06/2007 13:11	18/06/2007 19:55	Load Cargo	McArthur Shipping & Ag
IRIS HALO	2	Nickel Ore	NIL	16/06/2007 21:28	20/06/2007 12:00	Discharge Cargo	Barwil Agencies
DIAMOND GLORY	2	Nickel Ore	NIL	16/07/2006 05:12	17/07/2006 10:35	Discharge Cargo	Barwil Agencies
TIAN LONG ZOU	1	Fuel Oil	Nil Cargo	16/09/2006 17:50	18/09/2006 14:00	Discharge Cargo	Barwil Agencies
HOPE STAR	9	Nil Cargo	Sugar	16/10/2006 16:20	17/10/2006 11:47	Load Cargo	Inchcape Shipping Serv
TASMAN CHIEF	A/3	Containers	Containers General Cargo	16/11/2006 01:30	16/11/2006 20:20	Discharge/Load	Oceania Maritime Serv
GENERAL VILLA	A/4	Fertilizer	NIL	16/11/2006 06:22	20/11/2006 13:00	Discharge Cargo	Oceania Maritime Serv
BOUGAINVILLE COAST	10	Containers	Containers	16/11/2006 07:00	16/11/2006 23:45	Discharge/Load	Toll International Pty Ltd
KINNA	1	LPG	LPG	16/11/2006 08:03	16/11/2006 14:53	Discharge Cargo	Oceania Maritime Serv
ZAO EXPRESS	1	Fuels	Fuels	16/11/2006 23:00	17/11/2006 18:00	Discharge Cargo	Barwil Agencies
PALMERSTON	1	Fuels	NIL	16/12/2006 00:30	16/12/2006 21:33	Discharge Cargo	Inchcape Shipping Serv
PACIFIC CONDOR	3	Containers Tyres	Containers	16/12/2006 13:46	17/12/2006 22:17	Discharge/Load	Oceania Maritime Serv
LUMINOUS HALO	2	Nickel Ore	Nil Cargo	16/12/2006 20:45	19/12/2006 09:00	Discharge Cargo	Barwil Agencies
BALTIMAR BOREAS	A/10	Containers	Bulk Cement	17/01/2007 06:50	17/01/2007 15:55	Discharge/Load	Strang International Pty

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
TIMARU STAR	9	NIL	Zinc Ingots Timber	17/02/2007 11:27	19/02/2007 23:28	Load Cargo	Townsville Shipping Ag
CHING HO	7	NIL	Concentrates	17/03/2007 05:55	18/03/2007 07:56	Load Cargo	Townsville Shipping Ag
SILVER SHADOW	9	Passenger Vessel	Passenger Vessel	17/03/2007 07:20	17/03/2007 17:50	Visit	Barwil Agencies
YASA UNSAL SUNAR	2	Nickel Ore	NIL	17/03/2007 08:48	20/03/2007 07:01	Discharge Cargo	Barwil Agencies
CORAL PRINCESS	8	Passenger Vessel	NIL	17/04/2007 09:48	17/04/2007 13:01	Visit	Coral Princess Cruises
PACIFIC INVESTIGATOR	10/10	NIL	Machinery	17/05/2007 10:15	18/05/2007 12:35	Load Cargo	Perrott Salvage &
ELSA OLDENDORFF	3	NIL	Concentrates	17/06/2007 08:20	19/06/2007 19:13	Discharge Cargo	Townsville Shipping Ag
JOALMI	7	NIL	Concentrates	17/06/2007 11:00	18/06/2007 23:13	Load Cargo	Townsville Shipping Ag
BARCELONA	9	Motor Vehicles	NIL	17/07/2006 05:22	17/07/2006 10:15	Discharge Cargo	Monson Agencies Aust
ALCEM CALACA	4	Bulk Cement	NIL	17/07/2006 06:30	18/07/2006 20:46	Discharge Cargo	Cement Australia (Shi
MOROBE COAST	A/10	NIL	NIL	17/07/2006 07:45	18/07/2006 12:07	Discharge/Load	Toll International Pty Ltd
NAMHAE GAS	1	LPG	NIL	17/07/2006 12:15	17/07/2006 19:10	Discharge Cargo	Oceania Maritime Serv
OB	9	NIL	Sugar	17/07/2006 20:38	18/07/2006 00:48	Load Cargo	Inchcape Shipping Serv
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	17/10/2006 09:25	17/10/2006 12:50	Visit	Coral Princess Cruises
MANDARIN ARROW	7	Nil Cargo	Fertilizer	17/10/2006 18:06	19/10/2006 18:15	Load Cargo	Barwil Agencies
CAPE DELFARO	A/3	Containers	Containers	17/11/2006 11:08	19/11/2006 00:48	Discharge/Load	Toll International Pty Ltd
HMAS KANIMBLA	10	NIL	NIL	17/12/2006 10:10	17/12/2006 15:55		Patrick Defence Logistic
ALCEM CALACA	4	Bulk Cement Bulk Cement	NIL	17/12/2006 12:06	19/12/2006 03:53		Cement Australia (Shi
TEAM ANJA	1	Fuels	NIL	18/01/2007 01:27	19/01/2007 00:05	Discharge Cargo	Barwil Agencies
KEN RYU	9/2/4	NIL	Timber	18/01/2007 04:58	26/01/2007 10:00	Load Cargo	Geelong Shipping Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CAPE DELFARO	3	Containers	NIL	18/01/2007 16:39	19/01/2007 05:58	Discharge/Load	Toll International Pty Ltd
OCEAN PREDATOR	A/7	NIL	Concentrates	18/03/2007 10:08	20/03/2007 00:03	Load Cargo	Townsville Shipping Ag
POSITIVE LEADER	A/9	Motor Vehicles	NIL	18/03/2007 21:10	19/03/2007 09:15	Discharge Cargo	Oceania Maritime Serv
PALMERSTON	A/1	Fuels	NIL	18/04/2007 03:02	18/04/2007 20:12	Discharge Cargo	Inchcape Shipping Serv
MADANG COAST	10	Containers	Containers	18/04/2007 07:11	18/04/2007 18:56	Discharge/Load	Consort Express Lines
CEC FORCE	8	NIL	Zinc Ingots	18/04/2007 09:12	20/04/2007 00:03	Load Cargo	Townsville Shipping Ag
CAPE DARBY	3	Nil Cargo	Containers General Cargo	18/04/2007 14:02	19/04/2007 11:40	Discharge/Load	Toll International Pty Ltd
SHIPPING-LAND 6	9	NIL	Sugar	18/05/2007 10:17	19/05/2007 14:00	Load Cargo	Inchcape Shipping Serv
MAGNETIC ISLE	A/2	Nickel Ore	NIL	18/05/2007 11:35	21/05/2007 19:30	Discharge Cargo	Barwil Agencies
GLOBAL LEADER	9	NIL	Motor Vehicles	18/06/2007 04:07	18/06/2007 12:00	Discharge Cargo	Oceania Maritime Serv
HMAS BUNDABERG	8	NIL	NIL	18/06/2007 13:55	19/06/2007 10:00	Visit	USS - UBS(Aust)
PORT MELBOURNE	A/7	NIL	Fertilizer	18/07/2006 07:18	19/07/2006 21:18	Load Cargo	Barwil Agencies
DIAMOND GLORY	A/2	Nickel Ore	NIL	18/08/2006 01:20	19/08/2006 15:50	Discharge Cargo	Barwil Agencies
NEW MARINER	A/9	Fertilizer	Nil Cargo	18/09/2006 05:35	21/09/2006 11:00	Discharge Cargo	Oceania Maritime Serv
NEPTUNE SCAN	10	Machinery	Nil Cargo	18/09/2006 07:45	19/09/2006 11:10	Discharge Cargo	McArthur Shipping & Ag
EMU ARROW	7	Nil Cargo	Concentrates	18/09/2006 08:05	19/09/2006 04:00	Load Cargo	Townsville Shipping Ag
DAME ROMA MITCHELL	8	NIL	NIL	18/09/2006 13:00	23/09/2006 08:30	Visit	Australian Customs Ser
JASMINE EXPRESS	A/1	Fuel Oil	Fuel Oil	18/09/2006 16:28	19/09/2006 12:00	Discharge Cargo	Barwil Agencies
CURIA	3	Fertilizer	Nil Cargo	18/10/2006 05:55	20/10/2006 17:50	Discharge Cargo	Oceania Maritime Serv
MARIA C	7	Nil Cargo	Fertilizer	18/11/2006 06:10	20/11/2006 08:00	Load Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
IRIS HALO	A/2	Nickel Ore	Nil Cargo	18/11/2006 07:34	21/11/2006 02:55	Discharge Cargo	Barwil Agencies
GRANDE NAPOLI	9	Motor Vehicles	NIL	18/12/2006 04:30	18/12/2006 10:05	Discharge Cargo	Oceania Maritime Serv
WESTERN TRIUMPH2	A/10/3/1	Containers	General Cargo	18/12/2006 06:05	19/12/2006 00:08	Discharge/Load	Strang International Pty
JASMINE	A/1	Fuels	NIL	19/01/2007 02:30	19/01/2007 20:12	Discharge Cargo	Inchcape Shipping Serv
ALCEM CALACA	4	Bulk Cement	NIL	19/01/2007 08:15	21/01/2007 05:52	Discharge Cargo	Cement Australia (Shi
CHOLLADA NAREE	3	Concentrates	NIL	19/01/2007 12:45	21/01/2007 14:55	Discharge Cargo	Monson Agencies Aust
BOUGAINVILLE COAST	10	Containers	Containers	19/01/2007 13:30	20/01/2007 08:27	Discharge/Load	Consort Express Lines
BARRINGTON	1	Fuels	NIL	19/02/2007 03:27	19/02/2007 22:05	Discharge Cargo	Inchcape Shipping Serv
PACIFIC FALCON	3	Containers General Cargo	Containers	19/02/2007 07:26	20/02/2007 22:00	Discharge/Load	Oceania Maritime Serv
PRIAM	A/3	NIL	Timber	19/03/2007 06:00	22/03/2007 16:03	Load Cargo	Geelong Shipping Serv
KEN RYU	A/11	NIL	Concentrates	19/03/2007 21:55	21/03/2007 10:05	Load Cargo	Barwil Agencies
PACIFIC PRINCESS	9	Passenger Vessel	Passenger Vessel	19/04/2007 07:50	19/04/2007 17:30	Visit	Oceania Maritime Serv
JADE BREEZE	3/9/9/A	Concentrates	NIL	19/04/2007 13:56	26/04/2007 20:00	Discharge Cargo	Townsville Shipping Ag
ALCEM CALACA	4	NIL	Bulk Cement	19/05/2007 12:43	21/05/2007 08:00	Discharge Cargo	Cement Australia (Shi
DAI NAM	1	Fuels	Fuels	19/06/2007 09:53	20/06/2007 08:15	Discharge Cargo	Barwil Agencies
CORAL PRINCESS II	8	NIL	Passenger Vessel	19/06/2007 10:10	19/06/2007 13:26	Discharge/Load	Coral Princess Cruises
MANDARIN ARROW	7	NIL	Fertilizer	19/06/2007 13:08	23/06/2007 21:50	Load Cargo	Townsville Shipping Ag
MARIE O	9	NIL	Sugar	19/06/2007 18:13	20/06/2007 18:50	Load Cargo	Inchcape Shipping Serv
ALCEM CALACA	4	Bulk Cement	NIL	19/08/2006 02:25	20/08/2006 11:25	Discharge Cargo	Cement Australia (Shi
KING HALO	A/2	Nickel Ore	NIL	19/08/2006 18:00	22/08/2006 13:00	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
ARISTEA M	A/7	Nil Cargo	Fertilizer	19/09/2006 06:22	21/09/2006 16:29	Load Cargo	Townsville Shipping Ag
STOLT RINDO	A/1	Nil Cargo	Sulphuric Acid	19/09/2006 13:15	20/09/2006 08:55	Load Cargo	Barwil Agencies
MAPLE ACE 11	3	Motor Vehicles	Motor Vehicles	19/09/2006 17:12	19/09/2006 21:00	Discharge Cargo	Inchcape Shipping Serv
GLORIOUS HALO	A/2	Nickel Ore	Nil Cargo	19/10/2006 08:05	21/10/2006 10:00	Discharge Cargo	Barwil Agencies
TEAM PANTHER	A/9	Nil Cargo	Molasses	19/11/2006 03:25	22/11/2006 21:20	Load Cargo	Inchcape Shipping Serv
LELIEGRACHT	10	Nil Cargo	General Cargo	19/11/2006 12:55	20/11/2006 19:30	Load Cargo	McArthur Shipping & Ag
GAZELLE COAST	A/10	Containers	Containers	19/12/2006 07:00	20/12/2006 05:44	Discharge/Load	Consort Express Lines
CORAL PRINCESS II	8	Passenger Vessel	NIL	19/12/2006 10:05	19/12/2006 14:22	Visit	Coral Princess Cruises
KING HALO	A/2	Nickel Ore	NIL	19/12/2006 18:33	22/12/2006 23:54	Discharge Cargo	Barwil Agencies
LAKE JOY	11	Nil Cargo	Concentrates	19/12/2006 20:09	20/12/2006 19:26	Load Cargo	Barwil Agencies
NORDIC BULKER	7/3/7/9	NIL	Concentrates Lead Ingots	20/01/2007 17:25	25/01/2007 18:06	Load Cargo	Townsville Shipping Ag
GOLDEN YUKI	A/9	NIL	Molasses	20/02/2007 01:15	21/02/2007 00:35	Load Cargo	Oceania Maritime Serv
NAMHAE GAS	A/1	LPG	NIL	20/02/2007 05:25	20/02/2007 11:26	Discharge Cargo	Oceania Maritime Serv
BIANCO DAN	A/7/3/9	NIL	Concentrates Concentrates	20/02/2007 06:30	25/02/2007 08:58	Load Cargo	Townsville Shipping Ag
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	20/02/2007 09:35	20/02/2007 13:40	Visit	Coral Princess Cruises
ALCEM CALACA	4	Bulk Cement	NIL	20/02/2007 13:15	22/02/2007 09:26	Discharge Cargo	Cement Australia (Shi
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	20/03/2007 09:45	20/03/2007 14:10	Visit	Coral Princess Cruises
ALCEM CALACA	4	NIL	Bulk Cement	20/06/2007 11:37	21/06/2007 21:56	Discharge Cargo	Cement Australia (Shi
PACIFIC CONQUEST	8	NIL	NIL	20/06/2007 16:10	21/06/2007 17:58	Crew Change	Fodico Pty Ltd
GOLDEN KAORI	A/9	NIL	Molasses	20/06/2007 21:10	22/06/2007 23:25	Load Cargo	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CAPE DELGADO	A/3	NIL	Containers Metals	20/07/2006 06:05	21/07/2006 21:53	Discharge/Load	Toll International Pty Ltd
C.S.VALIANT	7	NIL	Concentrates	20/07/2006 16:15	22/07/2006 08:27	Load Cargo	Townsville Shipping Ag
HAUSTRUM	1	Fuels	NIL	20/08/2006 09:14	21/08/2006 04:10	Discharge Cargo	Barwil Agencies
PALMERSTON	1	Fuel Oil	Fuel Oil	20/09/2006 11:07	21/09/2006 02:00	Discharge Cargo	Inchcape Shipping Serv
LIZZIE KOSAN	1	LPG	LPG	20/10/2006 12:35	20/10/2006 23:00	Discharge Cargo	Oceania Maritime Serv
SIRIUS HIGHWAY	A/8	Motor Vehicles	Motor Vehicles	20/11/2006 10:25	21/11/2006 04:50	Discharge Cargo	Monson Agencies Aust
CHENGTU	A/4	Containers General Cargo	Nil Cargo	20/11/2006 15:24	21/11/2006 00:05	Discharge Cargo	Swire Shipping
HANJIN BRISBANE	A/9	NIL	Sugar	20/12/2006 07:37	21/12/2006 06:26	Load Cargo	Inchcape Shipping Serv
MOROBE COAST	10	Containers	Containers	21/02/2007 07:12	21/02/2007 22:05	Discharge/Load	Toll International Pty Ltd
ASTOR	9	Passenger Vessel	Passenger Vessel	21/02/2007 07:38	21/02/2007 19:00	Visit	Barwil Agencies
JASMINE	1	Fuels	NIL	21/02/2007 11:48	22/02/2007 01:20	Discharge Cargo	Inchcape Shipping Serv
MADANG COAST	10	Containers	Containers	21/03/2007 06:00	21/03/2007 20:03	Discharge/Load	Toll International Pty Ltd
GENERAL DELGADO	7	NIL	Concentrates	21/03/2007 09:20	22/03/2007 03:35	Load Cargo	Barwil Agencies
PANTANAL	10	NIL	General Cargo Nil Cargo	21/04/2007 03:26	24/04/2007 13:02	Load Cargo	Townsville Shipping Ag
GLOBAL ESCORT	9	NIL	Sugar	21/04/2007 05:20	22/04/2007 01:55	Load Cargo	Inchcape Shipping Serv
HMAS TOWNSVILLE	8	NIL	NIL	21/04/2007 16:00	27/04/2007 09:06	Visit	Royal Australian Navy
KUROSHIO EXPRESS	1	Fuels	NIL	21/04/2007 16:30	23/04/2007 03:15	Discharge Cargo	Barwil Agencies
HUME HIGHWAY	3	NIL	Motor Vehicles	21/05/2007 05:12	21/05/2007 11:15	Discharge Cargo	Monson Agencies Aust
LIBRA LEADER	9	NIL	Motor Vehicles	21/05/2007 07:35	21/05/2007 14:00	Discharge Cargo	Oceania Maritime Serv
PACIFIC INVESTIGATOR	4	NIL	Machinery	21/05/2007 08:40	22/05/2007 14:35	Load Cargo	Perrott Salvage &

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
GLORIOUS HALO	A/2/2	Nickel Ore	NIL	21/05/2007 21:45	25/05/2007 03:33	Discharge Cargo	Barwil Agencies
ORIENTE SKY	A/9/7	NIL	Concentrates	21/07/2006 12:32	23/07/2006 20:48	Load Cargo	Townsville Shipping Ag
PACIFIC CONDOR	3	Containers General Cargo	Containers	21/07/2006 23:43	22/07/2006 17:40	Discharge/Load	Oceania Maritime Serv
NAMHAE GAS	A/1	LPG	NIL	21/08/2006 06:45	21/08/2006 16:30	Discharge Cargo	Oceania Maritime Serv
PACIFIC MERCURY	3	Concentrates	NIL	21/08/2006 19:00	27/08/2006 19:50	Discharge Cargo	Oceania Maritime Serv
PALMERSTON	1	Fuel Oil	Fuel Oil	21/10/2006 03:18	21/10/2006 22:12	Discharge Cargo	Inchcape Shipping Serv
BASILISK	RR	NIL	NIL	21/10/2006 08:15	08/05/2007 16:10	Repairs	Tenix
LUMINOUS HALO	2	Nickel Ore	Nil Cargo	21/10/2006 19:47	24/10/2006 13:00	Discharge Cargo	Barwil Agencies
CAPE MORETON	3	Containers	Containers	21/10/2006 21:26	24/10/2006 15:48	Load Cargo	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	Nil Cargo	21/11/2006 02:25	22/11/2006 23:59	Discharge Cargo	Cement Australia (Shi
GLORIOUS HALO	A/2/2	Nickel Ore	Nil Cargo	21/11/2006 07:10	23/11/2006 20:10	Discharge Cargo	Barwil Agencies
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	21/11/2006 09:45	21/11/2006 13:00	Visit	Coral Princess Cruises
BLUE STAR	9	NIL	Passenger Vessel	21/12/2006 09:00	21/12/2006 16:00	Visit	Townsville Shipping Ag
HELIX	1	Fuels	Fuels	21/12/2006 17:40	22/12/2006 15:10	Discharge/Load	Barwil Agencies
SAGITTARIUS LEADER	9	Motor Vehicles	NIL	22/01/2007 19:54	23/01/2007 00:45	Discharge Cargo	Oceania Maritime Serv
HMAS KANIMBLA	10	NIL	NIL	22/02/2007 07:55	22/02/2007 12:05	Visit	Patrick Defence Logistic
CAPE DARNLEY	3	Containers General Cargo	NIL	22/02/2007 09:07	22/02/2007 21:52	Discharge/Load	Toll International Pty Ltd
ATROMITOS	11/7	NIL	Concentrates Concentrates	22/02/2007 16:45	24/02/2007 05:55	Load Cargo	Monson Agencies Aust
GRETKE OLDENDORFF	7	NIL	Concentrates	22/03/2007 05:53	23/03/2007 04:15	Load Cargo	Barwil Agencies
GOLDEN KAORI	4	NIL	Molasses	22/03/2007 09:33	23/03/2007 12:00	Load Cargo	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
SITEAM ANJA	1	Fuels	NIL	22/03/2007 10:23	23/03/2007 06:53	Discharge Cargo	Barwil Agencies
PACIFIC FALCON	4	Containers General Cargo	Containers	22/04/2007 06:55	23/04/2007 08:57	Discharge Cargo	Oceania Maritime Serv
PEGASUS HIGHWAY	9	Motor Vehicles	NIL	22/04/2007 15:08	22/04/2007 23:48	Discharge Cargo	Monson Agencies Aust
KEN REI	3	NIL	Timber	22/05/2007 04:25	26/05/2007 09:55	Load Cargo	Townsville Shipping Ag
AFRICAN IBIS	A/7	NIL	Concentrates	22/05/2007 06:20	24/05/2007 12:40	Load Cargo	Townsville Shipping Ag
CORAL PRINCESS	8	NIL	Passenger Vessel	22/05/2007 09:35	22/05/2007 13:10	Discharge/Load	Coral Princess Cruises
PACIFIC ADVENTURER	3	NIL	Containers	22/06/2007 11:17	22/06/2007 22:05	Discharge Cargo	Oceania Maritime Serv
BARRINGTON	1	Fuels	NIL	22/07/2006 01:57	22/07/2006 22:00	Discharge Cargo	Inchcape Shipping Serv
BOUGAINVILLE COAST	10	Containers	Containers	22/07/2006 10:42	24/07/2006 17:45	Discharge/Load	Toll International Pty Ltd
TINOS	3	Concentrates	NIL	22/07/2006 19:30	25/07/2006 11:55	Discharge Cargo	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	NIL	22/07/2006 23:50	25/07/2006 12:47	Discharge Cargo	Cement Australia (Shi
SEPIK COAST	10	Containers	Containers	22/08/2006 07:30	22/08/2006 20:17	Discharge/Load	Consort Express Lines
MARINE ISLAND	9	NIL	Sugar	22/08/2006 22:25	23/08/2006 18:17	Load Cargo	Inchcape Shipping Serv
HOEGH TROPICANA	4	Motor Vehicles	Motor Vehicles	22/09/2006 08:35	22/09/2006 12:25	Discharge Cargo	Oceania Maritime Serv
POLARQUEEN	9	Nil Cargo	Sugar	22/09/2006 10:54	23/09/2006 04:50	Load Cargo	Inchcape Shipping Serv
LILY OLDENDORFF	7	Nil Cargo	Concentrates	22/09/2006 14:18	23/09/2006 17:56	Load Cargo	Monson Agencies Aust
ZAO EXPRESS	1	Fuel Oil	Fuel Oil	22/10/2006 00:45	22/10/2006 20:10	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	Nil Cargo	22/10/2006 02:23	23/10/2006 13:20	Discharge Cargo	Cement Australia (Shi
GENERAL DELGADO	8	Fertilizer	Nil Cargo	22/10/2006 09:45	23/10/2006 12:28	Discharge Cargo	Oceania Maritime Serv
GOLDEN LUCY 1	8	NIL	Molasses	22/11/2006 13:45	24/11/2006 19:00	Load Cargo	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
DUSITA NAREE	3/A/7	Nil Cargo	Concentrates Refined Copper	22/11/2006 20:20	01/12/2006 06:00	Load Cargo	Townsville Shipping Ag
NEW CONCORD	A/9	Nil Cargo	Sugar	22/11/2006 23:35	23/11/2006 23:15	Load Cargo	Inchcape Shipping Serv
CAPE DARNLEY	3	Containers	Containers Refined Copper	22/12/2006 02:23	23/12/2006 23:47	Discharge/Load	Toll International Pty Ltd
CORAL PRINCESS	8	NIL	Passenger Vessel	23/01/2007 09:30	23/01/2007 13:00	Visit	Coral Princess Cruises
IKAN SEMBAK	2	Nickel Ore	NIL	23/02/2007 00:30	26/02/2007 18:00	Discharge Cargo	Barwil Agencies
HMAS TARAKAN	4	NIL	NIL	23/02/2007 13:40	24/02/2007 13:00	Visit	Royal Australian Navy
IKAN TAMBAN	7	NIL	Concentrates	23/03/2007 06:06	23/03/2007 22:56	Load Cargo	Monson Agencies Aust
NAMHAE GAS	1	LPG	NIL	23/03/2007 08:40	23/03/2007 16:00	Discharge Cargo	Oceania Maritime Serv
MAROUDIO	A/7/3	NIL	Concentrates Zinc Ingots	23/04/2007 06:15	27/04/2007 02:55	Load Cargo	Townsville Shipping Ag
GAZELLE COAST	10	Containers	Containers	23/05/2007 05:55	24/05/2007 08:15	Discharge/Load	Consort Express Lines
SEPIK COAST	10	Containers	Containers	23/06/2007 05:05	23/06/2007 20:25	Discharge/Load	Consort Express Lines
HELIX	1	Fuels	Fuels	23/07/2006 00:34	23/07/2006 22:10	Discharge Cargo	Barwil Agencies
HMAS KANIMBLA	8	NIL	NIL	23/07/2006 10:00	23/07/2006 13:12	Discharge Cargo	Patrick Defence Logistic
UTOPIA ACE	9	Motor Vehicles	NIL	23/07/2006 14:35	23/07/2006 20:28	Discharge Cargo	Inchcape Shipping Serv
GENERAL VILLA	4	Sulphur	NIL	23/08/2006 04:35	25/08/2006 11:20	Discharge Cargo	Barwil Agencies
CAPE DELFARO	9	Containers	Containers	23/08/2006 21:00	27/08/2006 09:05	Discharge/Load	Toll International Pty Ltd
ALCEM CALACA	4	Bulk Cement	Nil Cargo	23/09/2006 12:58	25/09/2006 02:55	Discharge Cargo	Cement Australia (Shi
USAV JOINT VENTURE	10	NIL	NIL	23/09/2006 16:40	24/09/2006 15:54	Take on Bunkers	Patrick Defence Logistic
HMAS MANOORA	10/10	Motor Vehicles	NIL	23/10/2006 08:17	25/10/2006 12:10	Discharge/Load	Royal Australian Navy
HUME HIGHWAY	9	Motor Vehicles	Motor Vehicles	23/10/2006 11:40	23/10/2006 17:42	Discharge Cargo	Monson Agencies Aust

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
MERIDIAN HALO	A/2	Nickel Ore	Nil Cargo	23/11/2006 22:37	27/11/2006 13:15	Discharge Cargo	Barwil Agencies
ALCEM CALACA	11/4	Bulk Cement	NIL	23/12/2006 07:03	27/12/2006 22:32	Discharge Cargo	Cement Australia (Shi
JASMINE HALO	A/2	Nickel Ore	NIL	23/12/2006 09:45	28/12/2006 03:00	Discharge Cargo	Barwil Agencies
APOSTOLOS 11	9	Nil Cargo	Concentrates	23/12/2006 12:15	26/12/2006 21:00	Load Cargo	Townsville Shipping Ag
STENTOR	7	NIL	Concentrates	24/01/2007 06:00	26/01/2007 03:02	Load Cargo	Monson Agencies Aust
MOROBE COAST	10	Containers	Containers	24/01/2007 07:42	24/01/2007 20:00	Discharge/Load	Toll International Pty Ltd
SHENG MU	A/7	NIL	Fertilizer	24/03/2007 05:55	25/03/2007 00:05	Load Cargo	Barwil Agencies
HELIX	1	Fuels	NIL	24/03/2007 12:42	25/03/2007 07:00	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	NIL	24/03/2007 14:53	26/03/2007 16:27	Discharge Cargo	Cement Australia (Shi
EMERALD HALO	2	Nickel Ore	NIL	24/03/2007 15:55	26/03/2007 16:00	Discharge Cargo	Barwil Agencies
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	24/04/2007 09:20	24/04/2007 13:00	Discharge/Load	Coral Princess Cruises
PACIFIC VOYAGER	3	Containers	Containers	24/04/2007 11:10	24/04/2007 20:20	Discharge/Load	Oceania Maritime Serv
FALCON TRAVELLER	9	NIL	Sugar	24/05/2007 07:21	25/05/2007 07:55	Load Cargo	Inchcape Shipping Serv
GOLDEN AKANE	A/4	NIL	Tallow	24/05/2007 09:55	25/05/2007 06:42	Load Cargo	Oceania Maritime Serv
PALMERSTON	1	Nil Cargo	Fuels	24/05/2007 12:12	24/05/2007 22:58	Discharge Cargo	Inchcape Shipping Serv
AUK ARROW	A/7	NIL	Fertilizer	24/05/2007 14:30	27/05/2007 19:54	Load Cargo	Townsville Shipping Ag
ELSA OLDENDORFF	A/7	NIL	Concentrates	24/06/2007 07:25	27/06/2007 00:50	Load Cargo	Townsville Shipping Ag
PACIFIC CHALLENGER	3	Concentrates	Containers	24/06/2007 13:06	25/06/2007 17:05	Discharge/Load	Oceania Maritime Serv
TEAM ANATAS	8	Nil Cargo	Molasses	24/08/2006 22:06	28/08/2006 19:55	Load Cargo	Inchcape Shipping Serv
ONYX ARROW	3	Motor Vehicles	Motor Vehicles	24/09/2006 13:02	24/09/2006 19:30	Discharge Cargo	Monson Agencies Aust

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CORAL PRINCESS II	8	Passenger Vessel	Passenger Vessel	24/10/2006 09:45	24/10/2006 12:56	Visit	Coral Princess Cruises
HELIX	1	Fuel Oil	Fuel Oil	24/10/2006 11:18	25/10/2006 07:10	Discharge Cargo	Barwil Agencies
CATTLEYA ACE	9	Motor Vehicles	Motor Vehicles	24/10/2006 14:58	24/10/2006 21:00	Discharge Cargo	Inchcape Shipping Serv
NENA C	7/11	Nil Cargo	Concentrates Concentrates	24/11/2006 08:30	26/11/2006 18:20	Load Cargo	Monson Agencies Aust
LAKE ARUFURA	A/3/8	Concentrates	Scrap	24/11/2006 21:22	29/11/2006 21:45	Discharge Cargo	Townsville Shipping Ag
MOROBE COAST	10	Containers	Containers	24/11/2006 23:41	25/11/2006 10:55	Discharge/Load	Consort Express Lines
MARIA C	7	Nil Cargo	Fertilizer	24/12/2006 10:30	27/12/2006 19:24	Load Cargo	Barwil Agencies
KINNA	1	LPG	NIL	25/01/2007 14:16	25/01/2007 19:31	Discharge Cargo	Oceania Maritime Serv
CAPE DONINGTON	3	Containers General Cargo	Containers General Cargo	25/02/2007 08:35	25/02/2007 23:50	Discharge/Load	Toll International Pty Ltd
SHANGHAI HIGHWAY	9	Motor Vehicles	NIL	25/02/2007 20:30	26/02/2007 04:50	Discharge Cargo	Monson Agencies Aust
COLUMBIA RIVER	9	NIL	Scrap	25/03/2007 02:53	28/03/2007 19:00	Load Cargo	Inchcape Shipping Serv
GUNDULIC	A/7	NIL	Fertilizer	25/03/2007 06:11	27/03/2007 16:00	Load Cargo	Barwil Agencies
PACIFIC GAS	1	LPG	NIL	25/04/2007 07:56	25/04/2007 13:50	Discharge Cargo	Oceania Maritime Serv
LUMINOUS HALO	2	Nickel Ore	NIL	25/04/2007 16:14	30/04/2007 10:00	Discharge Cargo	Barwil Agencies
PACIFIC SUNSHINE	A/1	Nil Cargo	Fuels	25/05/2007 01:33	25/05/2007 21:08	Discharge Cargo	Barwil Agencies
PACIFIC INVESTIGATOR	10	NIL	Machinery	25/05/2007 06:10	25/05/2007 15:00	Load Cargo	Perrott Salvage &
CLIPPER TRUST	2	Nickel Ore	NIL	25/05/2007 12:55	30/05/2007 00:42	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	NIL	25/05/2007 14:20	28/05/2007 11:30	Discharge Cargo	Cement Australia (Shi
STAR BIRD	10	NIL	Containers General Cargo	25/06/2007 06:05	25/06/2007 10:05	Load Cargo	Oceania Maritime Serv
STOLT JASMINE	1	NIL	Sulphuric Acid	25/06/2007 12:20	26/06/2007 06:10	Load Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
ALCEM CALACA	4	Bulk Cement	NIL	25/06/2007 23:35	27/06/2007 12:00	Discharge Cargo	Cement Australia (Shi
BOUGAINVILLE COAST	10/10	Containers	Containers	25/08/2006 22:05	26/08/2006 18:02	Discharge/Load	Toll International Pty Ltd
CHALOTHORN NAREE	A/4/8	Nil Cargo	Scrap	25/09/2006 04:55	30/09/2006 01:12	Load Cargo	Inchcape Shipping Serv
ECO CHASER	7	Nil Cargo	Fertilizer	25/09/2006 07:18	26/09/2006 12:24	Load Cargo	Townsville Shipping Ag
NAN CHANG HAI	9	NIL	NIL	25/09/2006 20:23	26/09/2006 01:00	Take on Bunkers	Barwil Agencies
CHEKIANG	3	Containers	Containers	25/10/2006 05:07	25/10/2006 23:06	Discharge/Load	Oceania Maritime Serv
MATHAWEE NAREE	A/7	Nil Cargo	Concentrates	25/10/2006 06:38	25/10/2006 23:39	Load Cargo	Townsville Shipping Ag
ANNOU G. O.	A/2	Nickel Ore	Nil Cargo	25/10/2006 10:28	28/10/2006 20:56	Discharge Cargo	Barwil Agencies
CARL OLDENDORFF	7	Nil Cargo	Concentrates	25/11/2006 06:00	26/11/2006 01:50	Load Cargo	Monson Agencies Aust
VOGE FELIX	7/4	NIL	Concentrates Timber	26/01/2007 08:30	29/01/2007 20:35	Load Cargo	Townsville Shipping Ag
PACIFIC VOYAGER	2	NIL	Containers	26/01/2007 15:05	26/01/2007 21:26	Discharge Cargo	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	NIL	26/02/2007 06:42	27/02/2007 09:50	Discharge Cargo	Cement Australia (Shi
YASA UNSAL SUNAR	A/2	Nickel Ore	NIL	26/02/2007 20:20	03/03/2007 09:00	Discharge Cargo	Barwil Agencies
ALBERT OLDENDORFF	7	NIL	Concentrates	26/02/2007 21:36	27/02/2007 17:54	Load Cargo	Townsville Shipping Ag
GALAXY LEADER	3	Motor Vehicles	NIL	26/03/2007 06:04	26/03/2007 11:56	Discharge Cargo	Oceania Maritime Serv
HMAS MANOORA	10	NIL	Army Equipment	26/03/2007 07:10	27/03/2007 06:56	Load Cargo	Royal Australian Navy
PALMERSTON	1	Fuels	NIL	26/03/2007 09:20	27/03/2007 04:03	Discharge Cargo	Inchcape Shipping Serv
PACIFIC CONDOR	3	Containers General Cargo	Containers	26/03/2007 13:52	27/03/2007 11:04	Discharge Cargo	Oceania Maritime Serv
CEC CENTURY	4	General Cargo	NIL	26/03/2007 17:41	27/03/2007 17:39	Discharge Cargo	McArthur Shipping & Ag
GAZELLE COAST	A/10	Containers	Containers	26/04/2007 06:40	26/04/2007 23:10	Discharge/Load	Consort Express Lines

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
LUCY OLDENDORFF	A/11	NIL	Concentrates	26/05/2007 19:30	27/05/2007 21:57	Load Cargo	Barwil Agencies
YASA UNSAL SUNAR	2	Nil Cargo	Nickel Ore	26/06/2007 05:35	30/06/2007 17:55	Discharge Cargo	Barwil Agencies
PACIFIC CONDOR	3	Containers	Containers	26/06/2007 20:05	27/06/2007 11:34	Discharge/Load	Oceania Maritime Serv
CCNI ANCUD	11	Nil Cargo	Concentrates Concentrates	26/06/2007 21:20	27/06/2007 19:35	Load Cargo	Monson Agencies Aust
KINNA	1	LPG	NIL	26/06/2007 22:25	27/06/2007 09:05	Discharge Cargo	Oceania Maritime Serv
EMERALD HALO	2	Nickel Ore	NIL	26/07/2006 22:04	28/07/2006 23:40	Discharge Cargo	Barwil Agencies
LUMINOUS HALO	2	Nickel Ore	Nil Cargo	26/08/2006 22:42	30/08/2006 07:35	Discharge Cargo	Barwil Agencies
CORAL PRINCESS II	9	Passenger Vessel	Passenger Vessel	26/09/2006 09:45	26/09/2006 13:10		Coral Princess Cruises
STOLT AZALEA	8	Nil Cargo	Tallow	26/09/2006 12:00	27/09/2006 17:35	Load Cargo	Barwil Agencies
SUNNY SUCCESS	A/3/A/3	Concentrates	Nil Cargo	26/10/2006 01:41	03/11/2006 12:57	Discharge Cargo	Oceania Maritime Serv
NIUGINI COAST	10	NIL	Containers	26/10/2006 10:10	27/10/2006 06:05	Load Cargo	Consort Express Lines
SUN ACE	4	Motor Vehicles	Motor Vehicles	26/11/2006 08:10	26/11/2006 19:40	Discharge Cargo	Inchcape Shipping Serv
CORAL PRINCESS II	8	NIL	NIL	26/12/2006 08:35	26/12/2006 14:35	Visit	Coral Princess Cruises
HANJIN BRISBANE	A/9	Sugar	NIL	27/01/2007 00:55	28/01/2007 06:50	Load Cargo	Inchcape Shipping Serv
BARRINGTON	1	Fuels	NIL	27/01/2007 02:40	27/01/2007 12:56	Discharge Cargo	Inchcape Shipping Serv
TROPIC SUNSEEKER	8	NIL	NIL	27/01/2007 11:10	27/01/2007 12:00	Take on Bunkers	Sunlover Cruises
ARCADIA	11/7/11	NIL	Concentrates	27/01/2007 18:27	05/02/2007 18:00	Load Cargo	Monson Agencies Aust
CHENGTU	9/3	Containers General Cargo	Containers Refined Copper	27/02/2007 02:06	02/03/2007 15:56	Discharge/Load	Oceania Maritime Serv
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	27/02/2007 08:30	27/02/2007 12:45	Visit	Coral Princess Cruises
PAPUAN CHEIF	4	Containers	Containers	27/02/2007 15:54	28/02/2007 06:00	Discharge Cargo	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
HAWKE BAY	A/7	NIL	Concentrates	27/02/2007 20:06	28/02/2007 12:00	Load Cargo	Monson Agencies Aust
RUBIN NACRE	3	Concentrates	NIL	27/02/2007 22:54	01/03/2007 14:26	Discharge Cargo	Monson Agencies Aust
PALMERSTON	1	Fuels	NIL	27/02/2007 23:47	28/02/2007 07:54	Discharge Cargo	Inchcape Shipping Serv
CORAL PRINCESS	8	Passenger Vessel	Passenger Vessel	27/03/2007 09:52	27/03/2007 13:05	Visit	Coral Princess Cruises
CLIPPER TRUST	2/9	Nickel Ore	NIL	27/03/2007 10:33	31/03/2007 07:30	Discharge Cargo	Barwil Agencies
HANJIN CALCUTTA	A/3	Concentrates	NIL	27/04/2007 05:20	28/04/2007 05:18	Discharge Cargo	Townsville Shipping Ag
SELENDANG NILAM	9	NIL	Sugar	27/06/2007 08:33	28/06/2007 17:25	Load Cargo	Inchcape Shipping Serv
PALMERSTON	1	NIL	Fuels	27/06/2007 18:55	28/06/2007 04:00	Discharge Cargo	Inchcape Shipping Serv
MOROBE COAST	10	Containers	Containers	27/07/2006 07:25	27/07/2006 18:51	Discharge/Load	Toll International Pty Ltd
ID HARMONY	A/9	NIL	Sugar	27/07/2006 20:52	28/07/2006 20:26	Load Cargo	Inchcape Shipping Serv
ODIN PACIFIC	9	Nil Cargo	Sugar	27/08/2006 18:15	28/08/2006 22:30	Load Cargo	Inchcape Shipping Serv
ALCEM CALACA	4	Bulk Cement	Nil Cargo	27/08/2006 22:30	29/08/2006 13:18	Discharge Cargo	Cement Australia (Shi
PACIFIC FALCON	3	Containers Tyres	Containers	27/09/2006 13:42	27/09/2006 23:50	Discharge/Load	Oceania Maritime Serv
CHENGTU	3	Containers General Cargo	Containers General Cargo	27/09/2006 19:30	28/09/2006 19:05	Discharge/Load	Swire Shipping
NIU AILAN COAST	10/8/9/A	Containers	Containers	27/09/2006 22:55	29/09/2006 12:04	Discharge/Load	Consort Express Lines
PACIFIC CONDOR	9	Containers Tyres	Containers General Cargo	27/10/2006 16:55	29/10/2006 05:02	Discharge/Load	Oceania Maritime Serv
STAR BIRD	10	Containers General Cargo	Containers	27/11/2006 04:24	27/11/2006 16:10	Discharge/Load	Oceania Maritime Serv
ALCEM CALACA	4	Bulk Cement	Nil Cargo	27/11/2006 05:39	29/11/2006 00:43	Discharge Cargo	Cement Australia (Shi
SUN RIVER	A/1	Fuels	Fuel Oil	27/11/2006 12:25	28/11/2006 23:50	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
AVEDON CALYPSO	A/2	Nickel Ore	Nil Cargo	27/11/2006 15:30	29/11/2006 01:25	Discharge Cargo	Barwil Agencies
CAPE DARNLEY	3	Containers	Containers	27/11/2006 23:15	28/11/2006 04:55	Discharge Cargo	Toll International Pty Ltd
PACIFIC ACE	A/11	NIL	Concentrates	27/12/2006 18:02	30/12/2006 14:55	Load Cargo	Barwil Agencies
LJUBLJANA	A/7	NIL	Concentrates	27/12/2006 22:05	28/12/2006 15:42	Load Cargo	Monson Agencies Aust
CAMPBELL COVE	8/7/10/9	Barge in Tow	Nil Cargo	28/02/2007 09:38	05/03/2007 09:00	Repairs	Barwil Agencies
COOK STRAIT	4	Fertilizer	NIL	28/02/2007 23:20	04/03/2007 22:54	Discharge/Load	Oceania Maritime Serv
CAPE FLATTERY	11	NIL	Concentrates	28/03/2007 12:20	29/03/2007 13:55	Load Cargo	Barwil Agencies
KIWI BREEZE	A/4	Motor Vehicles	NIL	28/04/2007 04:55	28/04/2007 11:52	Discharge Cargo	Barwil Agencies
PACIFIC EXPLORER	A/3	Containers	Containers	28/05/2007 07:07	28/05/2007 22:49	Discharge/Load	Oceania Maritime Serv
LUCAS OLDENDORFF	7	NIL	Concentrates	28/05/2007 14:13	30/05/2007 04:00	Load Cargo	Monson Agencies Aust
LUCIJA	A/9	NIL	Sugar	28/06/2007 19:16	30/06/2007 00:50	Load Cargo	Inchcape Shipping Serv
ALAM SELAMAT	A	NIL	Sugar	28/07/2006 00:00	28/07/2006 00:00	Load Cargo	Inchcape Shipping Serv
VOGE KATJA	A/7/A/7	NIL	Concentrates	28/07/2006 08:07	01/08/2006 09:00	Load Cargo	Townsville Shipping Ag
IRIS HALO	A/3/2	Nickel Ore	NIL	28/07/2006 22:26	31/07/2006 18:00	Discharge Cargo	Barwil Agencies
SARA AL JABER	11/3	Nil Cargo	Concentrates Lead Ingots	28/08/2006 14:20	31/08/2006 21:06	Load Cargo	Townsville Shipping Ag
CHEKIANG	3	Containers	Containers Nil Cargo	28/08/2006 15:40	29/08/2006 17:15	Discharge/Load	Oceania Maritime Serv
LAKE MAJA	A/7	Nil Cargo	Concentrates	28/08/2006 22:05	29/08/2006 15:00	Load Cargo	Townsville Shipping Ag
ALCEM CALACA	4	Bulk Cement	Nil Cargo	28/10/2006 02:42	30/10/2006 06:52	Discharge Cargo	Cement Australia (Shi
TOPFLIGHT	11/7/3	Nil Cargo	Concentrates Zinc Ingots	28/10/2006 05:18	31/10/2006 17:50	Load Cargo	Townsville Shipping Ag
AVEDON CALYPSO	A/2	Nickel Ore	Nil Cargo	28/10/2006 23:08	30/10/2006 16:05	Discharge Cargo	Barwil Agencies

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CORAL PRINCESS II	9	NIL	NIL	28/11/2006 09:30	28/11/2006 14:00	Visit	Coral Princess Cruises
CAPE YORK 1	3	Containers	Containers Refined Copper	28/11/2006 15:10	30/11/2006 21:50	Discharge/Load	Consort Express Lines
PARINDA NAREE	3	Concentrates	NIL	28/12/2006 01:45	31/12/2006 13:45	Discharge Cargo	Barwil Agencies
IRIS HALO	A/2	Nickel Ore	Nil Cargo	28/12/2006 05:10	31/12/2006 17:10	Discharge Cargo	Barwil Agencies
BLUE STAR	9	Passenger Vessel	NIL	28/12/2006 09:25	28/12/2006 16:15	Visit	Townsville Shipping Ag
TATE J	A/7/A/7	NIL	Concentrates	28/12/2006 17:57	07/01/2007 08:11	Load Cargo	Townsville Shipping Ag
PACIFIC FALCON	4	Containers Tyres	Containers	28/12/2006 18:53	29/12/2006 13:00	Discharge/Load	Oceania Maritime Serv
JASMINE	A/1	Fuels	NIL	29/01/2007 06:12	29/01/2007 20:05	Discharge Cargo	Inchcape Shipping Serv
STAR BIRD	10	Containers	NIL	29/01/2007 09:02	29/01/2007 13:00	Discharge Cargo	Oceania Maritime Serv
CALIFORNIAN HIGHWAY	9	Motor Vehicles	NIL	29/01/2007 12:08	29/01/2007 18:40	Discharge Cargo	Monson Agencies Aust
MOROBE COAST	A/10	Containers	Containers	29/03/2007 06:06	29/03/2007 19:35	Discharge/Load	Consort Express Lines
HMNZS ENDEAVOUR	1	NIL	NIL	29/03/2007 08:36	01/04/2007 20:58	Visit	USS - UBS(Aust)
IKAN SEMBAK	2	Nickel Ore	Nil Cargo	29/03/2007 18:23	01/04/2007 07:55	Discharge Cargo	Barwil Agencies
ALCEM CALACA	4	Bulk Cement	NIL	29/04/2007 17:40	01/05/2007 12:24	Discharge Cargo	Cement Australia (Shi
ALBERT OLDENDORFF	11/7	NIL	Concentrates	29/05/2007 07:18	02/06/2007 05:50	Load Cargo	Townsville Shipping Ag
LIZZIE KOSAN	1	LPG	NIL	29/05/2007 17:36	29/05/2007 23:15	Discharge Cargo	Oceania Maritime Serv
BALTIMAR BOREAS	3	NIL	Containers	29/05/2007 19:54	30/05/2007 16:10	Load Cargo	McArthur Shipping & Ag
MOROBE COAST	10	Containers	Containers	29/05/2007 21:03	30/05/2007 14:55	Discharge/Load	Consort Express Lines
HMAS MANOORA	4	NIL	NIL	29/06/2007 08:43	30/06/2007 14:50	Visit	Department of Navy
CHANGSHA	3	Containers	Containers	29/07/2006 15:18	30/07/2006 07:51	Discharge/Load	Oceania Maritime Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
KANG HING	7	NIL	Concentrates	29/07/2006 17:11	31/07/2006 02:12	Load Cargo	Monson Agencies Aust
VOGE KATJA	A/7	Nil Cargo	Concentrates	29/08/2006 16:45	30/08/2006 21:00	Load Cargo	Townsville Shipping Ag
ALCEM CALACA	4	Bulk Cement	Nil Cargo	29/09/2006 01:20	30/09/2006 15:25	Discharge Cargo	Cement Australia (Shi
CAPE DARNLEY	3	Containers	Containers	29/09/2006 06:05	01/10/2006 09:00	Load Cargo	Consort Express Lines
SILVER BAY	9	Nil Cargo	Sugar	29/09/2006 14:15	30/09/2006 14:47	Load Cargo	Inchcape Shipping Serv
LUMINOUS HALO	A/2	Nickel Ore	Nil Cargo	29/09/2006 16:43	02/10/2006 12:00	Discharge Cargo	Barwil Agencies
BOUGAINVILLE COAST	10/A/10	Containers	Nil Cargo	29/10/2006 07:06	01/11/2006 00:42	Discharge Cargo	Toll International Pty Ltd
PALMERSTON	1	Fuels	Fuel Oil	29/11/2006 06:53	29/11/2006 23:20	Discharge Cargo	Inchcape Shipping Serv
DAI VIET	1	Fuel Oil	NIL	29/12/2006 04:12	30/12/2006 00:01	Discharge Cargo	Barwil Agencies
LAKE ARU	A/7	NIL	Concentrates	29/12/2006 11:52	30/12/2006 09:52	Load Cargo	Monson Agencies Aust
CICLOPE	4	Sulphur	Nil Cargo	29/12/2006 15:22	31/12/2006 06:55	Discharge Cargo	Barwil Agencies
GRIFFON	7	NIL	Concentrates	30/01/2007 06:42	04/02/2007 17:52	Load Cargo	Monson Agencies Aust
CORAL PRINCESS II	8	NIL	NIL	30/01/2007 08:30	30/01/2007 13:25	Discharge Cargo	Coral Princess Cruises
HMAS MANOORA	10	Army Equipment	Nil Cargo	30/03/2007 07:12	30/03/2007 10:56	Discharge/Load	Royal Australian Navy
GOLDEN YASAKA	8	NIL	Tallow	30/04/2007 09:00	01/05/2007 19:00	Load Cargo	Oceania Maritime Serv
CLIPPER TRUST	A/2	Nickel Ore	NIL	30/04/2007 12:00	01/05/2007 17:03	Discharge Cargo	Barwil Agencies
CAPE DARBY	3	Containers	Containers	30/05/2007 06:00	30/05/2007 17:35	Discharge/Load	Toll International Pty Ltd
IRIS HALO	A/2	Nickel Ore	NIL	30/05/2007 20:00	02/06/2007 08:45	Discharge Cargo	Barwil Agencies
EXCELLENT ACE	9	Motor Vehicles	NIL	30/07/2006 16:06	30/07/2006 22:00	Discharge Cargo	Inchcape Shipping Serv
TRIUMPH ACE	9	Motor Vehicles	NIL	30/08/2006 07:11	30/08/2006 13:38	Discharge Cargo	Inchcape Shipping Serv

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
EMERALD HALO	A/2	Nickel Ore	Nil Cargo	30/08/2006 08:35	01/09/2006 19:00	Discharge Cargo	Barwil Agencies
USS MOMSEN	4	NIL	NIL	30/08/2006 10:13	03/09/2006 09:00	Visit	Patrick Defence Logistic
KINNA	1	LPG	LPG	30/09/2006 00:45	30/09/2006 06:47	Discharge Cargo	Oceania Maritime Serv
TPC AUCKLAND	A/7	Nil Cargo	Fertilizer	30/09/2006 04:03	30/09/2006 21:00	Load Cargo	Townsville Shipping Ag
NIUGINI COAST	8	NIL	Containers	30/09/2006 06:00	01/10/2006 17:02	Load Cargo	Consort Express Lines
FELICITY ACE	9	Motor Vehicles	Motor Vehicles	30/10/2006 03:23	30/10/2006 08:57	Discharge Cargo	Inchcape Shipping Serv
SEPIK COAST	10/7/8	Containers	Containers	30/10/2006 06:34	02/11/2006 23:50	Discharge/Load	Consort Express Lines
GEORGIY KONONOVICH	8	Nil Cargo	Molasses	30/10/2006 13:24	01/11/2006 23:24	Load Cargo	Inchcape Shipping Serv
IRIS HALO	A/2	Nickel Ore	Nil Cargo	30/10/2006 18:10	03/11/2006 03:00	Discharge Cargo	Barwil Agencies
SHIMANAMI STAR	7	Nil Cargo	Fertilizer	30/12/2006 18:55	31/12/2006 12:30	Load Cargo	Barwil Agencies
CICLOPE	A/4	Sulphur	NIL	31/03/2007 05:14	01/04/2007 17:52	Discharge Cargo	Barwil Agencies
CAPE DELGADO	3	Containers General Cargo	General Cargo	31/03/2007 07:02	01/04/2007 06:34	Load Cargo	Toll International Pty Ltd
NEW BARONESS	4	NIL	Scrap	31/05/2007 04:10	02/06/2007 04:20	Load Cargo	Inchcape Shipping Serv
HMAS BALIKPAPAN	10/9	NIL	NIL	31/05/2007 09:59	04/06/2007 07:00		Department of Navy
CAPE PRESTON	3	NIL	Containers	31/05/2007 14:30	02/06/2007 17:50	Load Cargo	Toll International Pty Ltd
SPRING ACCORD	A/11	NIL	Concentrates Concentrates	31/07/2006 04:12	01/08/2006 18:30	Load Cargo	Barwil Agencies
SILVER LINING	1	Fuel Oil	NIL	31/07/2006 20:10	01/08/2006 11:48	Discharge Cargo	Inchcape Shipping Serv
PACIFIC ADVENTURER	3	Containers	Containers Nil Cargo	31/07/2006 22:28	01/08/2006 07:35	Discharge/Load	Oceania Maritime Serv
MADANG COAST	10	Containers	Containers	31/08/2006 23:40	01/09/2006 12:00	Discharge/Load	Toll International Pty Ltd

PORT of TOWNSVILLE

Shipping Movement Report for 1/07/2006 to 30/06/2007

Vessel Name	*Berth*	*Import*	*Export*	*Arrival*	*Departure*	Port Activity	*Agent*
CORAL PRINCESS	9	Passenger Vessel Passenger Vessel	Passenger Vessel	31/10/2006 09:30	31/10/2006 13:00	Visit	Coral Princess Cruises
ATLANTIC STAR	9	Nil Cargo	Sugar	31/10/2006 23:10	01/11/2006 21:54	Load Cargo	Inchcape Shipping Serv
COLUMBIA RIVER	9	Nil Cargo	Sugar	31/12/2006 18:57	02/01/2007 04:13	Load Cargo	Inchcape Shipping Serv