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Air Quality Assessment
Sydney Heritage Fleet
Pyrmont, NSW 2009

Report Number 610.10676-R6R0

16 December 2011

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PYRMONT NSW 2009

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Air Quality Assessment
Sydney Heritage Fleet
Pyrmont, NSW 2009

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EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd has been commissioned by Crawford Architects on behalf of Sydney Maritime Museum Ltd to provide environmental assessment reports to support a Development Application for the Sydney Heritage Fleet, Bank Street, Pyrmont.

This report presents the Air Quality Impact Assessment for the above proposed development.

This report has been completed with reference to the Director-General's requirements for the development, and with reference to the methodology prescribed in "*Approved Methods for modelling and assessment of air pollutants in New South Wales"* (2005), *"Assessment and Management of Odour from Stationary Sources in NSW: Technical Framework"* (2006) and *"Assessment and Management of Odour from Stationary sources in NSW; Technical Notes"* (2006).

The report examines the existing environmental conditions at the proposed Project Site by reference to validated air quality and meteorological monitoring data. The potential sources of emissions to air associated with the construction and operational phases of the development have been identified, and quantified where possible.

The potential impact of these sources upon existing air quality has been made through qualitative methods only. None of the identified emissions to air were considered to be of sufficient scale to justify quantitative assessment through dispersion modelling or other quantitative methods.

A comprehensive range of air quality monitoring and procedural requirements have been recommended as pragmatic controls during the construction and operational phases, which are considered proportionate to the anticipated scale of impacts.

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Crawford Architects on behalf of Sydney Maritime Museum Ltd (Client) to provide environmental assessment reports to support a Development Application (DA) for the Sydney Heritage Fleet (SHF), Bank Street, Pyrmont.

This report presents the Air Quality Impact Assessment for the above proposed development.

This report has been undertaken in accordance with SLR's Offer of Services, Sydney Heritage Fleet Bank Street, Pyrmont; Specialist Building / Environmental Technology Services (Ref. 610.10676 SHF P1 20110823, dated 23 August 2011).

From the information provided by the Client, the following briefly describes the development:

- The development will comprise a non-profit making working museum and a home for the SHF.
- The site is located under the eastern pylon of the Anzac Bridge with a water frontage to Blackwattle Bay and a street frontage to Bank Street. Approximately half of the site adjacent to the bridge pylon will be occupied by the SHF and the other half to the east will become a community park. The land understood to be developed as a community park does not form part of this assessment.
- Located to the west of the bridge pylon is a freestanding Exhibition Pavilion with an attached refreshment kiosk and amenities also at sea wall/water level.
- The land based component of the project comprises two storage areas at sea wall/water level.
    - The first to store dragon boats operated by Dragon Boats NSW with direct access to a new boat ramp.
    - The second to store and operate small vessels owned by the SHF, which will also make use of the boat ramp.
- Directly above the boat storage areas are exhibition spaces, meeting rooms, amenities, and entry lobby and reception areas.
- Across from the entry courtyard fronting Bank Street is a single storey building with some mezzanine spaces over which are the SHF's maintenance workshops and storage areas which are required to service the SHF vessels. The roof of the maintenance areas will be "green", to provide sound insulation for the SHF's operations and a visually attractive landscape for the adjacent residential buildings.
- Where reference is made to the site being developed for commercial use, this terminology is used to differentiate from residential or industrial uses, and is not intended to construe a commercial (or business) venture.

1.1 Objectives

The objective of the services performed was to assess the impact upon air quality of the construction and operation of the proposed development in accordance with the Director-General's requirements (DGRs).

Key issues identified from the DGR's with respect to air quality and odour are as follows:

Air and Odour

The Environmental Assessment must include an Air Quality Impact Assessment that is prepared strictly in accordance with the "Approved Methods for modelling and assessment of air pollutants in New South Wale 2005".

The Air Quality Impact Assessment must make appropriate reference to the "Assessment and Management of Odour from Stationary Sources in NSW: Technical Framework 2006" and "Assessment and Management of Odour from Stationary sources in NSW; Technical Notes 2006".

The key air quality issues for the proposal will depend on the methods used to manage and remediate the contaminated material. Potential matters that must be covered in the Air Quality Impact Assessment include, where applicable:

i. The identification of the pollutants of concern, including the individual toxic air pollutants, dust and odours;

ii. The identification and assessment of all relevant fugitive and point source emissions;

iii. Appropriate coverage of all aspects of the remediation, including the excavation, storage, transport and treatment of contaminated material; and

iv. Proposed air quality management and monitoring procedures during remediation.

The Air Quality Impact Assessment must consider the requirements of the Protection of the Environment Operations Clean Air Regulation 2010.

1.2 Scope of Work

To achieve the above objectives, the following scope of works was implemented:

- Description of environmental values.
- Identification and estimation of emissions.
- Assessment of potential impacts.
- Identification of mitigation measures and requirements for monitoring.

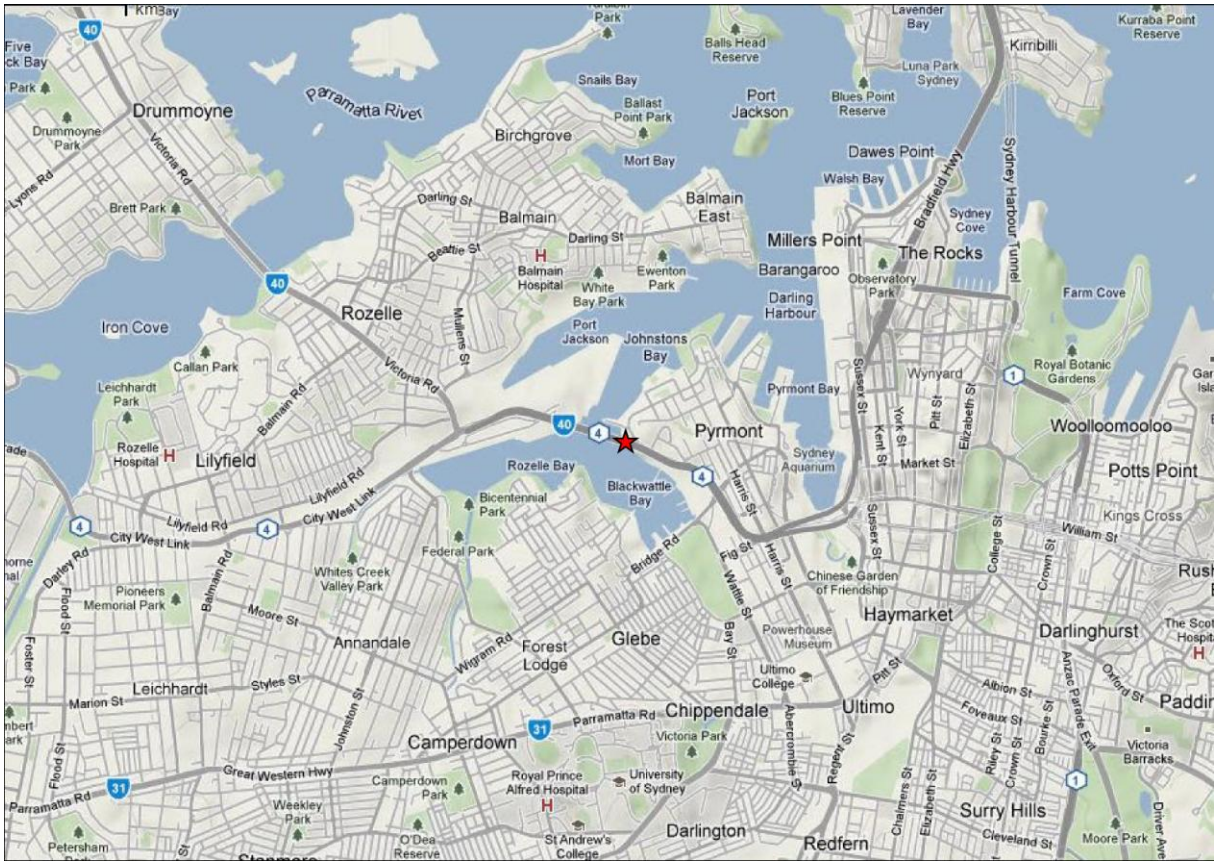
2 SITE DESCRIPTION

2.1 Site Location and Description

The Project Site is located off Bank Street, Pyrmont, NSW 2009, approximately 1.3 kilometres (km) west of Sydney Central Business District (CBD).

A Locality Map is provided below in **Figure 1**.

Figure 1 Locality Map



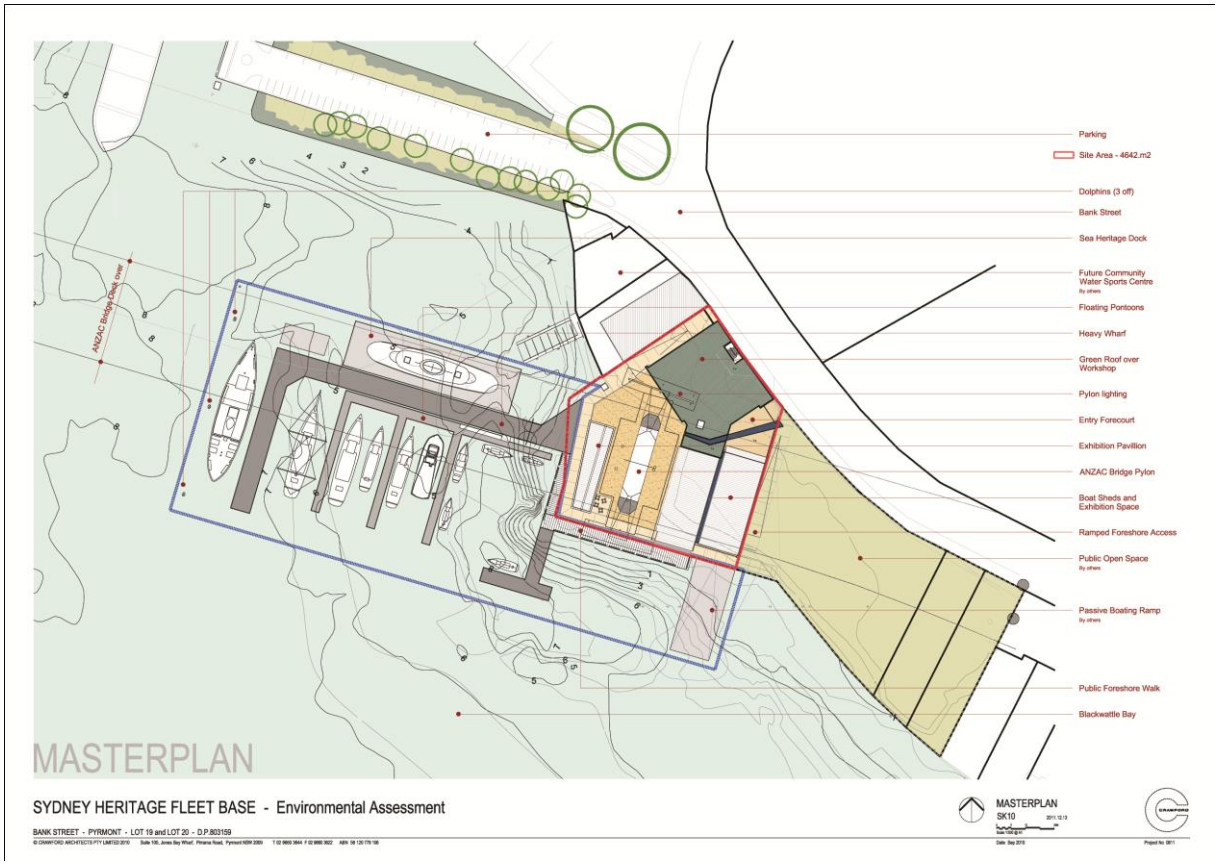
Source: SLR Consulting

The Project Site is a combination of two lots located beneath the eastern pylon of the Anzac Bridge, comprising Lot 19 and Lot 20 of Deposit Plan 803159. The area included within this DA is shown in **Figure 2** and is approximately 4,642 m^2 in area.

For clarity, throughout this report when both lots are being referred to, the term 'Project Site' will be used. If they need to be discussed individually the lots will be referred to by their associated lot and Deposit Plan number.

Two leases exist on the site, a land lease (identified in **Figure 2** by a red boundary) and a water lease (identified by a blue boundary) with a total area of 16,820 m^2. The public open space (shaded in green in **Figure 2**) is shown, although this is not included within this DA, and does not form part of this assessment.

Figure 2 Site Plan



Source: Crawford Architects

The Project Site is bordered to the south and west by Blackwattle Bay, to the north by Bank Street. The surrounding land uses include:

- North and Northwest: On the other side of Bank Street is Jackson's Landing residential and community estate.
- South and West: Blackwattle Bay borders the Project Site.
- Northeast: There is a small cluster of commercial buildings located on the opposing side of Bank Street.
- Southeast: A series of buildings operated by Poulos Bros Seafoods Pty Ltd, Bidvest Australia Pty Ltd, Hymix Australia Pty Ltd and the Sydney Fish Markets.

2.2 Project Description

The proposed development works shall incorporate the following:

- A two storey building with some mezzanine spaces.
- Located west of the bridge pylon is a freestanding Exhibition Pavilion with an attached kiosk and amenities.
- Boat sheds and vessel storage for dragon boating.
- Shipwrights and boat storage area which includes a machine shop, workshop, timber store, lunch room and amenities.

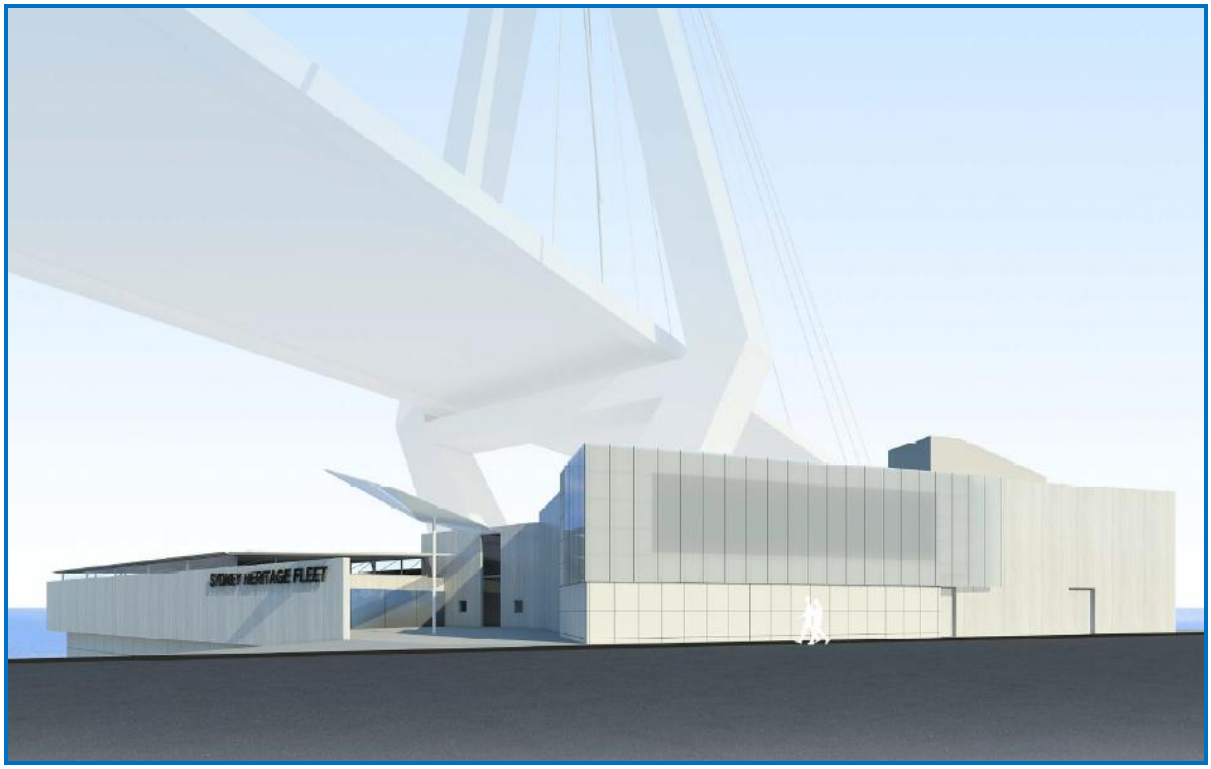
- Directly above the storage areas are exhibition spaces, meeting rooms, amenities, and entry, lobby and reception areas.
- Restoration and maintenance workshop, including a metal fabrication workshop, parts stores, garbage and recycling stores, paint and flammable goods store.
- Working living museum.
- Lay apart stores and electrical workshop.
- The mezzanine which incorporates amenities.
- Heavy wharf.
- Floating pontoons.

Figure 3 and **Figure 4** below show design perspectives for the proposed development from the proposed public open space and from Bank Street, respectively.

Figure 3 View of Proposed Development from Public Open Space

Source: Crawford Architects

Figure 4 View of Proposed Development from Bank Street



Source: Crawford Architects

3 LEGISLATION AND GUIDANCE

3.1 Protection of the Environment Operations (Clean Air) Regulation 2010

The Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Regulation) is the core legislative and regulatory instrument for air quality issues in NSW.

Areas of relevance to the following study include:

- Part 4 of the POEO Regulation which covers motor vehicles and motor vehicle fuels, including the use and required maintenance of motor vehicles to prevent excessive air impurities emission to air (Division 4) and the method of transfer of petrol into a vehicle's fuel tank (Division 5).
- Part 5 of the POEO Regulation deals with the emission of air impurities from activities and plant (scheduled and non-scheduled premises). Of particular relevance includes approved circumstances for marine vessels to emit smoke (assuming all practicable means are employed to prevent and minimise the emission of smoke) such as the period that the vessel is approaching, leaving or manoeuvring at a berth or a period of no more than 30 minutes per 24 hours, after lighting a boiler and in the lead up to normal boiler operation.
- Part 6 of the POEO Regulation deals with the storage, transport and control of volatile organic liquids, and details the control equipment required for storage tanks. (It is noted that exemptions from the requirement for control equipment include small storage tanks receiving less than 600 kL of volatile organic solvent per year).

3.2 Office of Environment and Heritage Policy

3.2.1 Air Quality

The relevant air quality criteria applicable to the Project Site are prescribed by the NSW Office of Environment and Heritage (OEH) in their document, "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales"* (2005) (Approved Methods).

Particulate Matter less than 10 Microns (PM_{10})

The term "particulate matter" refers to a category of airborne particles that range from 0.1 micrometres (µm) to 50 µm in aerodynamic diameter. PM_{10} refers to particulate matter with a diameter less than 10 µm. The relevant OEH criteria for particulate matter are defined for PM_{10} as annual average and 24 hour maximum goals and are summarised in **Table 1**.

Table 1 Assessment Criteria for Particulate Matter (PM_{10})

Pollutant	Averaging Period	Criteria
Particulate matter <10µm (PM_{10})	Annual	30 µg/m^3
	24 hour	50 µg/m^3

Note: µg/m^3 = micrograms per cubic metre

The above criteria refers to total impact (i.e. incremental increase due to the proposed development plus background concentrations due to all other sources) but excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents etc.

Dust Deposition

To avoid the nuisance impact of dust, the OEH has prescribed goals for dust fallout and this is expressed in terms of an acceptable increase in dust deposition over the existing background deposition levels. The annual average OEH goals for depositional dust that apply to the proposed development site are provided in **Table 2**.

Table 2 Assessment Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2g/m^2/month	4g/m^2/month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, *AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method*.

Carbon Monoxide

Carbon monoxide (CO) is an odourless, colourless gas formed from the incomplete burning of fuels in motor vehicles. CO bonds to the haemoglobin in the blood and reduces the oxygen carrying capacity of red blood cells, thus decreasing the oxygen supply to the tissues and organs, in particular the heart and the brain.

It can be a common pollutant at the roadside and highest concentrations are found at the kerbside with concentrations decreasing rapidly with increasing distance from the road. CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow.

The goals specified within the Approved Methods for CO are provided in **Table 3**.

Table 3 Assessment Criteria for Carbon Monoxide (CO)

Pollutant	Averaging Period	Criterion
CO	15-min	87 ppm (100 mg/m^3)
	8-hour	9 ppm (10 mg/m^3)

Note: ppm = parts per million

Oxides of Nitrogen (NO_X)

Oxides of nitrogen (NO_X) is a general term used to describe any mixture of nitrogen oxides formed during combustion. In atmospheric chemistry NO_X generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO_2).

NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to form NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. Long term exposure to NO_2 can lead to lung disease.

NO will be converted to NO_2 soon after leaving a car exhaust.

The goals specified within the Approved Methods for NO_2 are provided in **Table 4**.

Table 4 Assessment Criteria for Nitrogen Dioxide (NO_2)

Pollutant	Averaging Period	Criterion
NO_2	1-hour	12 pphm (246 µg/m^3)
	annual	3 pphm (62 µg/m^3)

Note: pphm = parts per hundred million

3.2.2 Odour

The NSW OEH make recommendations for the appropriate management and assessment of odour in their documents "*Assessment and Management of Odour from Stationary Sources in NSW: Technical Framework"* (2006) (Odour Framework) and "*Assessment and Management of Odour from Stationary sources in NSW; Technical Notes"* (2006) (Odour Technical Notes).

Key principles adopted by the Odour Framework include:

- Planning to prevent and minimise odour (i.e. through careful location and design of new activities and sustainable land-use planning around existing activities to ensure the best environmental outcomes).
- Use of a range of strategies to manage odour (depending on the sources, odour nature and impacts of the emissions).
- Ongoing environmental improvement. Operators of all developments should adopt a risk management approach to minimise the potential for odour impacts.

The odour benchmark for an operational facility is whether emission of odour is 'offensive', or is being prevented or minimised using best management practices and best available technology.

3.3 Clean Air Society of Australia and New Zealand Draft Guidelines

The CASANZ (Clean Air Society of Australia & New Zealand) draft document "*Odour Separation Distances Guidelines*" (March 2008) provides recommendations on odour separation distances for various activities as follows:

Table 5 Recommended Separation Distances

Activity	Description	Recommended Separation Distance (m)
Bulk Shipping Facilities	Wharf and Storage	300
Coal Handling	Handling Capacity < 1 tonne / day Storage Capacity < 50 tonnes	500
	Handling Capacity > 1 tonne / day Storage Capacity > 50 tonnes	1,000
Marinas and Boating Facilities	Storage	100
	Repair and Maintenance	300

Source: CASANZ (2008)

The separation distances above are provided for initial guidance where site-specific information is not available that adequately describes the various activities that may give rise to nuisance issues (e.g. nuisance odour that may be associated with the emission of volatile organic compounds [VOCs] and other odorous compounds.

In relation to the SHF development, the scale of activities are considered to be minor, and that the overly-conservative approach as presented by the separation distances would over-estimate the potential area of impact.

The following assessment has reviewed potential odour sources on a case-by-case basis to determine the potential for odour impacts on the surrounds.

3.4 Assessment Approach

The air quality assessment will utilise qualitative assessment techniques where it is considered reasonable that air quality management practices and techniques can control and manage the potential impacts effectively.

Where air quality impacts require more detailed examination, quantitative assessment techniques will be used (e.g. estimation of pollutant emission rates).

Local road traffic emissions will be estimated using traffic flow data consistent with the McLaren TMAP report as well as published road traffic pollutant emission factors. Where these estimations indicate that there will be a significant change in local road traffic emissions, the assessment will be supplemented by further detailed quantitative assessment techniques.

A broad "risk-based" approach has been adopted for the operational phase of workshop and associated emissions of VOCs and particulate.

The risk-based assessment takes account of a range of impact descriptors, including the following:

- Nature of Impact: does the impact result in an adverse or beneficial environment?
- Sensitivity: how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.
- Magnitude: what is the anticipated scale of the impact?

The integration of sensitivity with impact magnitude is used to derive the predicted significance of that change.

4 THE EXISTING ENVIRONMENT

4.1 Existing Air Quality

4.1.1 NSW OEH Air Quality Monitoring Data

OEH maintains a network of air quality monitoring stations (AQMS) across NSW. The nearest OEH AQMS to the site is located at Rozelle, approximately 1 km to the northwest of the site.

The Rozelle AQMS was commissioned in 1978 and is located in the grounds of Rozelle Hospital, off Balmain Road, Rozelle. The monitoring site is situated at an elevation of 22 metres Australian Height Datum (AHD) in a residential area in the OEH's East Sydney region.

A number of air pollutants and meteorological variables are currently measured at Rozelle AQMS including:

- Ozone (O_3).
- Oxides of nitrogen (NO, NO_2 & NO_X).
- Carbon monoxide (CO).
- Fine particles (by nephelometry).
- Fine particles (PM_{10} using a Tapered Element Oscillating Microbalance [TEOM]).

Given the proximity of the Rozelle monitoring site to the proposed development site, Rozelle AQMS data has been chosen as representative data available for the assessment of background particulate (PM_{10}), CO and NO_X (as NO_2) conditions.

NSW OEH verified data was obtained for the Rozelle monitoring site for 2010 (calendar year) and the month of September 2011. This data is summarised in **Table 6** below and shows no exceedances of the relevant OEH criteria were measured for these pollutants during 2010.

A similar data search for the period 1 January 2011 to 30 September 2011 indicated no exceedances of the relevant OEH criteria have been measured to date. Daily average concentrations for September 2011 are within the same range of the annual average for 2010.

Table 6 Rozelle AQMS Data – 2010 Calendar Year and September 2011

Description	NO_2 (pphm)	CO (ppm)	PM_{10} (µg/m³)
2010 Calendar Year			
Annual Average	1.1	0.4	16.1
Annual Maximum	4.9	1.8	37.6
Annual Exceedances	0	0	0
September 2011			
Daily Average	1.1	0.3	18.3
Daily Average Range	0.5 – 1.9	0.1 – 0.5	6.0 – 39.4

Source: NSW OEH

4.1.2 Dust Deposition Monitoring Data

SLR Consulting recently carried out dust deposition monitoring for a period of one month within the Rozelle local area. **Table 7** below gives the results of dust deposition monitoring undertaken in June 2011. It is noted that westerly and south-easterly winds were predominant during the monitoring period.

Table 7 Dust Deposition Monitoring Results – Rozelle Local Area, June 2011

Description	Total Insoluble Solids (g/m^2/month)
Sample 1	1.0
Sample 2	0.9
Site Average	**1.0**

Source: SLR Consulting

4.2 Local Meteorology

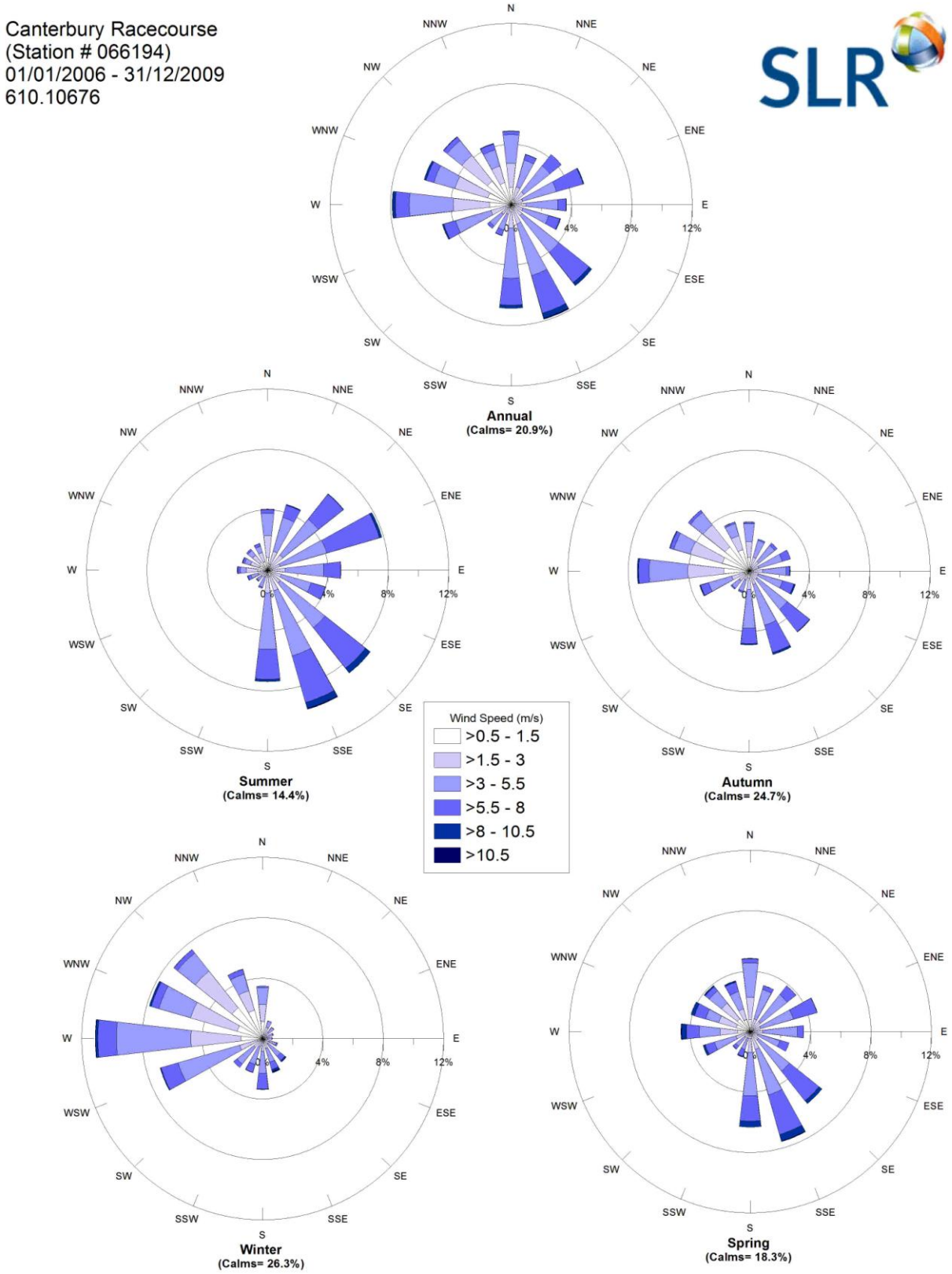
4.2.1 Local Wind Conditions

The nearest and most representative Bureau of Meteorology (BoM) Automated Weather Station (AWS) to the site is located at Canterbury Racecourse (Station Number: 0066194) approximately 8 km southwest. Canterbury Racecourse AWS is situated at an elevation of 3 m AHD.

In the absence of site specific data, data from the Canterbury Racecourse AWS was chosen as the most representative meteorological data available for the proposed development site. An analysis of wind data for 2006 to 2009 at Canterbury Racecourse indicates that winds from all directions are experienced at the site (refer to **Figure 5** for annual and seasonal 4-year wind roses).

The strongest winds originate from the south southeast and the west. The average wind speed recorded at Canterbury Racecourse AWS for the 2006 to 2009 period is 3 m/s.

Figure 5 Canterbury Racecourse AWS Annual and Seasonal Wind Roses, 2006 to 2009



4.3 Surrounding Sources of Emissions to Atmosphere

4.3.1 Licensed Activities

The following sources have been identified from a desktop mapping study for activities regulated under the National Pollutant Inventory (NPI) or by an Environmental Protection Licence, as having a potential impact on the site area. An arbitrary cut-off distance of 5 km from the site has been applied.

Table 8 Licensed Activities

Identified Source	Location	Approx Distance / Direction to Project Site	Industry Type	Significant Emissions
NPI Regulated Activities				
Malt Shovel Brewery	99 Pyrmont Bridge Rd, Camperdown	2.2 km / SSW	Beer Manufacturing	Ethanol, Total Volatile Organic Compounds (TVOCs)
Pilkington Glass	8-40 Euston Rd, Alexandria	3.9 km / S	Glass / Glass Product Manufacturing	Metallic compounds, CO, NO_x, PM_{10}, Polycyclic Aromatic Hydrocarbons (PAHs), Sulphur Dioxide (SO_2), TVOCs
Shell Gore Bay Petroleum Terminal	Manns Av, Greenwich	3.4 km / N	Petroleum Product Wholesaling	Benzene, Cumene, Ethyl benzene, n-Hexane, NO_x, PM_{10}, SO_2, Toluene, TVOCs, Xylenes
Australian Refined Alloys	202-212 Euston Rd, Alexandria	4.2 km / S	Smelting and Refining	Metallic compounds, PAHs, TVOCs, PM_{10}, NO_x, CO
Peerless Holdings	74 Edinburgh Rd, Marrickville	4.5 km / SSW	Oil and Fat Manufacturing	Metallic compounds, Benzene, CO, PM_{10}, NO_x, Formaldehyde, n-Hexane, PAHs, TVOCs, Toluene, SO_2
EPL Regulated Activities				
Hansons Construction Materials	Bridge Rd, Glebe	0.5 km / SSE	Bulk Shipping and Concrete Works	Dust, PM_{10}
Sydney Ports Corporation	Wharf 7, Sommerville Rd, Glebe	0.6 km / NW	Bulk Shipping	Dust, PM_{10}
Barangaroo Delivery Authority	Hickson Rd, Millers Point	1.4 km / NE	Construction, contaminated groundwater treatment	Odour, ambient lead and metallic compounds, PM_{10}, PAHs, TSP, VOCs
Sydney Shop Repair & Engineering	Goat Island	2 km / N	Boat Construction / Maintenance	Odour, dust

Identified Source	Location	Approx Distance / Direction to Project Site	Industry Type	Significant Emissions
Rail Corporation	PO Box K349, Haymarket	2.1 km / SE	Railway system activities	Dust
Thales Australia Limited	Garden Island, Potts Point	4 km / NE	Boat Construction / Maintenance	Odour, dust, PM_{10}
Ardent Leisure Limited	1b New Beach Rd, Rushcutters Bay	4.2 km / E	Boat Mooring, Storage and Repair	Odour, dust, PM_{10}
Cardinal Group	3-7 O'Riordan St, Alexandria	4.2 km / SSE	Waste Processing (non-thermal treatment) and storage	Odour, dust, metal dust, PM_{10}
Veolia Environmental Services	76-82 Burrows Rd, Alexandria	4.5 km / S	Waste Processing (non-thermal treatment) and storage	Odour, dust, PM_{10}
Monroe Springs	52 O'Riordan St, Alexandria	4.8 km / SSE	Metallurgical activities	Odour, dust, metal dust, PM_{10},VOCs
Australian Refined Alloys	202-212 Euston Road, Alexandria	5 km / S	Metallurgical activities, waste storage, resource recovery	Dust, PM_{10}, ambient lead, NO_x, SO_2, VOCs

Source: NPI and OEH

4.3.2 Non-Licensed Activities

Figure 6 Non-Licensed Activities

Identified Source	Location	Distance / Direction to Project Site	Industry Type	Significant Emissions
Poulos Bros Seafoods	Pyrmont	0 km / E	Wholesale Seafood suppliers	Odour
Fish Markets	Pyrmont	0 km / E	Restaurants, Seafood Wholesale,	Odour
Sydney Cruises	Pyrmont	0 km / SE	Commercial Boat Cruises	Odour, PM_{10}, dust, SO_2, NO_x, CO, CO_2
Road Traffic	Anzac Bridge and Surrounds	0 km/ N	Road Transport	PM_{10}, dust, CO, NO_x, SO_2, CO_2

4.4 Road Traffic

Road traffic in the local area using the local and arterial road networks are summarised in McLaren Traffic Engineering's, "*Traffic Management and Accessibility Plan for the Sydney Heritage Fleet TMAP Masterplan*" (November 2011) (McLaren TMAP).

Road traffic in the urban environment forms a significant source of air pollution. Studies have shown that in urban areas, road traffic exhaust emissions may contribute a significant proportion of particulate emissions, and are also associated with emissions of:

- Oxides of nitrogen (NO_X).
- Carbon monoxide (CO).
- Particulate matter (as PM_{10}).

- Volatile organic compounds (VOCs), particularly benzene (C_6H_6) and 1-3, butadiene (C_4H_6).

Existing traffic flow data is presented below as two-way Annual Average Daily Traffic (AADT) flows (as vehicle counts). This data has been sourced from the McLaren TMAP report.

3.3 Traffic Volumes

Referenced from. Bank Street, Pyrmont Master Plan Appendix B: Traffic and Transport December 2005.

Traffic volumes at the southern end of Bank Street are 9,005 vehicles per day (vpd) according to data sourced from the RTA's Signal Co-ordinated Adaptive Traffic System (SCATS). To the north of the fish market/Miller Street intersection, traffic levels are significantly lower at 4,486 vpd.

This volume comprises traffic generated by the Bank Street master plan area (for example Hymix generates around 7000 vehicles per month) and other uses such as Channel 10 on the corner of Quarry Masters Drive, the Child Care Centre and residential dwellings.

RTA annual average daily traffic (AADT) counts indicate that in 2002 the Western Distributor (on Anzac Bridge) carried around 129,000 vpd, up from 120,000 vpd in 1999. The historical traffic growth rate is 3.7% per annum, based on RTA published traffic data.

Pyrmont Bridge Road carries around 22,010 vpd (AADT 2002) west of Wattle Street (down from 24,616 vpd in 1999); and 31,655 vpd east of Wattle Street (down from 34,762 vpd in 1999). The section of Pyrmont Bridge Road between Wattle Street and the Western Distributor on-ramp has high traffic volumes as traffic accessing the Western Distributor from Wattle Street needs to travel via Pyrmont Bridge Road. To the northwest of the Western Distributor, traffic levels on Pyrmont Bridge Road are lower and the route performs more of a sub-arterial function servicing Harris Street and the Pyrmont/Darling Harbour area.

The data presented above is summarised in **Table 9** and **Figure 7.**

Table 9 Summary of Traffic Flows (AADT)

Reference	Description	Measured AADT	Source (Year)
A	Bank Street (southern)	9,005	RTA SCATS (2005)
B	Bank Street (north of Fish Market)	4,486	RTA SCATS (2005)
C	Anzac Bridge	129,000	RTA SCATS (2005)
D	Bridge Road (west of Wattle Street)	22,010	(2002)
E	Bridge Road (east of Wattle Street)	31,655	(2002)

Figure 7 Traffic Flow Measurement Points

Source: SLR Consulting

5 IMPACT ASSESSMENT

5.1 Identified Environmental Impacts and Effects

5.1.1 Construction Phase

Potential environmental impacts associated with the construction phase may be associated with:

- Dust emissions from construction phase activities, including:
    - demolition
    - site clearance
    - site preparation and grading
    - construction of services and temporary structures
    - windblown materials from stockpiles
- The emission of ground contaminants associated with construction phase activities, and in particular excavation or other ground invasive activities.
- The emission of contaminants from disturbed sediments in Blackwattle Bay during piling activities.
- The emission of products of combustion from construction phase plant and machinery.

5.1.2 Operational Phase

Environmental impacts associated with the operational phase may be associated with:

- Emission of products of combustion from operational phase traffic.
- Emission to air from materials and processes within the workshop.
- Delivery and handling of coal for the coal-fired boilers in the SHF.
- Removal of grate ash from the coal-fired boilers in the SHF.
- Emission of products of combustion from the boilers in the SHF.

5.2 Environmental Impacts

5.2.1 Construction Phase

Dust Emissions from Construction Phase Activities

During the construction phase, the potential for dust to be emitted from the Project Site will be directly influenced by the nature of the activities being performed. Although a detailed construction plan has not yet been prepared, it is anticipated that activities may include site remediation, earthworks, regrading and the construction of new on-site facilities including hard standing areas for operational uses, surfaced road access and the construction of wharf areas. There are no existing buildings or structures that will require clearance and demolition.

Temporary elevation in particulate emissions and local dust levels is considered to be inevitable as part of the construction works, particularly where those activities are undertaken during dry and/or windy conditions. The impact of elevated dust emissions is dependent upon the potential for particulates to become and remain airborne prior to being deposited as dust or experienced as an ambient particulate concentration. Unlike other pollutants, the presence and deposition of dust is dependent upon the distance from source to receptor and the prevailing meteorological conditions.

Given the nature and scale of the development the potential for dust emissions from the construction phase is considered to be low and short-term in nature.

Excavation works for the construction of the multi-level Exhibition Building and Café Building are anticipated to potentially cause short-term emission of dust, which would require the application of suitable dust control measures.

Although temporary elevation in dust levels is considered to be inevitable as part of the construction works, particularly during dry and/or windy conditions, it is not considered that downwind dust deposition rates would exceed the OEH dust deposition criterion, and that dust emissions may be effectively managed at source through the implementation of appropriate measures within the Construction Environmental Management Plan (CEMP).

The Emission of Ground Contaminants Associated with Construction Phase Activities

Given the industrial nature of the Pyrmont Peninsula and its potential impact on the health of Blackwattle Bay, and taking into consideration of the potentially contaminating activities identified in SLR Consulting's report 'Preliminary Contaminated Land Assessment', there is a risk that the Project Site may be contaminated with ground contamination due to historical land uses.

Table 10 below is taken from the SLR Consulting report 'Preliminary Contaminated Land Assessment' and represents a summary of the potential for ground contamination which may be released due to construction phase activities.

Table 10 Summary of Potentially Contaminating Activities

Potentially contaminating Activity	Sub Component / Description	Likelihood of Contamination	Potential Chemicals of Concern
The presence of the sump drain system and the lack of bunding within the basement cellar beneath the hotel	Potential contamination of groundwater, Wallis lake, and/or soils through loss of mobile contaminants from the cellar area	Moderate likelihood of contamination	TPH, Biological, Ethanol, and other chemicals associated with cleaning
The potential presence of fill of unknown origin and composition.	Fill soils possibly imported to the site as part of land filling activities	Low to moderate likelihood of contamination	TPH, BTEX, PAH, Phenolic Compounds and Heavy Metals, OCPs, PCBs and asbestos
The potential impact of the previous Service Station operations	The potential residual contamination around the possible underground storage tank(s) and other operational activity located on the adjacent Bottle Shop property	Low to moderate likelihood of contamination	TPH, BTEX, PAH, Phenolic Compounds and Heavy Metals
Minor and major flooding within the vicinity of the Hotel	The potential residual contamination of the soil through rising and receding flood waters	Low to Moderate likelihood of contamination	Unknown
The fire which burnt down the original hotel building between 1911 and 1920	The potential residual contaminations through burnt, melted and deposited contaminants	Low to moderate likelihood of contamination	PAH, Heavy Metals, Asbestos, TPHs
The potential impact of the unidentified building present on the Bottle Shop property during and prior to 1984	Potential associated contamination through historical activities within this site	Unknown	Unknown

To date, it is understood that the location, nature and depth of the potential ground contamination has not been determined, and as such, any excavations into the site for the establishment of pilings and to cut the ground for the construction of the split level Exhibition Building and Café Building may cause the emission of ground contaminants. Given the scale of the development, it is reasonable to assume that any such impacts may be experienced as short-duration odour impacts rather than health impacts, but this assessment is based without the knowledge of the ground contamination that may be encountered during those construction and ground preparation works, and the depth of excavations.

Reference should be made to SLR Consulting's report "Preliminary Contaminated Land Assessment" for detailed assessment of any health implications associated with the disturbance of ground contamination to site-workers.

In the event that ground contamination is present at the locations of excavations, or as material is extracted during piling activities, an odour assessment and management procedure would need to be developed to manage the risks of off-site odour impacts and/or health impacts from the volatilisation of ground contaminants. This should be provided as part of an Air Quality Sub-Plan as part of an over-arching CEMP.

The Emission of Contaminants from Disturbed Sediments in Blackwattle Bay

Further to the section above concerning the emission of ground contaminants associated with construction phase activities, there is a similar risk associated with the disturbance of sediments in Blackwattle Bay.

As highlighted in SLR Consulting's report 'Preliminary Contaminated Land Assessment', emissions of odour may occur where excavation is necessary for the installation of pile foundations or during any activities involving sediment disturbance in the Bay.

In the event that sediment disturbance is required for piling and/or other construction activities, an odour assessment and management procedure would need to be developed to manage the risks of off-site odour impacts and/or health impacts from the volatilisation of ground contaminants. This should be provided as part of an Air Quality Sub-Plan as part of an over-arching CEMP.

The Emission of Products of Combustion from Construction Phase Plant and Machinery

Exhaust emissions from wagons, plant and other equipment associated with the construction of the Project Site may be regarded as an additional source of emissions to air on the local network and at the Project Site during the construction phase.

Given the nature and scale of the development, and the absence of buildings and infrastructure to be removed as part of the development of the Project Site or the requirement for bulk soil import/export, the number and scale of construction plant and machinery, and road traffic vehicles for cut & fill operations is considered to be low, and the potential for exhaust emissions from the construction phase is considered to be correspondingly low.

5.2.1 Operational Phase

Emissions to Atmosphere of Products of Combustion from Operational Phase Traffic

In order to address the potential impact upon air quality associated with the anticipated increase in traffic, reference needs to be made to the anticipated increase in traffic and congestion.

In regard to the increased demand for parking, the following text is taken from the McLaren TMAP report:

"3.8 Required Parking

Draft Sydney Development Control Plan (DCP) 2010 Section 2 states the following parking requirements for the proposed development:

- *Art Gallery or Museum*
    - *o 1 per 1000m^2 GFA for staff*
    - *o 1 per 200m^2 for visitors*

Publicly accessible floor space has been calculated as following:

- Level 0 - excluding lift shaft, stair, first aid, staff room, staff amenities, workshops and dragon boat facilities - 97.m^2
- Level 1 - including exhibition space, meeting space, lobby (entry), amenities and shop - excluding voids, workshops, kitchen, manager's office, reception, lift shaft and stair - 960.m^2
- Level 2 - being just the landing, corridor and viewing gallery - 66.m^2

*Based on the floor space total of 1123m^2 the SHF museum would require **6** visitor parking spaces and **1** staff space. It is assumed workshop and maintenance staff will be required during the weekdays."*

The McLaren TMAP report presents a variety of engineering and service solutions to the traffic and parking issues, including proposed abutment parking and no abutment parking or extra parking supply, and presents a number of access constraints and opportunities for future development, including:

- Public transport services
    - Sydney Buses
    - Light rail
    - Ferry
- Pedestrians
- Cyclists

Reference should be made to the McLaren TMAP report for full details of these solutions and their relevance to the NSW Department of Urban Affairs and Planning *"Integrating Land Use and Transport : Improving Transport Choice — Guidelines for Planning and Development"* (2001).

Based upon the detailed assessment of existing road traffic, road capacity, the demand for parking and options for developing sustainable transportation, the McLaren TMAP report makes the following conclusions:

"7 Conclusions

In view of the foregoing, it is evident that the development proposal is supportable in terms of traffic and parking considerations. The museum will draw upon established and potentially upgraded public transport initiatives including ferry connections from the National Maritime Museum, existing bus / light rail / train services to the Ultimo / Pyrmont precinct. School and organised tours of the museum will be encouraged utilising bus / coach and ferry service options.

Shuttle bus services from nearby public car parking areas may also be investigated."

In light of the conclusions of the McLaren TMAP, it is concluded that the marginal increase in anticipated traffic movements will be low, and therefore that the marginal impact from road traffic exhaust emissions would also be low. The impact of the increased traffic upon air quality is therefore not considered to represent a significant constraint to the development or sufficient to warrant a quantitative assessment.

Emissions to Atmosphere from Materials and Processes within the Workshop

Emissions generated on site due to workshop materials and processes would primarily consist of VOCs (e.g. xylene, tolune, butanol, methyl ethyl ketone (MEK)) from solvent use. Solvents are used in boat repairs constantly and emissions are possible during solvent storage, application and mixing or due to accidental spillage. Dust emissions will also be generated from maintenance activities and repairs.

The *National Pollutant Inventory Emission Estimation Technique Manual for Maritime Operations*, Version 2.0 (July 2008) (NPI EETM 2008) makes the following statement in relation to the handling of bulk liquid fuels in maritime operations:

> *"Typical maintenance operations that occur at maritime facilities include:*
>
> - *painting*
> - *abrasive blasting, or*
> - *equipment cleaning.*
>
> *Maintenance operations lead to emissions to air of Total VOCs and speciated VOCs from solvent evaporation and emissions of particulate matter and trace metals from abrasive blasting. Spills of paints and solvents can lead to emissions to water of Total VOCs and speciated VOCs. Disposal of waste solvents and paints to hazardous waste facilities is considered a mandatory transfer of reportable NPI substances."*

Reference is made in NPI EETM 2008 to the *National Pollutant Inventory Emission Estimation Technique Manual for Shipbuilding, Repair and Maintenance* (1999) (NPI EETM 1999).

Section 4.2 of NPI EETM 1999 presents a summary of inputs and emission sources of maintenance operations. This table of information is reproduced below.

Table 11 Inputs and Emission Sources of Maintenance Operations

Process	Material Inputs	Possible Emissions of NPI-Listed Substances
Engineering operations	Degreasing agents, solvents, acids	Spent solvents, VOCs, waste acids
Rust removal	Acids, abrasive blasting materials	Waste acids, PM_{10}
Paint preparation	Solvents (thinners), white spirits, enamel reducers	Spent solvents, VOCs
Surface coating and finishing	Enamels, paints, electroplating substances, galvanising metals, acids	Spent solvents, VOCs, metals, waste acids
Engine repairs	Degreasing agents, solvents, acids	Spent solvents, VOCs, waste acids

Source: NPI EETM 1999

It is understood that the workshop may periodically undertake a range of maintenance and repair activities. These activities are likely to be limited to some small-scale engineering processes as outlined in **Table 11**, machining and some small-scale welding operations.

As such, the potential impacts of the operation of the workshop are not likely to be significant, with the exception of solvent use and welding fumes.

As stated in Section 4.5.1.1 of NPI EETM 1999, the emission of VOCs from solvents (including degreasing agents) may include:

> *"Mineral spirits, aromatic hydrocarbons (eg. xylenes, toluene, etc), aliphatic hydrocarbons, ketones, esters, alcohols, glycol ethers, phenols, turpentine, and various halogenated solvents, for example, trichloroethylene, 1,1,1-trichloroethane, and perchloroethylene."*

The emission of VOCs from solvent use may be estimated from the emission estimation technique (EET) outlined in Section 4.5.1.1 of NPI EETM 1999, which states that organic emissions (i.e. TVOC) may be estimated as 1,000 kg/tonne.

The annual usage of solvent and paints/degreasers/other adhesives is estimated to be 520 L/yr and 720 L/yr respectively. Assuming a solvent density of 0.8 g/mL and paint/degreaser/other adhesives density of 1.0 g/mL, the total estimated solvent consumption rate is estimated to be 1.14 tonnes per year, and the corresponding TVOC emission from these processes may be estimated to be 1,140 kg/y.

The NPI reporting threshold for VOCs is 10 tonnes usage per year. As is demonstrated above, the SHF usage of solvents fall well below this threshold at 1.14 tonnes usage per year, and as such it is considered reasonable that the impacts may be adequately controlled by the implementation of suitable controls on the emission of fugitive VOCs.

Welding fumes may require localised occupational health and safety controls to manage the risk to operators. It is not anticipated that these impacts would present as a material change to local air quality beyond the site boundary and is therefore considered to meet the requirements of the POEO Regulation 2010.

As discussed in Section **3.4**, a broad "risk-based" approach has been applied to the operational phase of workshop and associated emissions of VOCs and particulate. The following assessment has been made:

- The sensitivity of the surrounds may be classified as "high" based on the proximity of residential dwellings to the site (approximately 25 m to the north-east).
- The magnitude of the impact may be considered as slight (i.e. the predicted impact may be tolerated) given the low annual usage rates of solvents.

Taking the above determinations into consideration, emissions due to workshop activities are considered to be of minor significance.

Delivery and Handling of Coal for the Coal Fired Boilers in the SHF

The NPI EETM 2008 makes the following statement in relation to the handling of bulk dry material in maritime operations:

> *"Handling of bulk dry material (e.g. coal, bauxite, alumina, aluminium fluoride, coke) leads to emissions of particulate matter (PM_{10}) and emissions of trace compounds contained in the bulk material to air. Runoff from stockpiles can also lead to emissions of NPI substances to water and transfers to wastewater treatment facilities.*
>
> *Handling emissions are generated from material transfers (e.g. conveyor to conveyor, conveyor to stockpile, front end loaders handling material and ship loading).*
>
> *Furthermore, wind erosion of bulk dry materials will lead to emissions of particulate matter and trace compounds contained in the bulk material to air."*

As stated in the NPI EETM 2008, the EETs for the handling and storage of bulk dry materials (e.g. coal) are derived from the *National Pollutant Inventory Emission Estimation Technique Manual for Mining, Version 3.0* (June 2011) (NPI EETM 2011).

Given the nature of the delivery into a partially enclosed hopper (in this case the coal bunker), it is reasonably assumed that the appropriate proxy estimation technique is derived from the estimation technique for loading trains with coal, as provided in Table 2 of NPI EETM 2011:

- TSP: 0.0004 kg/t
- PM_{10}: 0.00017 kg/t

The total estimated mass of coal used by the SHF per year (and therefore assumed to be loaded into the coal bunkers of SHF vessels) is 60 tonnes. Based upon the above assumptions, the estimated particulate emissions to air from the handling of bulk dry materials (coal) are estimated below:

Table 12 Estimated Annual Emissions from Handling of Bulk Dry Materials (Coal)

Substance	Mass of Coal (t/y)	Emission Factor (kg/t)	Emission (kg/y)
TSP	60	0.0004	0.024
PM_{10}	60	0.00017	0.010

Coal will be delivered by truck and supplied in carry bags suitable for lifting by forklift, with drawstring discharge direct into a bunker on the relevant vessels. Enclosure or part enclosure (by curtain) of the bunker portal will be required to minimise coal dust emissions, to ensure emissions of particulate comply with POEO Regulations, and to comply with Best Practice measures for these operations.

The Removal of Grate Ash from the Coal Fired Boilers

Grate ash will be generated from the combustion of solid fuels (i.e. coal) and will need to be periodically removed from the vessels. Grate ash will be deposited into bags within the vessels and removed in sealed bags for subsequent disposal at a suitable waste management facility.

As such, the potential for particulate emissions from this activity is considered to be minor, except where bag failure or accidental spillages occur. In such situations, the impact of particulate emissions will be controlled at the source by prompt spill management, involving the damping down of the ash, bagging and removal.

It is considered that the potential for off-site impacts would be low, and any significant impacts would be occupational health and safety issues associated with acute exposure to grate ash exposure. The handling of grate ash will generate particulate emissions and consideration should be given to occupational health and safety for workers within the vicinity of grate ash handling areas. The provision of suitable personal protective equipment (PPE), including dust masks is recommended.

The Emission of Products of Combustion from the Boilers in the SHF

As previously noted in **Section 3.1**, the POEO Regulation 2010 lists a number of approved circumstances where by smoke emissions are allowed to be discharged from marine vessels. These include the period that the vessel is approaching, leaving or manoeuvring at a berth and the period (of no more than 30 minutes per 24 hours) after lighting a boiler and leading up to normal boiler operation. These approved circumstances assume all practicable means are employed to prevent and minimise the emission of smoke.

Compliance with these allowable derogations will ensure that the emission of combustion products from vessel boilers is within acceptable limits (as prescribed by the POEO Regulations).

In accordance with Part 6 of the POEO Regulation 2010, control equipment is not required where the volume of volatile organic liquid loaded into storage tanks on premises does not exceed 600 kL. The estimated annual usage of SHF fuel and diesel is 5 kL and 0.2 kL respectively, and therefore this exemption applies.

The NPI reporting threshold concerning the combustion or burning of fuel is 400 tonnes or more of fuel per year or 1 tonne or more of fuel in an hour at any time. Minimum usage limits required to trip this threshold include 478,000 litres/ yr of diesel, 541,000 l/yr of petrol and 400 tonnes per year of solid fuel. SHF usage and combustion of liquid and solid fuels falls well below this reporting threshold at 0.9 tonnes usage per year.

It is therefore considered reasonable that these impacts should be considered significantly below the relevant thresholds to not require quantitative assessment through dispersion modelling. Assuming that the above activity data is representative of future consumption, the SHF emissions should not cause any significant air quality impacts at the neighbouring receptors.

6 MITIGATION AND MONITORING

6.1 Construction Phase

Construction phase dust emissions will need to be controlled at source to manage any short-term impact on the local community. It is not anticipated that dust emissions would be significant, however good construction management practices will be implemented through the Air Quality Sub-Plan implemented through the Construction Environmental Management Plan (CEMP) to provide pro-active control of dust emissions.

The CEMP will provide detail of dust management measures, which will include the identification of conditions during which particularly dust-producing activities may be curtailed or ceased, dust suppression measures (e.g. waster bowsers and sprays) which may be employed to damp-down earthworks or hard-standing areas during construction, the provision of dust screens, appropriate management of stockpiled materials, visual inspection of off-site compliance, and a clear communication strategy for the management and prompt investigation of dust complaints. Reference should be made to Section 4.16 of the OEH's Local Government Air Quality Toolkit, "*Module 1: Air pollution control techniques*" for an overview of dust suppression techniques and management strategies.

The disturbance of contaminated soil and sediment will also be addressed in the CEMP. To date, the potential and extent of ground contamination has not been established, and therefore the subsequent potential for invasive ground works to cause the emission of ground vapour or contaminated dust particles has not been established. However, the extent of ground contamination will be determined prior to commencing construction, and a remediation strategy agreed with the Council (if required). Where this is determined to potentially affect the emission of odour or contaminated dust from the site, these impacts would be specifically addressed in the remediation strategy and CEMP.

The disturbance of sediment from Blackwattle Bay also poses a significant risk of causing short-term acute odour impacts. The method employed for submarine piling should consider the potential to disturb marine sediments, and avoid excavation to the surface wherever feasible. Where sediment needs to be drawn to the surface, the CEMP will provide specific measures to minimise the potential for odour impacts, which may include preventing the material from drying and minimising exposure times.

An odour management plan will be developed as part of the CEMP that will provide a pro-active management procedure to record activities and observations on-site, provide a range of odour control methods to manage the risk of odour emissions during construction activities and provide a methodology for the recording and response to any received odour complaints.

To reduce the impact of construction plant emissions, plant should be located as far from local receptors as practicable and engines should not be left idling when not in use. Stationary trucks should switch off engines if idling time on-site is likely to exceed 2 minutes and should avoid using the local road network during peak traffic periods. All equipment used on site should also be maintained to the required performance standards.

6.2 Operational Phase

An Odour Management Plan will be developed as part of the Operational Environmental Management Plan (OEMP) that will provide a pro-active management procedure to record activities and observations on-site and provide a range of odour control methods to manage the risk of odour emissions from operational activities and provide a methodology for the recording and response to any received odour complaints. Reference will be made to the OEH's Local Government Air Quality Toolkit, "*Module 3: Guidelines for managing air pollution"* for the appropriate management and investigation of odour complaints.

The control of fugitive emissions from the workshop will be managed through careful use and bunded storage of solvents, the provision of spill clean-up kits including absorbing materials to minimise the potential for VOC emissions. Client-supplied information has confirmed that approximately 12 x 20 L spill kits will be located on site at the workshop during operational activities. Waste solvents will be properly stored in sealed and marked containers to contain vapours and removed from site for treatment or disposal at a suitable waste management facility.

Where feasible, products and agents with lower VOC content will be used.

Where possible, the delivery of liquid fuels will utilise reciprocal feeds, so that the tank vapours are displaced into the delivery vehicle rather than being emitted to atmosphere as a fugitive emission.

Dust, scrapping waste and debris and empty stripper/varnish/solvent containers will be managed and disposed of in an appropriate manner, as discussed in the SLR Consulting Waste Management Plan.

Coal handling activities will be carefully managed to ensure particulate emissions are minimised. Bunker portals should be enclosed (or partially enclosed where shown to be effective) by the use of a curtain.

Appropriate PPE should be worn by workers during any removal of grate ash from the coal-fired boilers to avoid health risks associated with respirable particulates.

As previously noted in **Section 3.1**, the POEO Regulation 2010 lists a number of approved circumstances where by smoke emissions are allowed to be discharged from marine vessels. These include the period that the vessel is approaching, leaving or manoeuvring at a berth and the period (of no more than 30 minutes per 24 hours) after lighting a boiler and leading up to normal boiler operation.

Taking the above approved circumstances into consideration, all practicable means should be employed to prevent and minimise the emission of smoke.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

SLR Consulting has been commissioned by Crawford Architects on behalf of Sydney Maritime Museum Ltd to provide environmental assessment reports to support a Development Application for the Sydney Heritage Fleet, Bank Street, Pyrmont.

The Air Quality Assessment examines the existing environmental conditions at the proposed Project Site by reference to validated air quality and meteorological monitoring data. The potential sources of emissions to air associated with the construction and operational phases of the development have been identified, and quantified where possible.

The potential impact of these sources upon existing air quality has been made through qualitative methods. None of the identified emissions to air were considered to be of sufficient scale to justify quantitative assessment through dispersion modelling or other quantitative methods.

7.2 Recommendations

A comprehensive range of air quality monitoring and procedural requirements have been recommended as pragmatic controls during the construction and operational phases, which are considered proportionate to the anticipated scale of impacts.

Recommendations provided in the Air Quality Assessment are summarised in **Table 13** as follows:

Table 13 Air Quality Recommendations

Phase / Activity	Recommendation
Construction Phase	
Construction Environmental Management Plan (CEMP) to address pro-active control of dust emissions	Dust management measures to include identification of conditions during which particularly dust generating activities may be curtailed or ceased, dust suppression measures, visual inspection of off-site compliance, a clear communication strategy for management and prompt investigation of dust complaints.
CEMP to address the disturbance of contaminated soil and sediment including associated odour impacts and health implications	Extent of ground contamination to be determined prior to commencing construction and a remediation strategy. Where this is determined to potentially affect the emission of odour or contaminated dust from the site, these impacts to be specifically addressed in the remediation strategy and CEMP. An odour assessment and management procedure would need to be developed to manage the risks of off-site odour impacts and/or health impacts from the volatilisation of ground contaminants. Reference should be made to SLR Consulting's report "Preliminary Contaminated Land Assessment".
Location and management of plant	Plant should be located as far from local receptors as practicable and engines should not be left idling when not in use. Stationary trucks should switch off engines if idling time on-site is likely to exceed 2 minutes and should avoid using the local road network during peak traffic periods. All equipment used on site should be maintained to the required performance standards.

Phase / Activity	Recommendation
Operational Phase	
Implementation of an Odour Management Plan as part of the Operational Environmental Plan (OEMP)	The Odour Management Plan will provide a pro-active management procedure to record activities and observations on-site, provide a range of odour control methods to manage the risk of odour emissions from operational activities and provide a methodology for the recording and response to any received odour complaints.
Workshop emissions	Control of fugitive emissions from the workshop should be managed through careful use and bunded storage of solvents, the provision of spill clean-up kits including absorbing materials to minimise the potential for VOC emissions. Waste solvents should be properly stored in sealed and marked containers and removed from site for treatment or disposal at a suitable waste management facility. Where feasible, products and agents with lower VOC contents should be used. Where possible, the delivery of liquid fuels will utilise reciprocal feeds, so that the tank vapours are displaced into the delivery vehicle rather than being emitted to atmosphere as a fugitive emission. Welding fumes arising from boat maintenance operations may require localised occupational health and safety controls to manage the risk to operators.
Coal handling	Coal handling activities should be carefully managed to ensure particulate emissions are minimised. Bunker portals should be enclosed (or partially enclosed where shown to be effective) by the use of a curtain.
Grate ash handling	Where bag failure or accidental spillages occur, particulate emissions should be controlled at the source by prompt spill management, involving the damping down of the ash, bagging and removal. The provision of suitable personal protective equipment (PPE), including dust masks, is recommended for the purposes of occupational health and safety.
Combustion emissions from the Boilers in the SHF	All practicable means should be employed to prevent and minimise the emission of smoke during boiler combustion.

8 LIMITATIONS

The following information will assist in understanding the uncertainties relating to the interpretation of the data obtained during this investigation and the recommendations presented in the report, and help with assessment and interpretation of the report.

The services undertaken consist of a qualitative assessment of identified potential sources of emissions to air associated with the construction and operational phases of the development. Emissions to air have been quantified where possible.

SLR Consulting is not a professional quantity surveyor (QS) organisation. As such, any areas, volumes and tonnages or any other quantities noted in this report are only indicative estimates. The services of a professional QS organisation should be required if quantities are to be relied upon.

SLR Consulting assumes no responsibility for the quality or accuracy of data obtained from external sources, or for occurrences outside the scope of works defined in this report.

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9 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

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SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

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