APPENDIX 5

Draft Air Quality Management Plan

Air Quality Management Plan

DRAFT

Barangaroo Delivery Authority

Barangaroo Headland Park and Northern Cove
Hickson Road, Sydney, NSW

November 2010
JBS41181-15904 rev A
JBS Environmental Pty Ltd

Table of Contents

Figures

Appendices

List of Abbreviations

A list of the common abbreviations used throughout this report is provided below.

- As Arsenic
- Cd Cadmium
- Cr Chromium
- Cu Copper
- BTEX Benzene, Toluene, Ethylbenzene and Xylenes
- B(a)P Benzo (a) pyrene
- DECCW NSW Department of Environment, Climate Change and Water
- DQO Data Quality Objectives
- DP Deposited Plan
- EPA New South Wales Environment Protection Authority
- Hg Mercury
- HIL Health Based Investigation Level
- LOR Limit of Reporting
- MAH Monocyclic Aromatic Hydrocarbon
- Ni Nickel
- OCP Organochlorine Pesticide
- SAR Site Audit Report
- SAS Site Audit Statement
- PAH Polycyclic Aromatic Hydrocarbons
- Pb Lead
- PIL Phytotoxicity Based Investigation Level
- PCB Polychlorinated Biphyenyls
- PQL Practical Quantitation Limit
- QA/QC Quality Assurance/Quality Control
- RPD Relative Percentage Difference
- TPH Total Petroleum Hydrocarbons (C_6-C_9 and C_{10}-C_{36})
- Zn Zinc

1 Introduction

1.1 Introduction and Objectives

JBS Environmental Pty Ltd was engaged by Barangaroo Delivery Authority (BDA) to prepare an Air Quality Management Plan (AQMP) for the proposed construction works referred to as the 'Early Works' and 'Main Works' on the Headland Park portion of the Barangaroo development site located at Hungry Mile (Hickson Road), Sydney, NSW, 2000 (**Figure 1**). The AQMP is required to monitor and control potential air emissions from the construction program proposed for the Headland Park. The provisions of the AQMP will require to be implemented into the Environmental Construction Management Plan (ECMP) as proposed to be prepared for the construction works and relevant parts of the Remediation Environmental Management Plan (REMP) also being prepared for the works.

Air Quality Impact Assessments[1] (AQIAs) have been prepared for the proposed Early Works and Main Works on the Headland Park. The AQIAs assessed a range of potential sources of air emissions on the Headland Park site. It was found that unacceptable levels of air pollutants will not occur at the surrounding areas during the site works where a range of control and monitoring provisions are implemented on the site. The AQMP has been prepared to document the recommended control and monitoring works as identified by the AQIAs.

1.2 Site Identification

The Barangaroo Project Site is located at Hungry Mile (Hickson Road), Sydney NSW. The Barangaroo Project Site is legally referred to as Lots 1, 3, 5 and 6 Deposited Plan (DP) 876514 and includes the adjacent parts of Sussex Street, Hickson Road and Towns Place, as shown in **Figure 1**. The Barangaroo Project Site details are summarised in **Table 1.1** and described in more detail in the following sections.

Table 1.1 Summary Details for the Barangaroo Project Site

Lot/DP	Lots 1, 3, 5 and 6 of Deposited Plan 876514, including adjacent parts of Sussex Street, Hickson Road and Towns Place
Address	Hungry Mile (Hickson Road) Millers Point NSW
Local Government Authority	City of Sydney
Site Zoning	Zone B4 Mixed Use and RE1 Pubic Recreation
Current Use	Vacant / Roadway
Geographical Co-ordinates, Elevation	Easting – 333643m E, Northing – 6251851m S, 2-3m AHD
Site Area	Approximately 22 ha

It is noted that two small portions have been excluded from the Barangaroo Project Site for the purposes of construction planning including:

- Moore's Wharf (in the far north eastern section of the Headland Park Site); and
- The area immediately surrounding the Port Control Tower.

The location of these areas relative to the Barangaroo Project Site is shown on **Figure 2**, which also shows the location of former structures that were present during the former commercial / industrial site use.

[1] *Air Quality and Health Assessment Early Works – Headland Park Barangaroo Delivery Authority Barangaroo Hungry Mile, Sydney, NSW* JBS Environmental Pty Ltd September 2010 (JBS 2010)
Air Quality and Health Assessment Main Works – Headland Park Barangaroo Delivery Authority Barangaroo Hungry Mile, Sydney, NSW JBS Environmental Pty Ltd October 2010 (JBS 2010)

The Headland Park Site comprises the northern part of the Barangaroo Project Site. The Headland Park Site details are summarised in **Table 1.2**.

Table 1.2 Summary Details for the Headland Park Site

Lot/DP	Lot 1 and Part Lot 5 of Deposited Plan 876514, including adjacent parts of Hungry Mile (Hickson Road) and Towns Place
Address	Hungry Mile (Hickson Rd) Millers Point NSW
Local Government Authority	City of Sydney
Site Zoning	Zone B4 Mixed Use and RE1 Pubic Recreation
Current Use	Vacant
Geographical Co-ordinates, Elevation	Easting – 333547m E, Northing – 6252278m, 2-3m AHD
Site Area	Approximately 8 ha

1.3 Surrounding Landuse

The surrounding uses of land adjacent to the Headland Park Site have previously been reported as follows (ERM 2008b[2]):

- North: Immediately to the north is Sydney Harbour;
- East: Immediately to the east is the residential and commercial area of Millers Point (NE), in addition to Hungry Mile (Hickson Road) (SE);
- South: Immediately to the south is the temporary overseas passenger terminal, beyond which lies the Stage 1 Development; and
- West: Immediately to the west is Darling Harbour.

A former gasworks is known to have operated until the 1920s over part of the Stage 1 Development, as shown on **Figure 2**. The former gasworks location is known to continue to the east beneath Hungry Mile (Hickson Road), and the contaminated gasworks waste material in this area has the potential to impact soils and groundwater on the south-eastern portion of the Barangaroo Project Site. This part of the Stage 1 Development has been declared a Remediation Site by NSW DECCW (Declaration No. 21122, Area No. 3221) under the CLM Act 1997. It is understood that assessment programs are being undertaken on the Stage 1 Development in preparation for remediation.

1.4 Purpose

This AQMP has been designed to ensure, via the implementation of a number of ongoing monitoring and management measures pertaining to the proposed demolition and earthworks and associated environmental management works, that the risk to the construction workforce of the Barangaroo Headland Park, adjoining commercial and residential properties, and the surrounding environment is acceptable. Demolition, earthworks and building works are being undertaken as an Early Works and Main Works program for the development of the site as a Headland Park.

The AQMP is intended to inform the preparation of the ECMP being prepared for the site and relevant parts of the REMP.

[2] *Draft Stage 2 Remedial Action Plan for Barangaroo*, Hickson Road, Sydney, ERM, September 2008 (ERM 2008b)

1.5 Responsibilities

The construction works on the site shall be undertaken under the guidance of a head contractor who is yet to be appointed. The head contractor will be responsible for the implementation of the majority of procedures provided to the AQMP and ECMP. It is noted that where the specific procedures are technical or complex in nature then the Remediation Consultant as appointed to the project shall fulfil the requirements of the procedure, or advise the appropriate implementation of the procedure. JBS Environmental (JBS) will be available to undertake environmental monitoring and assessment tasks as the Remediation Consultant engaged on the project.

A formal list of procedures is provided to the AQMP based on an assessment of potential environmental emissions from anticipated site works required for the demolition, earthworks and building works. Specific responsibilities are nominated for the implementation of these procedures within the relevant procedure.

1.6 The Proposed Early Works

The purpose of the Early Works program is to prepare the Headland Park Site for its development into a naturalistic headland that will simulate the shoreline as it was in 1836 (MG 2010[3]).

Typically, "Early Works" are those activities that 'enable' a projects "main works" to commence unfettered and without delay[4]. The broad categories of Early Works required, taking due account of the Barangaroo Stage 1 works interface with the Headland Park site, are as follows:

- Site establishment including security arrangements;
- Demolition works (including redundant services);
- Site investigation;
- Environmental protection;
- Existing services modifications;
- Heritage protection;
- Sandstone extraction; and
- Receipt, management and retention of fill from Stage 1 (southern part of Barangaroo site).

1.6.1 Site Establishment and Security Arrangements

Early Works activities associated with site establishment and security are as follows:

- Erect perimeter hoarding and signage;
- Erect signage on Hungry Mile (Hickson Road) pertaining to site access etc;
- Establish public walkway / cycleway at site perimeter;
- Establish site facilities including offices, ablutions, first aid, storage etc;

[3] *Barangaroo Headland Park and Northern Cove, Preliminary Assessment and Request for Director-General's Requirements for Early Works and Main Works Project Applications*, MG Planning Pty Ltd, March 2010 (MG 2010)
[4] *Preliminary Environmental & Construction Management Plan Early Works – Headland Park Barangaroo Barangaroo Delivery Authority*, InfraSol Group Pty Ltd (InfraSol 2010)

- Establish gatehouse facilities at each entrance to site including height restriction warning;
- Install CCTV cameras;
- Establish protocols and onsite facilities for emergency services to support the construction phase;
- Establish with Energy Australia high voltage power supply points on the eastern boundary;
- Establish with Sydney Water, water and sewer connection points; and
- Confirm that no telecommunications land line is required and the mobile phone antennae systems are functional

1.6.2 Demolition Works

Early Works activities associated with demolition include:

- Removal of seven lighting towers and transporting them from site and de-energising the power supply;
    - Saw-cutting, removal and spoil of pavement materials for the purposes of:
    - Site investigation works;
    - Establishment of environmental protection;
    - Existing services modifications;
    - Exposing sandstone extraction;
    - Exposure of fill retaining wall footing locations;
- Decommission and removal of all redundant utilities / services:
    - Sewer lines and pits owned by Sydney Water;
    - In-ground power lines;
    - Sydney Ports Observation Tower substation (following construction and commissioning of a replacement facility at Merriman Street);
    - Other services either existing or as found including gas, water supply, stormwater, telecommunications (copper and optic fibre) etc; and
- Removal of redundant fencing and barriers.

1.6.3 Site Investigation

Early Works activities associated with land side site investigation including:

- Testing of pavement material throughout the site to establish boundaries between and proportions of reinforced concrete pavement and asphaltic concrete;
- Pavement test pits in nominated locations to establish the caisson material type, internal and external wall condition and material type;
- Test pits at nominated locations to establish nature and extent of existing sandstone seawall;

- Installation of groundwater monitoring points; and
- Explore in-ground service locations to establish the extent of decommissioning works.

1.6.4 Environmental Protection

Early Works activities associated with environmental protection in addition to those required by the AQMP including:

- Sediment and erosion control and protection works including:
  - Sediment dam(s) construction;
  - Run-off collection pits construction;
  - Concrete perimeter lined drain construction;
  - Secondary overflow dam(s) construction;
  - Swale drain construction;
- Delineation of stormwater drainage system catchments to separate clean water from the construction site;
- Install water management and treatment systems to manage groundwater / leachate seepage, stormwater run-off and construction water;
- Establish treated water infrastructure for water supply to dust control, wash-down measures; and
- Establish a low level bunded storage area of nominally 500m^2 for neat cut and stacked five tonne (nominal) blocks of sandstone.

1.6.5 Existing Services Modifications

Early Works activities associated with existing services modifications are primarily focused on existing sewer pump station SPS0014. Key aspects of these works include:

- Diversion of the Bettington Street high level sewer system towards Hungry Mile (Hickson Road);
- Connection of Sydney Ports Corporation Tower sewer into Merriman Street sewer;
- Construction of a new sewer line down Hungry Mile (Hickson Road) incorporating a temporary pump station north of existing pump station SPS1129;
- Establishment of a temporary overland sewer line from the temporary pump station into SPS1129;
- Interception of the Millers Point High Street and High Lane sewer system; and
- Provision of 100m^3 of overflow storage capacity at SPS1129.

1.6.6 Heritage Protection

Early Works activities associated with heritage protection measures are as follows:

- Survey of the SPS0014 super and sub-structures;
- Performance of pre-construction building surveys on heritage items (properties, sea wall, structures etc) which may be impacted by the Early Works; and
- Construct temporary retaining walls to protect SPS0014 from the earthworks filling activity.

1.6.7 Sandstone Extraction

Early Works activities associated with sandstone extraction include:

- Commencement of extraction of 60,000m^3 of sandstone for project re-use in landscaping and other structures. Nominal rough surface sections weighing 50 – 100 tonnes each are required. In the order of 65% of this material will be used to create the naturalistic shoreline. Five tonne blocks will be stored within the Headland Park site. In the order of 35% of this material will be required for other landscape features; and
- Extract sandstone rubble and develop the fill drainage blankets to manage the collection of leachate from within the deposited fill materials and to establish the new shoreline.

1.6.8 Receipt of Fill from Stage 1 (Southern Portion of Barangaroo)

The following measures are required to prepare for the receipt of fill from Barangaroo Stage 1:

- Construction of footings for retaining walls at specified locations to receive fill including:
  - Northern entry route (from Towns Place) to sandstone extraction;
  - Sandstone extraction (western side);
  - SPS0014 (south, east and western sides);
- Construction of retaining walls; and
- Receive fill materials (up to 150,000m^3) in a controlled manner separating Virgin Excavated Natural Material (VENM) from general fill and placing other material, pre –treated to meet regulatory standards, in a nominated area.

1.7 The Proposed Main Works

The proposed Main Works construction program includes all works required to construct the final landform of the Barangaroo Headland Park site including the Park and Northern Cove. Construction works will include:

- Land formation using fill from Stage 1 of the Barangaroo Development (Lend Lease portion of the site at to the south of the proposed Headland Park Site) ranging from 150,000m^3 as received during the Early Works program and an additional 150,000m^3 as received from the Stage 1 Barangaroo Development as undertaken in the Main Works program, to build the Headland up to finished levels for a nominal 0.8m topsoil layer;

- Construction of structural earth retaining walls using sandstone based materials;
- Creation of a naturalistic shoreline and Northern Cove through excavation / dredging, formation of retaining walls using boulders etc;
- Extraction of sandstone for earth retaining walls and naturalistic shoreline;
- Placement of up to 60,000m^3 of fill materials from the Stage 1 area of the Barangaroo site within the space created by the sandstone extraction;
- General landscaping and planting;
- Construction of a network of pedestrian pathways connecting the foreshore walkway and Merriman St;
- Construction of a shoreline promenade;
- Jetty / viewing platform extending into the Northern Cove from the southern shoreline;
- Construction of a car park within the headland with vehicular access from Towns Place and pedestrian access from various locations within Headland Park;
- Construction of a space area for a future use (as Cultural Facilities) comprising up to 18,000m^2 of floor space with ceiling heights ranging from 3 to 13m; and
- Site remediation works to address limited amounts of contaminated fill material that have been identified on the Headland Park site. These works will be incorporated with the overall excavation activities proposed for the Park.

1.8 Excavation, Filling and Land Formation

Excavation, filling and land formation package of the 'Main Works' involves the creation of the final landform through excavation of the shoreline and Northern Cove and the filling of the site to form the Headland. The proposed site dimensions are shown on **Figure 3**.

The main area of the excavation relates to the creation of the naturalistic shoreline and the Northern Cove with excavation proposed to a level 4m below sea level (reduced level -4.0m AHD) to create the new shoreline. Other minor landside excavation is also envisaged. In total it has been estimated that approximately 100 000m^3 of excavation will be undertaken as part of the proposed Main Works, along with up to 60 000m^3 of sandstone extraction as detailed in the Early Works Application (JBS, 2010b).

The proposed filling for the Main Works is in addition to the receipt and placement of up to 150 000m^3 of fill as received from the Stage 1 Barangaroo works, as provided for and detailed in the Early Works Application. Fill created on site through excavation of the shoreline and Northern Cove will be used to form the final landform. The remainder of the further fill that will be required on the site will be sourced from the Barangaroo Stage 1 basement excavations. It is estimated that an additional 150 000m^3 will be received from Stage 1 during the Main Works construction program.

In total there is approximately 350 000m^3 of fill to be placed, with a further nominal 0.8m topsoil layer as a medium for the planted and turfed area of the Headland Park.

As part of the shoreline works, the existing heritage listed sandstone seawall (western boundary) will be stabilised and partially dismantled. Retrieved sandstone blocks will be reused on site and incorporated in the Headland Park works.

Temporary retaining walls and infrastructure works will also be removed as part of the proposed works.

1.9 Environmental Condition of Fill Materials Received from Stage 1

The nature of the potential emissions of chemicals and odours from the Early Works and Main Works project phases at the Headland Park Site is associated with the environmental condition of the soils that are proposed to be used to form the park. As discussed above these are proposed to be substantially sourced from the Stage 1 Development in the southern part of the Barangaroo Site.

Previous environmental investigations conducted at the Barangaroo Project Site have identified a number of contamination issues, principally associated with fill materials, natural soil and groundwater within the footprint of a former gasworks (located on the Stage 1 Development), which require remediation/management, namely:

- Petroleum hydrocarbon (assessed as Total Petroleum Hydrocarbons(TPH)), Benzene, Toluene, Ethylbenzene & Xylene (BTEX) and Polycyclic Aromatic Hydrocarbon (PAH) impacted fill materials, soils and groundwater;
- Cyanide impacted fill materials, soil and groundwater;
- Phenol and ammonia impacted fill materials, soil and groundwater;
- Minor quantities of asbestos impacted fill materials; and
- Metal impacted fill materials, soil and groundwater (lead, cadmium, copper & zinc).

Provisions are in place to prevent the receipt of highly contaminated materials from other parts of the Barangaroo Site onto the Headland Park Site. However fill material that is received on the Headland Park Site may be impacted with lower levels of the nominated constituents. The potential environmental condition of the soils to be received on the Headland Park Site requires consideration with the potential air emissions from the works.

The footprint of the former gasworks has been declared by the NSW Department of Environment Climate Change and Water (DECCW) as a Remediation Site and is referred to as the "Declaration Area".

1.10 Identification of Potential Air Emissions

Several potential sources of air emissions have been identified in the AQIA's prepared for the proposed works. These are briefly listed following in **Table 1.3**.

Table 1.3: Summary of Air Emissions

Works	Air Emissions
Demolition / Removal of site pavement	Particulates
Excavation of soils (overlying proposed sandstone)	Particulates
Excavation of sandstone from Headland Park Site	Particulates
Haulage of soils / sandstone across site roads	Particulates
Stockpiling of soils	Particulates, Soil Contaminants
Fugitive dust emissions from exposed surfaces	Particulates, Soil Contaminants (where contaminated soil exposed)
Excavation of micro-tunnelling access pits	Particulates, Soil Contaminants (in proximity of Declaration Area along Hungry Mile, Hickson Rd)
Micro-tunnelling	Particulates, Soil Contaminants (in proximity of Declaration Area along Hungry Mile, Hickson Rd)
Receipt of Fill Materials from Stage 1	Particulates, Soil Contaminants
Operation of heavy vehicles for demolition and earthworks	Exhaust emissions

The most significant potential emissions have been identified as occurring from:

- Particulate emissions from soil excavation activities in close proximity of residential properties;
- Particulate emissions from soils stockpiling and handling on the Headland Park site; and
- Particulate, chemical and odour emissions from the receipt and handling of fill materials as proposed to be received from the Barangaroo Stage 1 development.

1.11 Environmental Procedures

A number of environmental control and monitoring provisions have been recommended in the AQIA's prepared for the Early Works and Main Works. These have been prepared as outline air quality management procedures, are provided in **Appendix A**, and are summarised in **Table 1.4** following.

Table 1.4: Summary of Air Quality Management Procedures

Procedure No.	Name
01	Dust and Airborne Hazard Control
02	Odour Prevention and Control
03	Odour Masking
04	Handling of Environmentally Impacted Material
05	Air Monitoring – Odours
06	Air Monitoring – Volatile Organic Compounds
07	Air Monitoring – Particulates
08	Air Monitoring – Asbestos
09	Air Monitoring – Access Pit Excavation
10	AQMP Review
11	Training

2 Limitations

This report has been prepared for use by the client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from other parties. The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

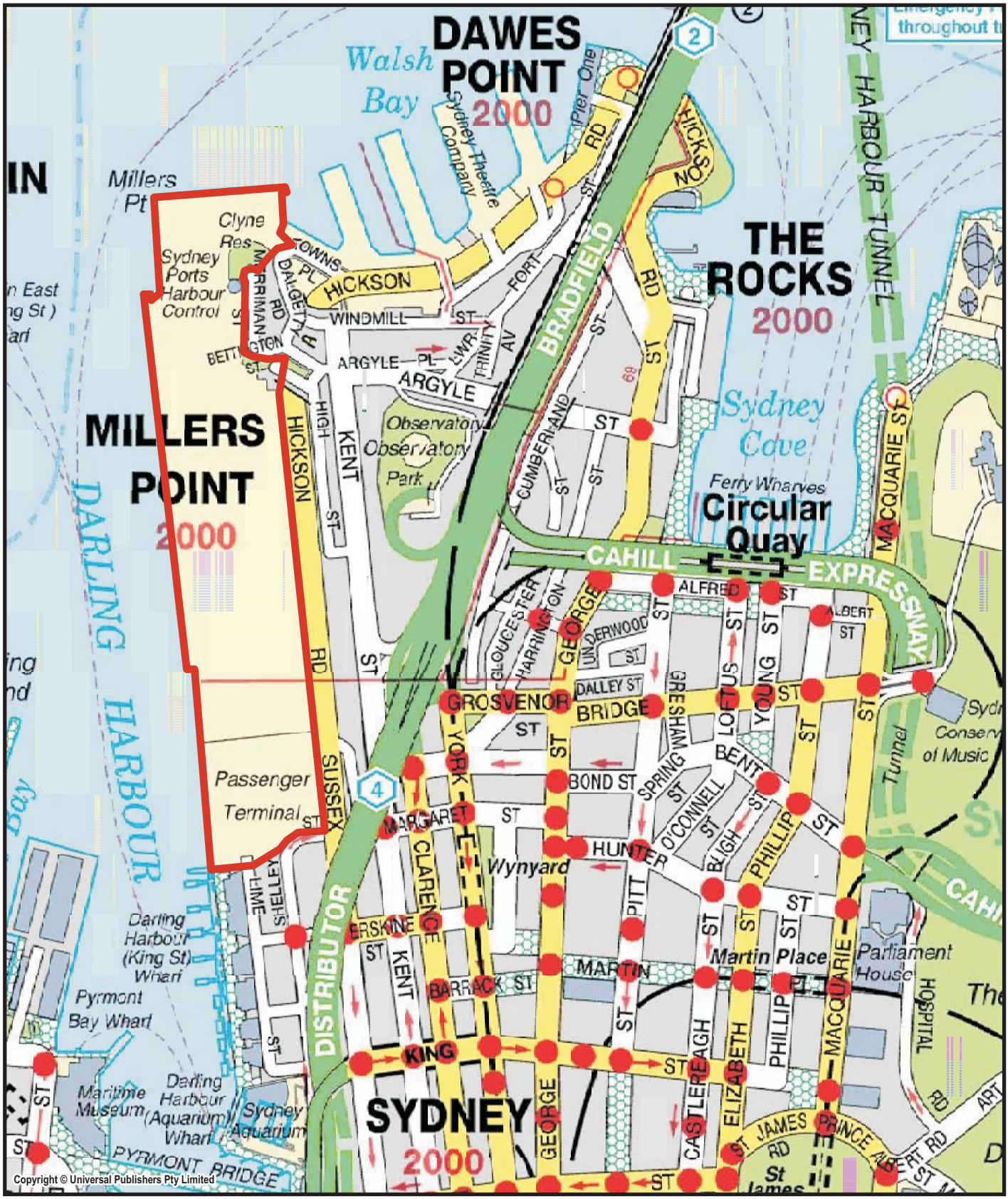
JBS Environmental Pty Ltd accepts no liability for use or interpretation by any person or body other than the client. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS Environmental Pty Ltd, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS Environmental Pty Ltd reserves the right to review the report in the context of the additional information.

Figures



JBS ENVIRONMENTAL

0 250m

Approximate scale

Figure 1 **Location of Barangaroo Site**

ERM (2008)
Note- All locations shown are approximate only

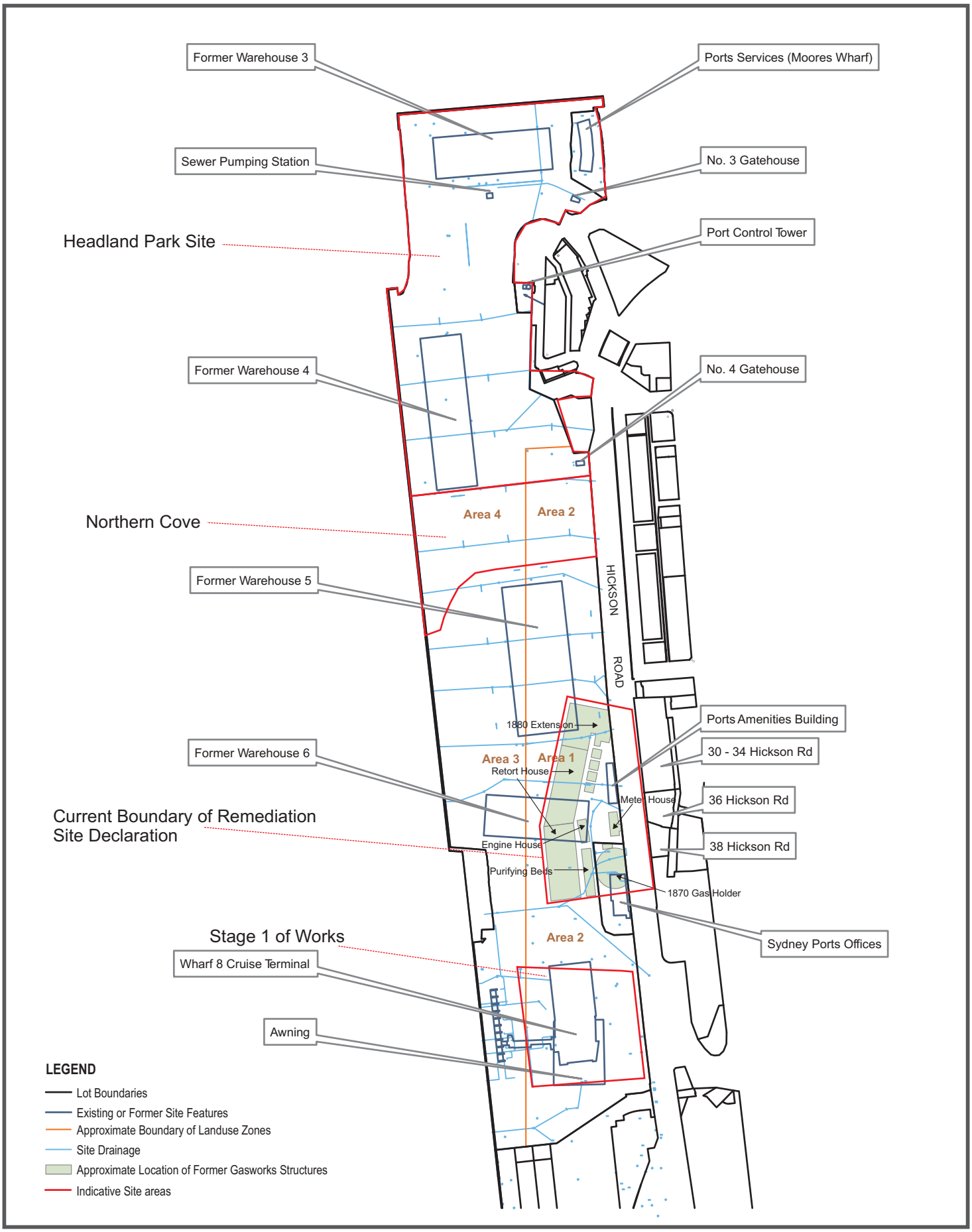


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Figure 2 **Site Layout**

ERM (2008)
Note- All locations shown are approximate only

Figure 3

1:500 @ A0 0 10 20 30 50m

BARANGAROO HEADLAND

PWP Landscape Architecture
739 Allston Way, Berkeley, California 94710

Johnson Pilton Walker
Level 10, Plaza Building Australia Square, 95 Pitt Street, Sydney NSW 2000

DESIGN DEVELOPMENT
HEADLAND PARK DD-PWP-L-S3-1003
PLAN

REV. 00

28th SEPTEMBER 2010

Appendix A

Air Quality Management Procedures

Dust and Airborne Hazard Control	AQMP01
Responsibility:	Head Contractor
Frequency:	All site works
Location:	Site
Objective:	To minimise dust emissions from demolition and earthworks.

Procedure

Dust and Asbestos Risk

Excavation and handling of soils has the potential to generate dust emissions.

Asbestos containing materials have been found to be potentially present in fill materials located across the site and may be received on the site within materials delivered from Barangaroo Stage 1. Previous environmental assessments have identified that asbestos occurs within the bonded matrix of these fibre cement fragments. No free asbestos fibres have been identified in soils.

Addison et. al. ('The Release of Dispersed Asbestos from Soil', Institute of Occupational Medicine Report No. TM/88/14, September 1988) have found that very high levels of respirable dust require to be generated before significant airborne concentrations of asbestos fibres were produced from soils contaminated with respirable asbestos fibres. It is considered that fibre cement sheet fragments require to be subjected to intensive mechanical processes to cause the release of asbestos fibres.

Asbestos containing fibre cement fragments present in the site sub-surface on the site are not considered to pose a risk. However where the fragments are disturbed by excavation works asbestos fibres will potentially be released. Measures to control dust emissions will be sufficient to control potential asbestos emissions.

Standards

All operations on site are to be conducted so that concentrations of dust and other hazardous substances satisfy those stipulated in NSW DECCW published and endorsed guidelines. These guidelines include:

- NEPC (1998) 'National Environment Protection Measure for Ambient Air Quality' and
- Environmental criteria provided to NSW DEC (August 2005) 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'.

Control

Measures shall be undertaken to reduce airborne emissions from site activities including:

- Water sprays used for dust suppression across unsealed areas of the site, stockpiles and other dust generating areas. All potential dust generating areas (i.e. areas of exposed soils) require to be watered on an hourly basis during periods of site operation or significant dust generation;
- A water misting system will be established on site boundaries of areas of soil handling in close proximity of residential properties. This will include excavation works as associated with the access pits for micro-tunnelling within Hickson Rd;
- Stockpile heights shall be minimised where possible;
- Where stockpiles are to be left in place for significant periods of time, they shall be seeded to promote vegetation growth to prevent dust emissions; and
- Where unfavourable meteorological conditions exist (i.e. strong winds directed at residential properties) site works shall be restricted to those with low potential for atmospheric emissions. This shall also include consideration of reduced production rates during these periods to minimise dust emissions.

Regular maintenance shall be undertaken of sprinkler heads, as used for dust control throughout the site, to prevent clogging.

It is noted that additional specific requirements have been developed for soils which are identified as potentially malodorous as detailed in AQMP02 Odour Control and AQMP04 Handling of Environmentally Impacted Soil which shall also reduce dust and potential asbestos emissions. The requirements of this procedure should be reviewed in accordance with the additional requirements of these other procedures.

Odour Prevention and Control	AQMP02
Responsibility:	Head Contractor JBS Environmental Contractors providing fill materials from Barangaroo Central and Barangaroo South
Frequency:	Disturbance of potentially malodorous / impacted soils
Location:	All areas on site
Objective:	To minimise potential odour impacts

Procedure

Malodorous materials may potentially be received on the Headland Park site with the receipt of fill materials from the Barangaroo Stage 1 development (i.e. Barangaroo Central and Barangaroo South). Coal tar based impact has been identified in some soils proposed to be excavated from the Barangaroo Stage 1 development. These soils have been found to be potentially malodorous.

Coal tar impacts may also be present in sandstone as excavated from access pits placed in Hickson Rd as placed in proximity of the former gasworks on Hickson Rd. This excavated sandstone is likewise anticipated to be potentially malodorous.

Extensive measures require to be undertaken to control potential odour generation and odour emissions from the site as detailed following. The measures require to be sufficient to prevent recognition of offensive odours at residential and commercial properties in proximity of the site. A range of odour control measures have been designed for the Headland Park works and are detailed following.

Odour Prevention Measures

Barangaroo Stage 1 Fill Materials Inspections

The most likely source of significant malodorous and chemical emissions will be the fill materials as received from the Barangaroo Stage 1 development. These fill materials will be delivered to the Headland Park by tipper.

All tipper loads of soils as delivered to the Headland Park site shall be inspected prior to entry to the Headland Park site. Potentially malodorous materials shall be identified by the inspection. Field staff undertaking inspections shall require to be aware that a 'moth ball' type odour is anticipated with environmentally impacted soils.

Any tipper load which is identified as containing malodorous soils shall be clearly identified by the attachment of an A3 size fluorescent orange sheet on both sides of the tipper bin. Identification of the impacted nature of the tipper contents will allow control measures to be prepared at the point of receipt prior to tipping. Materials which are identified as potentially malodorous shall be covered at all times during transport within the Headland Park.

Tipper Load Inspection Station

A Tipper Load Inspection Station (TLIS) shall be established at the entry to the Headland Park Site. All tippers importing fill materials to the Headland Park shall be required to stop at the TLIS for inspection. The TLIS shall comprise a scaffold section, or equivalent, to allow a Field Scientist to inspect road tipper contents. The TLIS shall contain provisions to ensure that tippers are required to pass within an adequate distance of the scaffold section to allow personnel inspection.

Preparations for Receipt of Malodorous Materials

Tipper loads of potentially malodorous materials shall be identified as described earlier. Provisions shall be in place prior to tipping of malodorous materials to ensure that covering is able to be commenced as soon as possible. The Head Contractor shall ensure the availability of materials. The Head Contractor shall prevent the identified tipper from dumping materials until all odour equipment is in place.

Covering of Malodorous Materials – Headland Park

Where a load of malodorous soils is tipped on the site to be used as filling material, measures will require to be implemented as soon as possible to prevent odour emissions. These measures shall include (but are not limited to):

- Tipping at the upwind portion of the site works to the extent possible to maximise dispersion distances to off-site properties (if possible); and / or
- Sealing of the malodorous stockpiled soil surface by covering. Appropriate sealing may include spraying of the malodorous surface with a hydromulch, or placement of a sufficient thickness of non-

impacted soils over the malodorous materials; and/ or

- Spraying of the exposed malodorous soil surface with a odour sealing solution. A mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water may be suitable to be used for this purpose. This may be prepared by the mixing of one 20L drum of Anotec 307 in 1,000L of water.

Malodorous Materials – Access Pits

Malodorous emissions as caused by excavation of impacted sandstone potentially present within proposed access pits in Hickson Rd, as placed during the Early Works, shall also require to be controlled. These measures shall include (but not be limited to):

- Excavation / hammering of sandstone underlying a layer of hydromulch or clean non-impacted soils. Maintenance of the layer of clean materials throughout the duration of exposure of the impacted materials;
- Placement of spoil directly into a lined tipper or waste bin. Noting the anticipated slow rate of excavation in these areas, the tipper / waste bin should be re-covered by tarpaulin or similar by an attendant between each bucket of spoil; and
- Transfer of malodorous materials as soon as possible to the Headland Park site for management or off-site disposal. Malodorous materials transferred to the Headland Park shall require to be identified by the attachment of an A3 size fluorescent orange sheet on both sides of the tipper bin.

Malodorous Materials Movement Scheduling

Malodorous materials as received on the Headland Park site will require to be consolidated into the proposed Headland subsequent to their receipt. Odour control measures may not be able to maintained throughout these works where compaction standards require to be achieved.

The Environmental Consultant provided to the Project shall advise the most appropriate period of each day to undertake these works based on an assessment of meteorological conditions. Results of environmental monitoring as undertaken during these works, including odour and VOC assessment as per AQMP05 Air Monitoring – Odours and AQMP06 Air Monitoring – Volatile Organic Compounds, shall be used to confirm that the advised meteorological conditions are appropriate.

Conditions which maximise separation distances to downwind receptors and increase dispersion of emissions shall be favoured. Malodorous materials shall be handled during these periods to the extent possible. It is anticipated that this will typically comprise afternoon periods. The environmental consultant shall be aware that conditions that favour odour dispersion may not favour reduction in dust emissions.

Similarly where the environmental consultant advises that non favourable meteorological conditions are present, handling of potentially malodorous materials will be prevented (where possible).

Handling / exposure of malodorous materials shall not occur during any periods where unacceptable levels of odour or VOC emissions are identified by AQMP05 Air Monitoring – Odours and / or AQMP06 Air Monitoring – Volatile Organic Compounds.

<u>Odour Masking</u>

All measures possible must be undertaken to prevent odour emissions prior to adopting odour masking measures as described in AQMP03 Odour Masking.

Odour Masking	AQMP03
Responsibility:	Head Contractor JBS Environmental
Frequency:	Disturbance of potentially malodorous / impacted soils
Location:	All areas on site
Objective:	To minimise potential odour impacts

Procedure

Malodorous materials may potentially be received on the Headland Park site with the receipt of fill materials from the Barangaroo Stage 1 development (i.e. Barangaroo Central and Barangaroo South). Coal tar based impact has been identified in some soils proposed to be excavated from the Barangaroo Stage 1 development. These soils have been found to be potentially malodorous.

Coal tar impacts may also be present in sandstone as excavated from access pits placed in Hickson Rd as placed in proximity of the former gasworks on Hickson Rd. This excavated sandstone is likewise anticipated to be potentially malodorous.

Extensive measures are proposed to control odour emissions. The nature of the available odour controls is that they are not able to be immediately applied to sources of odour emissions. During some periods of the works momentary 'puffs' of odour may occur during the periods where odour controls are being implemented.

The degree of recognition of these odours will be able to be reduced by the operation of an odour masking system.

Odour Masking System

An odour masking system will require to be established at the Headland Park site boundary prior to the receipt / handling of potentially malodorous materials. An odour masking system will require to established with the misting system provided to the access pit excavations where malodorous materials are identified.

The odour masking system shall only be implemented where environmental monitoring identifies that odour control procedures have failed and odour emissions are unable to be prevented.

An odour masking system shall be operated and maintained at the boundary of the earthworks during all stages of the works where potentially malodorous emissions may occur. This system shall comprise the following:

- Provision of odour control solution consisting of a mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water. This shall be prepared by the mixing of one 20L drum of Anotec 307 in 1,000L of water;
- Provision of an odour control solution spray system consisting of raised irrigation line (at least 1.5m above ground level) provided with sprinkler heads at a frequency of:
    - One head per 5m on the Headland Park eastern boundary;
    - One head per 5m on the Headland Park southern boundary where the interim Port Facility is operational to the south of the site;
    - One head per 20m on the remaining Headland Park boundaries;
    - One head per 1.5m for sprinkler systems installed surrounding access pit excavations;
- Sprinkler heads should be capable of delivering a fine mist of odour control solution with no discernible droplets; and
- Continuous supply of odour control solution to the raised irrigation line at a sufficient frequency to supply at least 100ml/minute to each sprinkler head included in the irrigation line.

System Operation

The odour masking system shall not be used as a substitute for proper odour control technologies. The odour masking system shall only be used during periods where short duration puffs of odour may occur and only where all odour control technologies, as described in AQMP02 Odour Prevention and Control are being implemented.

The odour masking system shall operate for a maximum of four hours on any day. The operation of the Odour Masking System shall be recorded on Form AQMP03.1.

Odour Masking System Operation	Form AQMP03.1

Date	Commenced Operation	Ceased Operation	Wind Speed and Direction	Comments

Handling of Environmentally Impacted Soil	AQMP04
Responsibility:	Head Contractor JBS Environmental
Frequency:	Handling of environmentally impacted soils, including stockpiled soils and receipt of impacted materials
Location:	Areas of site containing environmentally impacted soils
Objective:	To control potential environmental emissions from contaminated soils

Procedure

Potential hazardous emissions (dust, odour and vapours) may be released during the handling of environmentally impacted materials on the site. Measures shall be put in place to minimise such emissions. These measures shall include:

- Measures detailed in AQMP01 Dust and Airborne Hazard Control;
- Measures detailed in AQMP02 Odour Control;
- Measures detailed in AQMP03 Odour Masking;
- Handling and processing of all impacted soils as generated by remediation excavations on the Headland Park site or received as fill material from the Barangaroo Stage 1 works as per a materials tracking system developed for the site; and
- Transport of all impacted soils as per designated and marked 'impacted' and 'non-impacted' haul routes throughout the site. These routes shall be clearly identified on a site plan as posted within the Site. A heavy vehicle decontamination area shall be clearly marked on this plan. All persons engaged on the site shall be aware of the preferred haulage routes. The identification of preferred routes will assist in the appropriate placement and ready deployment of odour control methods, and prevent transport of impacted materials along site boundaries (where possible).

Where air quality management provisions are insufficient to allow monitoring criteria as detailed in AQMP05 Air Monitoring – Odours and/or AQMP06 Air Monitoring – Volatile Organic Compounds and/or AQMP07 Air Monitoring – Particulates and/or AQMP08 Air Monitoring – Asbestos and/or AQMP09 Air Monitoring – Access Pit Excavation then the relevant works shall be ceased until more favourable meteorological conditions or more appropriate work methods are available. The Remediation Consultant (JBS Environmental) shall advise more appropriate meteorological conditions.

Air Monitoring – Odours	AQMP05
Responsibility:	Head Contractor Site Auditor JBS Environmental
Frequency:	Handling / receipt / excavation of malodorous materials
Location:	Site boundaries and nearby residential areas
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the Headland Park site throughout the earth works. The extent of required monitoring is described following:

Odour

Odour monitoring shall be undertaken by JBS personnel at the downwind boundaries of the Headland Park. Odour monitoring shall be commenced subsequent to the receipt of first tipper load of malodorous materials (as per AQMP02 Odour Prevention and Control). Odour monitoring shall be undertaken at three locations as a minimum spaced no greater than 20m along the downwind boundary at a frequency of:

- Hourly during periods of receipt or handling of potentially malodorous materials; and
- A minimum of twice daily during other periods.

Odour monitoring shall further be undertaken at least once daily at the receptors nearest to the site, as shown on Figure AQMP5.1. This consists of the nearest residential locations, the base of the Sydney Ports Control Tower and the Interim Cruise Facility (when operational).

Odour monitoring shall be undertaken using a 'Nasal Ranger' field olfactometer. A single odour measurement shall be undertaken at each monitoring location. Where an odour strength of 2-4 odour units or greater is recorded, an additional four odour measurements shall undertaken on a 1 minute basis. Odour measurements shall be recorded on Form AQMP05.1.

Where three (or more) of the total five readings record an odour strength of or in excess of 2-4 odour units (based on coal tar recognition), measures as required by AQMP02 Odour Control shall be required to be undertaken to reduce the recognition of odours to an acceptable level. The odour masking system as described in AQMP03 Odour Masking shall also be activated (where appropriate).

JBS personnel who undertake odour monitoring shall be non-smokers and shall be free of any nasal / sinus conditions that may affect the ability to detect / recognise odours.

Figure AQMP5.1 **Odour Monitoring Locations**

Department of Lands (2010)
Note- All locations shown are approximate only

Air Monitoring – Odours	Form AQMP05.1

Date:_____

Downwind Locations (complete as per monitoring periods)

7-8am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

8-9am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

9-10am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

10-11am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

11-12am ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

12am-1pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

1-2pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

2-3pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

3-4pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

4-5pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

5-6pm ◇ No Malodorous Materials Handled

Boundary Assessed:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

Additional Measurements:_____

_____

Static Locations

Time:_____

Wind Direction and Velocity:_____ _____m/s

Measurements: 1._____OU 2._____OU 3._____OU

4._____OU 5._____OU 6._____OU

Additional Measurements:_____

_____

Completed by: _____

Air Monitoring – Volatile Organic Compounds	AQMP06
Responsibility:	Head Contractor Site Auditor JBS Environmental
Frequency:	Handling / receipt / storage of malodorous materials
Location:	Adjoining site works
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the Headland Park site throughout the earth works. The extent of required monitoring is described following:

Volatile Organic Compounds (VOCs) – Photo-Ionisation Detector

Assessment for VOCs shall be undertaken using a photo-ionisation detector (PID) provided with a 10.6eV bulb. Prior to use and at least on a daily basis the calibration of the PID shall be checked by comparison to a fresh air and isobutylene standard. The calibration check shall be recorded as per the appropriate PID calibration forms.

VOC monitoring shall be undertaken at all times in the proximity of handling of malodorous materials. Contaminants identified on the project site which have potentially significant health impacts are considered to occur within malodorous materials. The identification of malodorous materials is an appropriate measure for the potential presence of significant levels of VOCs.

The PID shall be maintained by an attended operator within a distance of approximately 2m during all periods of handling malodorous materials. Where the operator is unable to safely remain within 2m of the works area (consequent of heavy equipment or otherwise) the PID may be affixed to an excavator or similar in proximity of the works. PID measurements shall be undertaken as one hour averages.

The action level to assess PID readings requires to be determined on the basis of the separation distance to the nearest potentially exposed receptor. Locations of nearest receptors and separation distances are shown on Figure AQMP6.1 attached. The separation distance to the nearest receptor requires to be calculated by estimating the distance from the area of the malodorous materials to the nearest receptor. This is the sum of the distance from the site boundary to the receptor, and the downwind distance from the malodorous materials to the site boundary. The PID screening criteria are summarised following:

Separation Distance (m)	PID Screening Criteria (ppm)
50	0.1
100	0.2
150	0.3
200	0.3
250	0.4
300	0.4
350	0.5
400	0.5
450	0.6
500	0.6
600	0.7
700	0.7
800	0.8
900	0.9
1000	0.9

Where the screening criteria are exceeded then measures as required by EMP02 Odour Control shall be implemented to reduce VOC emissions. It is noted measures identified as appropriate for odour emissions are also appropriate for control of VOC emissions.

Subsequent to implementation of odour control measures, an additional air sample shall be required to be collected using a Draeger Tube.

All PID monitoring results require to be recorded on Form AQMP6.1.

Volatile Organic Compounds (VOCs) – Draeger Tube

Drager tube samples require to be collected where the PID screening level is exceeded and the maximum PID reading for the day has been recorded. Draeger tube samples require to be specific to benzene.

Draeger tube ID 81081841 shall be used for sampling. This tube is specific to benzene and has a benzene

detection limit of 0.5ppm. Draeger tube samples shall be collected at a height of 1.5m immediately overlying the malodorous materials. Some works may require to be temporarily ceased to allow collection of the sample.

Draeger tubes shall be sampled in strict accordance with the manufacturer specifications. Sampling shall be undertaken using a Draeger Accuro Pump. It shall be ensured that the recommended number of strokes are undertaken with the collection of each sample.

All Drager tube monitoring results require to be recorded on Form AQMP6.1.

The Draeger tube action level shall be set at a detection of benzene overlying the source (0.5ppm). Where a detection is recorded and odour controls have been implemented, works shall require to be modified. This shall include consideration of:

- Cessation of works until more favourable meteorological conditions are available; and/or
- Reduction in scale of works with VOC impacted / malodorous materials.

JBS ENVIRONMENTAL

0 250m

Approximate scale

Figure AQMP6.1

Approximate Separation Distances from Headland Park Boundary

Department of Lands (2010)
Note- All locations shown are approximate only

Air Monitoring – VOCs	Form AQMP06.1

Date:_____

Sampling Locations at 2m Distance Downwind of Work Zone (complete as per monitoring periods)

7-8am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

8-9am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

9-10am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

10-11am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

11-12am ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

12am-1pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

1-2pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

2-3pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

3-4pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

4-5pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

5-6pm ◇ No Malodorous Materials Handled

Wind Direction and Velocity:_____ _____m/s

Measurements (hourly average): _____ ppm

Drager Tube sample: ◇ No Sample ◇ No Benzene Detection ◇ _____ ppm

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Completed by: _____

Air Monitoring – Particulates / Dust	AQMP07
Responsibility:	Head Contractor Site Auditor JBS Environmental
Frequency:	Duration of earth works
Location:	Site boundaries
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the Headland Park site throughout the earth works. The extent of required monitoring is described following:

Dusts – Realtime Particulate Monitoring

Assessment of realtime levels of dusts shall be undertaken by JBS personnel observing site boundaries. Where visible dusts are found to be observable leaving the site boundary then actual site measurements shall be undertaken by a 'DUSTTRAK' Aerosol Monitor at the downwind site boundary. The averaged level of PM_{10} (particulate matter less than 10 microns is diameter) over a period of 30s shall be required to be less than 50µg/m^3 at the downwind portion of the site boundary.

Where the acceptable level of dust is exceeded by real-time aerosol monitoring, then dust control measures as advised in AQMP01 Dust and Airborne Hazard Control shall be implemented.

All measurements shall be recorded in Form AQMP07.1.

Dusts – Deposition Monitoring

Dust deposition monitoring shall be undertaken by dust deposition gauges maintained permanently at three locations identified on Figure AQMP7.1. These locations have been determined on the basis of siting requirements in AS2922-1997 'Ambient Air – Guide for Siting of Sampling Units' to the extent possible. Collection and analysis of samples shall be undertaken in accordance with AS3580.10.1-2003 'Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method'. Samples shall be collected and analysed on a monthly basis throughout the works.

Where the level of dust deposition exceeds 2g/m^2/month the implementation of AQMP01 Dust and Airborne Hazard Control shall be reviewed.

Dusts – Laboratory Analysis of Particulates

Confirmatory sampling shall be undertaken of the realtime particulate measurements being generated by the monitoring. This shall be undertaken by the fortnightly collection of an ambient air sample by a high volume sampling method. A high volume sampler shall be operated for a minimum period of 8 hours during site operation at a downwind location on the site boundary. Sample collection and analysis shall be in accordance with AS3580.9.6-1990 'Ambient Air – Determination of Suspended Particulate Matter PM_{10} – High Volume Sampler with Size Selective Inlet Gravimetric Method'.

Realtime measurements shall be taken at hourly intervals adjoining the sampler. The laboratory reported result of the high volume sampler shall be compared to the average of the realtime measurements. Where a significant discrepancy is identified (RPD>50% as calculated in accordance with AS4482.1-2005) the calibration of the Dusttrak (dust monitor) shall be confirmed by manufacturer service.

Repeated significant discrepancies in measurements will require revision of the AQMP in accordance with AQMP10 Review.

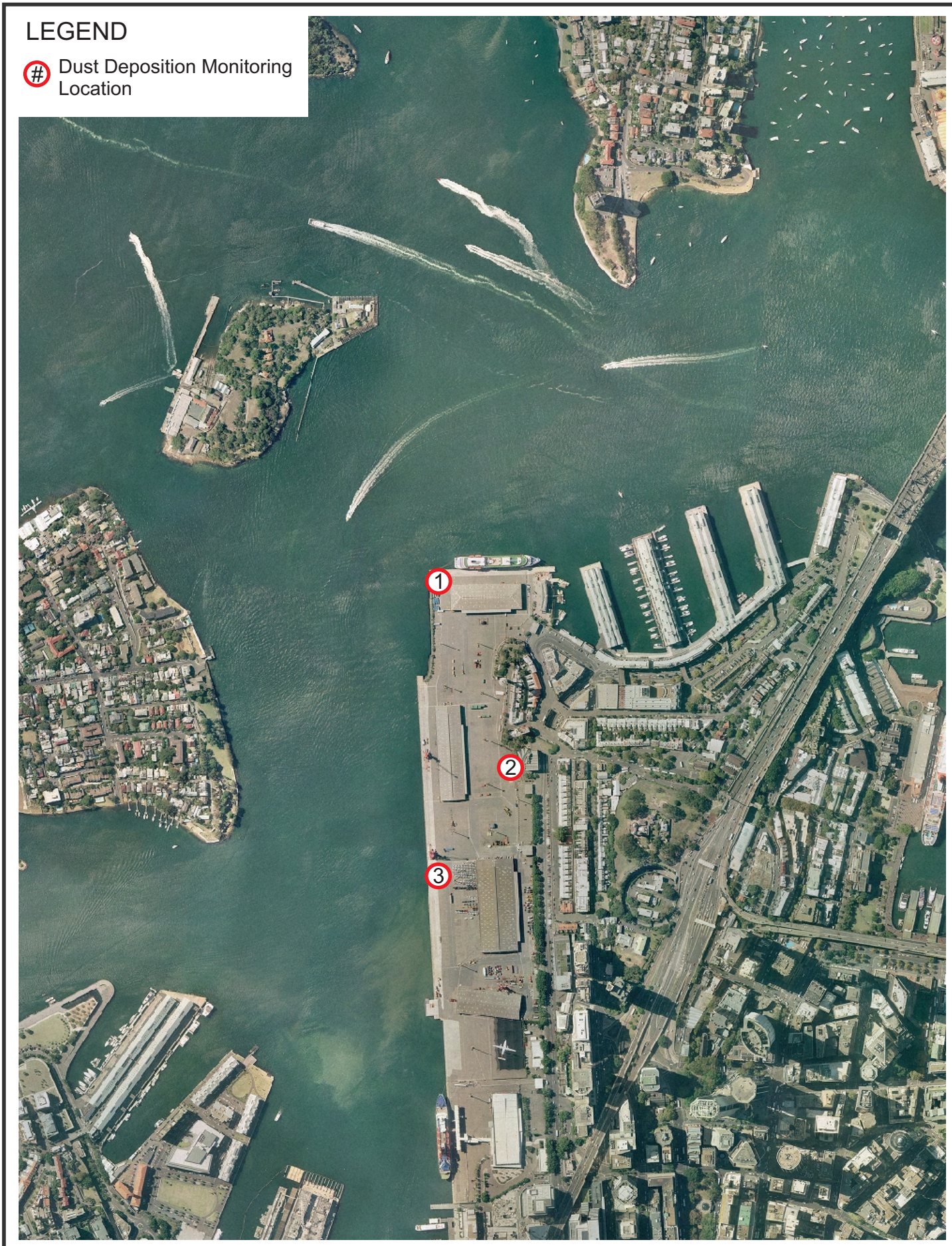

Figure AQMP7.1 **Dust Monitoring Locations**

Department of Lands (2010)
Note- All locations shown are approximate only

Air Monitoring – Dusts / Particulates	Form AQMP07.1

Date:_____

Dusts Visible at Site Boundaries?

7-8am	◇ No	◇ Yes	_____
8-9am	◇ No	◇ Yes	_____
9-10am	◇ No	◇ Yes	_____
10-11am	◇ No	◇ Yes	_____
11-12am	◇ No	◇ Yes	_____
12am-1pm	◇ No	◇ Yes	_____
1-2pm	◇ No	◇ Yes	_____
2-3pm	◇ No	◇ Yes	_____
3-4pm	◇ No	◇ Yes	_____
4-5pm	◇ No	◇ Yes	_____
5-6pm	◇ No	◇ Yes	_____

Dust-Trak Measurements

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Time:_____ Wind Direction & Speed:_____m/s

Completed by:_____

Air Monitoring – Asbestos	AQMP08
Responsibility:	Head Contractor Site Auditor JBS Environmental
Frequency:	Duration of early works
Location:	Site boundaries and nearby residential areas
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the Headland Park site throughout the earth works. The extent of required monitoring is described following:

Asbestos

Asbestos containing materials have been identified in fill based soils underlying the site. Asbestos containing materials may be present in soils as received from the Barangaroo Stage 1 development.

Where asbestos containing materials are identified in soils on the Headland Park site by the environmental consultant, asbestos monitoring shall be undertaken. Identification will be able to be undertaken during tipper inspections as undertaken with the requirements of AQMP02 Odour Prevention and Control, or during monitoring activities as required by other parts of the AQMP.

The potential generation of asbestos fibres shall be assessed by the daily static monitoring for asbestos fibres at three locations on the site boundary. These locations shall consist of at least one upwind and one downwind location. Sampling shall be undertaken in accordance with NIOSH Method 7400 'Asbestos and Other Fibres by PCM'. All results shall be required to meet the acceptance criteria as specified in the NOHSC 'Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres (2^{nd} edition)' of <0.01 fibres/ml.

Where fibres are recorded in downwind locations then the presence of asbestos fibres shall be confirmed by analysis using TEM analysis (as per NIOSH method 7402). Where asbestos fibres are identified then dust control procedures shall be reviewed as in accordance with AQMP01 Dust and Airborne Hazard Control. The recording of asbestos fibres will require a substantial review of work methods.

Air Monitoring – Access Pit Excavations	AQMP09
Responsibility:	Head Contractor Site Auditor JBS Environmental
Frequency:	Duration of earthworks within Hickson Rd
Location:	Adjoining Access Pit excavations and nearby residential areas
Objective:	To assess compliance with environmental standards for works

Procedure

A program of atmospheric monitoring shall be undertaken at the Access Pit excavations within Hickson Rd. The extent of required monitoring is described following:

Odour

Odour monitoring shall be undertaken at the access pit excavations continually where coal tar impacted sandstone is identified by excavations. Odour monitoring shall be undertaken using a 'Nasal Ranger' field olfactometer. Where repeated odour measurements of recognisable coal tar odour of 2-4 odour units are reported, the provisions of AQMP02 Odour Control shall require to be implemented.

JBS personnel who undertake odour monitoring shall be non-smokers and shall be free of any nasal / sinus conditions that may affect the ability to detect / recognise odours.

Volatile Organic Compounds (VOCs)

VOC monitoring shall be undertaken continually where coal tar impacted sandstone is identified by excavations. VOC monitoring shall be undertaken using a photo-ionisation detector (PID) provided with an 10.6eV bulb. Prior to use and at least on a daily basis the calibration of the PID shall be checked by comparison to a fresh air and isobutylene standard. The PID shall be set to report averaged levels over a minimum period of 30s. An acceptable level of 0.2ppm shall be assessed by the monitoring, as measured as an average over a minimum period of 30s.

Where the acceptable level of VOCs is exceeded on the PID, then measures as required by AQMP02 Odour Control shall be implemented to reduce VOC emissions. It is noted measures identified as appropriate for odour emissions are also appropriate for control of VOC emissions.

Dusts and Asbestos

Where visible dusts or asbestos containing materials are identified at access pit excavation works, dust and asbestos monitoring locations as required by AQMP07 and ASQMP08 shall be amended to include locations adjoining the access pit excavation works.

AQMP Review	AQMP10
Responsibility:	Head Contractor Site Auditor JBS Environmental Barangaroo Delivery Authority
Frequency:	Subsequent to environment incidents. Subsequent to changes in program of works.
Location:	Not applicable
Objective:	To ensure that the AQMP is current and appropriate for the site

Procedure

Subsequent to any environmental incidents on the site and/or a significant modification to the implemented scope of works, the Air Quality Management Plan shall be reviewed by JBS Environmental. All new copies of Air Quality Management Plans shall be re-distributed to all parties by JBS Environmental. The Environmental Construction Management Plan and/or the Remediation Environmental Management Plan will require to be updated with the provisions of the revised Outline Air Quality Management Plan.

On finalisation of revision, the Air Quality Management Plan shall be provided to the Barangaroo Delivery Authority for review / approval. The Authority shall advise acceptability of revisions (or otherwise) within seven days of receipt.

Training	**AQMP11**
Responsibility:	Head Contractor JBS Environmental
Frequency:	Throughout implementation of Environmental Management Plan
Location:	-
Objective:	To ensure that persons responsible for preparation of the AQMP are competent.

Procedure

Any person who is required to be responsible for technical / monitoring activities in relation to the implementation of the Air Quality Management Plan shall:

- Be inducted as the requirement and method of the specific activity by the JBS Environmental or their nominated representative;
- Have undertaken the 24 hour Health and Safety Training for Hazardous Waste / Materials under OSHA 29 CFR 1910:120 or equivalent;
- Have an adequately acute sense of smell to allow operation of a nasal ranger (as confirmed by ability to detect n-butanol odour at a level of 40ppb by dynamic olfactometry in accordance with AS/NZS 4323.3:2001; CEN EN 13725:2003); and
- Have completed a Workcover approved Asbestos Removal Supervisor course or equivalent.

Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
A	Matt Parkinson		Draft for client review		2/11/2010