

15 October 2015

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Dear Mark

Addendum to the Remedial Action Plan, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW - Offsite Treatment/Transport of Contaminated Material

1.0 Introduction

This Addendum to the *Remedial Action Plan (RAP)*, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW (AECOM, 2013a) (hereafter referred to as the *VMP/Block 4 RAP*) has been prepared by AECOM Australia Pty Limited (AECOM) for Lend Lease (Millers Point) Pty Ltd (Lend Lease).

This Addendum has been prepared in response to Condition B3 of the **Barangaroo Block 4 Remediation DA SSD 5897** (Block 4 Remediation Works) approval. It is also applicable to proposed remediation works within Block 5 and potentially Hickson Road works (if the ex-situ remediation option is undertaken), which are the subject of separate development applications.

1.1 Objectives

The objectives of this Addendum are to:

- Confirm that the offsite transport and treatment of hazardous waste for the Block 4 Remediation Works and the Stage 1B Perimeter Retention Wall (PRW) construction works described by the *'Block 4' Development Remediation Works, Bulk Excavation and Retention Wall System Construction, EPA Remediation Site 21122 'Block 4' (Stage 1B), Barangaroo South Environmental Impact Statement (EIS)* (JBA Urban Planning Consultants Pty Ltd, 11 November 2013) (hereafter referred to as the *Block 4 Remediation EIS*):
 - is consistent with the *VMP/Block 4 RAP* (AECOM, 2013a); and
 - complies with the NSW EPA (2014) *Waste Classification Guidelines* and the amended *Protection of the Environment Operations (Waste) Regulation* (2014).
- Provide further information regarding the environmental control measures which will be adopted during the works described by the *Block 4 Remediation EIS* (JBA, 2013) and within Block 5 and/or Hickson Road (collectively referred to here-in as the *Remediation Works*). Specifically, this addendum presents a methodology for odour control for the potential transportation of untreated contaminated material (i.e. material classified as hazardous waste); and
- Respond specifically to Condition B3 of SSD 5897.

1.2 Barangaroo Block 4 Remediation DA (SSD 5897)

As above, this Addendum has been prepared in response to Condition B3 of Barangaroo Block 4 Remediation DA SSD 5897 as follows:

(1) If contaminated material is to be transported off-site for treatment, the Applicant must provide an addendum to the RAP, prior to the issue of the relevant Construction Certificate. The RAP addendum must:

(a) be provided to the EPA for review and comment;

(b) include a methodology for odour control for the transportation of untreated contaminated material off-site which:

- demonstrates that the transportation of untreated contaminated material off-site would meet the minimum odour control requirements specified in the Block 4 Preliminary Air Quality and Odour Control Plan prepared by Lend Lease (dated 13 August 2014) in the RTS Addendum;
- provides detailed design of the odour control measures to be implemented during vehicle loading and transport;
- includes a suitable air quality and odour monitoring program to be implemented for this activity; and
- is incorporated into the Air Quality and Odour Management Sub-Plan required under Condition B14.

The RAP addendum must be approved by an EPA-accredited site auditor prior to the issue of the relevant Construction Certificate.

2.0 Remediation Strategy

The *Remediation Works* include the excavation and offsite transportation of untreated soil classified as hazardous waste for treatment at an offsite NSW EPA licensed treatment facility.

The *Remediation Works* will be undertaken in accordance with the *VMP/Block 4 RAP* (AECOM, 2013a) which was approved by the accredited NSW EPA Site Auditor (ENVIRON, 2013).

The potential approach to the *Remediation Works* within Block 4 and Block 5 considered by the *VMP/Block 4 RAP* (AECOM, 2013a) was ex-situ remediation (refer to Section 11 and 12.3.2 of the *VMP/Block 4 RAP* [AECOM, 2013a]). Ex-situ remediation has subsequently been confirmed as the preferred remedial approach for Block 4 and Block 5 as described by the *Block 4 Remediation EIS* (JBA, 2013) and *Block 5 Remediation EIS, (SSD 6533) Barangaroo Central Remediation of Block 5 - Part of EPA Remediation Site 21122* (JBA, 2014).

There are two alternate methods of remediation proposed in relation to Hickson Road, as described in the *Hickson Road Remediation Works (SSD 6617) EIS, Hickson Road, Barangaroo, Remediation of Hickson Road - Part of EPA Remediation Site 21122* (JBA, 2015). These are

- *In situ* remediation; and
- Ex-situ remediation - excavation and disposal and backfill.

The preferred remedial approach for Hickson Road is *in situ* chemical oxidation. If trials relating to *in situ* remediation are unsuccessful, then ex-situ remediation will be undertaken in Hickson Road, including offsite transportation of untreated soil classified as hazardous waste to an offsite NSW EPA licenced facility.

2.1 Consistency with the VMP/Block 4 Remedial Action Plan (AECOM, 2013a)

The ex-situ remediation approach to be adopted in relation to Block 4 and Block 5, which includes offsite treatment of contaminated soil classified as hazardous waste, is consistent with the remediation works anticipated by the *VMP/Block 4 RAP* (AECOM, 2013a). In particular, Sections 13.3 and 14.1 of the *VMP/Block 4 RAP* (AECOM, 2013a) state that material excavated from the Site will be treated onsite or *transferred to a licensed offsite facility for treatment in accordance with applicable regulations and NSW EPA requirements*.

That is, the RAP anticipated that ex-situ remediation of contaminated soil may comprise of either:

- Onsite treatment of excavated contaminated material within a soil treatment enclosure prior to disposal to an appropriately licenced offsite landfill; or
- Offsite treatment of excavated contaminated material at an appropriately licenced treatment facility prior to disposal to an appropriately licenced offsite landfill.

The environmental controls specified by the *VMP/Block 4 RAP* (AECOM, 2013a) accommodate both options (i.e. either onsite treatment or offsite treatment of contaminated soil). Specific sections of the *VMP/Block 4 RAP* (AECOM, 2013a) which are applicable to the offsite transportation of contaminated materials include:

- Section 14.7.2, Material Tracking: outlines the requirements for the tracking of all excavated material (treated or untreated) which will be detailed in a Material Tracking Procedure (to be prepared);
- Section 14.7.3, Material Preparation: as required to ensure potentially saturated materials are appropriately drained of excess water and spadeable (within the Excavation Enclosure [EE]) prior to transport to stockpiles and offsite disposal; and
- Section 14.7.6, Offsite Transportation of Materials: outlines requirements for trucks transporting materials off the Site.

Further details of controls related to the offsite transportation of untreated soil classified as hazardous waste are discussed in **Section 3.0** of this letter.

2.2 Regulatory Compliance

AECOM considers that with the successful implementation of the *VMP/Block 4 RAP* (AECOM, 2013a) and the additional requirements detailed herein, the offsite treatment of materials from the *Remediation Works* can be undertaken in accordance with the following guidelines and legislation:

- NSW EPA (2014) *Waste Classification Guidelines*; and
- *Protection of the Environment Operations (Waste) Regulation* (2014).

2.3 Conclusion

Based on the information presented above, it is concluded that the ex-situ remediation approach including offsite treatment of materials is consistent with the *VMP/Block 4 RAP* (AECOM, 2013a) and relevant legislation.

3.0 Environmental Control Measures

The following sections describe environmental control measures (including odour control requirements and air quality and odour monitoring) which will be implemented in relation to offsite disposal and treatment of contaminated soil during *Remediation Works*. These measures are based on those already prescribed by the *VMP/Block 4 RAP* (AECOM, 2013a) and include, where relevant, expanded detail and/or supplementary controls that will be adopted during the works.

3.1 Preliminaries and Site Establishment

As required by Section 13.1 of the *VMP/Block 4 RAP* (AECOM, 2013a), relevant project documentation will be prepared and licences or permits obtained prior to mobilising to Site. The Site will be prepared and Site Facilities established prior to the commencement of any remediation works at the Site.

In particular, approval will be sought from the NSW EPA in relation to the offsite treatment (including an Immobilisation Approval, as applicable), consent from an appropriately licenced facility capable of treating the contaminated soil and/or an appropriately licenced landfill capable of receiving the treated contaminated soil.

The Site Establishment works will include construction of an Excavation Enclosure (EE) and related Emissions Control System (ECS, refer to **Section 3.3** for further detail relating to bulk excavation works).

3.2 Dewatering of Excavations

As per Section 14.5 of the *VMP/Block 4 RAP* (AECOM, 2013a), dewatering during the remediation, excavation and construction works will be undertaken to remove groundwater from the soils within the *Remediation Works* area. The dewatering works will be undertaken after completion of the PRW construction works and with the installation of spear points across the area to lower the groundwater level below the excavation depth within this area.

Various site investigations conducted within the *Remediation Works* area indicate that the fill material comprises mainly sandy gravel/gravelly sands with brick and concrete rubble. Refer in particular to the following testpit

locations (where the fill materials could be observed in detail) detailed in Figure F5 of the *VMP/Block 4 RAP* (AECOM, 2013a):

- Block 4 - TP5 to TP7 and various boreholes locations (i.e. BH33 to BH59); and
- Block 5 - TP1 to TP4 and borehole locations BH64-BH66 and BH68.

Based on the nature of these granular fill types, it is expected that, the majority of the pore water otherwise entrained in the fill will be removed as an outcome of the dewatering works. This will assist in preparation of contaminated soil for excavation and transport as discussed in **Section 3.4**.

If additional dewatering or sludge removal works are required in localised areas as the excavation works progress (for example within former gasworks structures or to remove surface water that has accumulated locally on the top of the natural bedrock), pumps will be used to locally remove the liquid from the active excavation areas.

The objective of the dewatering operations will be to:

- minimise the excavation of saturated soils during the remediation works;
- assist the preparation of material for excavation and transport (refer to **Section 3.4**); and
- minimise the risk of potential leaks from trucks during transportation (refer to **Section 3.6**).

3.3 Excavation Enclosure and Emissions Control System

As discussed in Section 15.1 of the *VMP/Block 4 RAP* (AECOM, 2013a), the excavation of odorous materials will be undertaken within the confines of an Excavation Enclosure (EE). A negative air pressure will be maintained within the EE for the duration of the relevant remediation works and the air emissions will be appropriately managed/treated within an Emissions Control System (ECS).

It should be noted that the only exception to this will be materials removed during construction of the PRW, which may not be undertaken within an EE. The PRW construction works will be managed in accordance with the *Block 4 PRW - Preliminary Air Quality and Odour Control Plan* (Lend Lease, 2014, refer to **Attachment 1**).

3.4 Management of Odorous Materials During Excavation

As required by the *VMP/Block 4 RAP* (AECOM, 2013a) a range of odour control measures will be implemented during excavation of potentially odorous material.

Specific measures for the management of odorous materials during excavation will include:

- utilising an EE with associated ECS for excavation, stockpiling, material preparation and loading during bulk excavation; and
- minimising the quantity or surface area of odorous materials exposed at any given time.

Specific measures for management of odorous materials during construction of the PRW – which will be undertaken outside the EE – are described by the *Block 4 PRW - Preliminary Air Quality and Odour Control Plan* (Lend Lease, 2014). The controls described by the *Block 4 PRW - Preliminary Air Quality and Odour Control Plan* (Lend Lease, 2014) include the following works:

- covering of exposed odorous materials progressively or at the completion of each work period, using tarps, non-odorous material or foaming agents;
- disposal of stockpiles offsite as soon as practicable;
- use odour suppressants (such as BioSolve) or misting sprays in and around the work area;
- undertaking weather monitoring and modifying works based on weather conditions, if required; and/or
- the use of odour suppressant sprays or foams (such as Rusmar AC-645) on excavated odorous material.

Selection of the appropriate management and mitigation measures (to be applied during both excavation and construction of the PRW) will be based on consideration of:

- whether works are being undertaken inside an EE;
- the quantity and quality of odorous materials that are being disturbed;

- the duration of excavation works;
- the proximity of excavation works to sensitive receptors;
- prevailing and forecast weather conditions; and/or
- other activities being undertaken at the Site in parallel with excavation work.

A detailed odour management system will be developed as part of a future Air Quality and Odour Management Sub-Plan. This will include odour management response procedures and progressive implementation of contingency measures.

The management of odorous materials during offsite transportation will follow the same principles as described above for onsite works, and are discussed further in **Section 3.6**.

3.5 Material Preparation

As required by Section 14.7.3 of the *VMP/Block 4 RAP* (AECOM, 2013a), *excavated materials may require preparation prior to transport to stockpiles and offsite haulage*.

In particular, excavated materials may require preparation prior to loading to ensure the material is spadeable and suitable for transport. Material preparation at the Site may include:

- Mixing of saturated excavated material to make it spadeable prior to loading. This may be achieved by addition of fly ash, lime or cement;
- Drainage and drying of saturated excavated materials; and
- Screening or manual separation of material to separate oversize and/or materials suitable for recycling (e.g. steel, concrete, brick and rock fill, timber piles, construction and demolition waste).

Where materials with potential for volatile or odorous emissions require preparation prior to loading, the measures specified in **Section 3.4** will be used.

In addition to the requirements specified above, contaminated materials to be transported offsite will be subject to a visual assessment by the validation consultant prior to loading of the material onto trucks (refer to **Section 3.6**). The objective of the visual assessment will be to confirm that the material is spadeable and does not contain excess free liquids and is suitable for management as prescribed by **Section 3.6**.

If the material is considered unsuitable for offsite transport, it will be subject to further preparation within the EE prior to reassessment by the validation consultant.

3.6 Offsite Transportation of Materials

To ensure potential transport related impacts are suitably controlled, the following materials handling and environmental control measures will be implemented for trucks transporting contaminated soil materials classified as hazardous waste from the Site for treatment. These measures are considered current standard industry best practice for the works being undertaken:

- Materials will be loaded into trucks within the EE (excepting material generated by the PRW works - refer to the *Block 4 PRW - Preliminary Air Quality and Odour Control Plan* [Lend Lease, 2014] provided as **Attachment 1**);
- Once the truck trailer has been loaded, the exposed surface of the untreated contaminated soil classified as hazardous waste will be sprayed with a suitable foam agent, such as Rusmar AC-645 (or equivalent) to minimise the release of fugitive emissions during transportation. The intent of the foam agent is to form a barrier that provides adequate odour control for the duration of transport. The foam agent will be required to meet the following criteria:
 - must be non-hazardous and bio-degradable;
 - must be able to be quickly applied to truck loads shortly after the truck is loaded to rapidly mitigate the generation of fugitive emissions and odours;
 - must be applied at the recommended thickness;
 - must form a seal across the surface of the soil and effectively bind surface dust particles; and

- upon drying, must form a cover which is flexible and capable of resisting degradation during transportation of the materials to the licensed offsite facility.
- A suitable work area (for example a raised platform) will be constructed within the EE to allow a thorough application of the foam agent (or equivalent) across the surface of each truck load containing untreated contaminated soil classified as hazardous waste;
- Trucks carrying excavated materials will be covered and decontaminated in the wheel wash facility before exiting the EE (as applicable) and exiting the Site;
- Trucks carrying contaminated materials will be covered prior to exiting the Site and will remain covered until authorised to unload at the destination;
- Trucks will be fitted with seals to ensure that the movement of potentially saturated materials is undertaken appropriately;
- Trucks will not wait in the streets surrounding the Site or within the CBD;
- Trucks will exit the Site through predetermined exit points on Hickson Road and will follow a predetermined transport route to the destination (landfill or other) via Sussex Street, Anzac Bridge and the City West Link or across the Harbour Bridge;
- Truck trailers will be covered with a waterproof tarpaulin to mitigate the potential ingress of rainwater during transportation and to assist in protecting the integrity of the foaming agent;
- The truck will be inspected prior to leaving Site to ensure that the mitigation measures described above have been appropriately implemented. An Inspection and Test Plan will be implemented, including the following hold, record or inspection points:
 - Truck licenced to carry hazardous waste (N120);
 - EPA hazardous waste consignment information completed;
 - Rusmar AC-645 (or equivalent) applied at recommended depth (for example 75 mm in the case of AC-645) across truck surface area and forming a seal (including a photo);
 - Truck rear seals checked and locked;
 - Waterproof tarpaulin checked and in place;
 - Truck dangerous goods class/UN code placard/safety signage correct;
 - Truck route identified with driver; and
 - Global Positioning System (GPS) tracking of truck enabled.
- Where possible, the selected transport route(s) will avoid travel through residential areas;
- Contingency measures will be developed and implemented to manage potential risks associated with breakdowns, accidents or other emergency circumstances. This will include monitoring of trucks using GPS and development of actions to respond to breakdowns and accidents and to ensure soil transport is accomplished in accordance with the mitigation measures described above;
- Trucks containing untreated contaminated soil classified as hazardous waste will be inspected monthly at the receiving facility to ensure that:
 - the foam is in place and functioning as intended;
 - the cover is in place and functioning as intended;
 - no odour associated with the untreated contaminated soil is being emitted from the truck; and
- Monthly review of the odour emission control performance and effectiveness of measures described above.

Photographs will be taken regularly to confirm that the above works have been conducted appropriately.

3.7 Air Quality and Odour Monitoring Program

Ambient air monitoring will be conducted for the duration of the remediation works. Ambient air monitoring at the Site and in adjacent areas will be conducted in accordance with Section 8.3 (Air Quality Monitoring Program) of the following report:

- AECOM, 2014. *Air Quality Impact Assessment (AQIA), Remediation and Landforming Works, DA SSD 5897-2013, Barangaroo Block 4, Hickson Rd, Millers Pt, NSW*. 18 February.

The proposed Air Quality Monitoring Program is provided as **Attachment 2** of this letter.

The AQIA (AECOM, 2014) has been prepared to meet the requirements of Section 20.3 of the *VMP/Block 4 RAP* (AECOM, 2013a). Control measures and air quality and odour monitoring requirements specified in **Attachment 2** are consistent with the Lend Lease Air Quality and Odour Management Sub-Plan prepared as required by Condition B14 of the Block 4 DA. As required by Condition B13 of the Block 4 DA, an Air Quality Verification Report will also be prepared based on the final design of the development and including details on the Excavation Enclosure to be used during *Remediation Works*.

The air quality monitoring works will be undertaken to ensure that fugitive emissions and odours generated from the remediation works (including loading of soil for offsite transport/treatment) are within acceptable levels.

4.0 Offsite Treatment Facility

The offsite treatment facility selected will be required to meet the following minimum requirements:

- The facility and its operations must be approved by the NSW EPA and comply with the *Protection of the Environment Operations (Waste) Regulation (2014)*;
- The facility must have (or obtain) an Environment Protection License (EPL) which permits the treatment of Hazardous Waste and must comply with the requirements of the EPL for the duration of the Barangaroo treatment works;
- The facility must obtain an Immobilisation Approval from the NSW EPA as required by the NSW EPA *General Approval of the Immobilisation of Contaminants in Waste (Approval Number 2005/14)* for the materials to be received and treated from Barangaroo;
- Following treatment of Hazardous Waste materials (as required by the Immobilisation Approval, if required) all treated materials must be disposed to NSW EPA licensed landfill facility appropriately licensed to receive the relevant waste type; and
- All materials must be tracked through the treatment and landfill disposal process in accordance with Part 4 of the *Protection of the Environment Operations (Waste) Regulation (2014)*.

5.0 Conclusions

Based on the information provided herein, AECOM concludes that:

- This Addendum provides the information required by Condition B3 of the Block 4 DA (SSD 5987); and
- The proposed remediation strategy for Block 4 described by the *Block 4 Remediation EIS* (JBA, 2013) (i.e. excavation and offsite treatment of contaminated soils):
 - is consistent with the *VMP/Block 4 RAP* (AECOM, 2013a); and
 - complies with the NSW EPA (2014) *Waste Classification Guidelines* and the amended *Protection of the Environment Operations (Waste) Regulation* (2014).

AECOM considers that implementation of the ex-situ remediation strategy (i.e. excavation and offsite treatment of contaminated soils) and the environmental control measures detailed in the *Block 4 PRW - Preliminary Air Quality and Odour Control Plan* (Lend Lease, 2014) are current standard industry best practice for the works being undertaken and will:

- control fugitive emissions and odours:
 - generated from the excavation of highly odorous materials within the EE during excavation; and
 - potentially generated from trucks transporting untreated contaminated soil classified as hazardous waste to the offsite treatment facility.
- ensure that soil treatment works at the offsite treatment facility can be undertaken in a manner which complies with the regulatory requirements for that facility; and
- meet the requirements of the following guidelines and legislation:
 - NSW EPA (2014) *Waste Classification Guidelines*; and
 - *Protection of the Environment Operations (Waste) Regulation* (2014).

This Addendum will be incorporated into the Air Quality and Odour Management Sub-Plan prepared (as required by Condition B3 of the Block 4 DA).

6.0 References

AECOM, 2013a. *Remedial Action Plan, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW*. 24 July.

AECOM, 2013b. *Remediation and Landforming Works Development Application (SSD 5897-2013), Adjustment in Block 4 Basement Area - Barangaroo, Hickson Road, Millers Point, NSW*. 9 August.

AECOM, 2014. *Air Quality Impact Assessment (AQIA), Remediation and Landforming Works, DA SSD 5897-2013, Barangaroo Block 4, Hickson Rd, Millers Pt, NSW*. 18 February.

ENVIRON Australia Pty Ltd, 2013. *Site Audit Report, Remedial Action Plan, Declaration Area and Block 4, Barangaroo. Project Number: AS121111B/AS121111C. Audit Number: GN 439B-3 and GN 447A*. 31 July.

JBA Urban Planning Consultants Pty Ltd, 2013. *'Block 4' Development Remediation Works, Bulk Excavation and Retention Wall System Construction, EPA Remediation Site 21122 'Block 4' (Stage 1B), Barangaroo*. 11 Nov.

JBA Urban Planning Consultants Pty Ltd, 2014. *'Block 5' Remediation Environmental Impact Statement (SSD 6533) Barangaroo Central Remediation of Block 5 - Part of EPA Remediation Site 21122*. 8 September.

JBA Urban Planning Consultants Pty Ltd, 2015. *'Hickson Road' Remediation Works (SSD 6617) Environmental Impact Statement, Hickson Road, Barangaroo Remediation of Hickson Road - Part of EPA Remediation Site 21122*. 18 August.

Lend Lease, 2014. *Block 4 PRW - Preliminary Air Quality and Odour Control Plan*. 13 August – refer to **Attachment 1**.

NSW EPA (2014) *Waste Classification Guidelines*.

Protection of the Environment Operations (Waste) Regulation. 17 October 2014.

Yours faithfully,



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Attachment 1 - Lend Lease (2014) Block 4 PRW - Preliminary Air Quality and Odour Control Plan

Attachment 2 - Air Quality Monitoring Program

Attachment 1 - Lend Lease (2014) *Block 4 PRW - Preliminary Air Quality and Odour Control Plan*



Development Application SSD 5897
Proposed Block 4 Perimeter Retention Wall Construction
Preliminary Air Quality and Odour Control Plan – 13 August 2014

Introduction

This document has been prepared to supplement the Response to Submissions issued by Lend Lease for Development Application SSD 5897. This document has been prepared at the request of the Department of Planning and Environment (DoPE), at a meeting held between DoPE, Lend Lease and NSW EPA on 22 July 2014.

This document provides a preliminary plan of air quality and odour controls proposed during perimeter retention wall (PRW) construction, as part of SSD 5897. Measures in this plan are additional to those in the Air Quality Impact Assessment (AQIA) prepared and revised by AECOM for Block 4.

It is noted that this preliminary plan provides an overview of minimum air quality/odour controls to be implemented during retention wall construction as part of SSD 5897, when working in areas where gasworks tar or other odorous material is present. Prior to commencing works, detailed design of controls will be prepared based on selected contractor methodology, and provided to EPA for review and comment along with an updated Air Quality & Odour Management Plan and Air Quality Monitoring Plan.

Please see attached Block 4 PRW Preliminary Air Quality and Odour Control Plan.

Proposed Works	Perimeter Retention Wall (PRW) construction at Block 4 (Stage 1b)
Purpose of Works	Retaining soil and water to facilitate excavation
Type of Works	PRW type to be determined following procurement and contractor selection, anticipated to comprise either: 1. Secant or contiguous concrete piles; or 2. Diaphragm wall or sheet piles installed through bentonite slurry trench.
Source of Potential Odour/Air Quality Impact	Sub-surface tar – particularly present in historic gasworks structure on part of eastern boundary – that may be encountered and removed during PRW construction.
Preliminary Odour Control Methodology	
Primary Controls	Objective: Minimise the quantity of free tar exposed, to minimise odour generation / air emissions. The following air quality/odour control measures are proposed (to the extent practical), at locations where tar is anticipated:
Use construction method that limits odour generation / air emissions	• Where diaphragm wall or sheet pile method is used, conduct works under a bentonite slurry to minimise exposed excavation faces and free tar, and subsequent potential for odour generation / air quality impacts. • Where piling method is used, limit the extent of open excavation at any one time to a discrete hole (generally up to 1200mm diameter). Drill each hole using a rotary auger and then fill with a concrete slurry. This method will limit the amount of tar exposed at any one time, thereby minimising potential for odour generation / air quality impacts.
Secondary Controls	Objective: Control the impact of potential odours / air emissions generated. The following air quality/odour control measures are proposed (to the extent practical), at locations where tar is anticipated:
Manage odour/air emissions from spoil arisings / stockpiles	• Use a dedicated labour resource to manage odours in work area. • Install vertical barriers around the work area and adequately sealed, to help minimise risk of odour off-site. • Use odour suppressants (e.g. BioSolve) or misting sprays in or around the work area. • Spray odorous spoil / drill arisings with foaming agents (e.g. Rusmar) once brought to the surface. • Cover stockpiles with tarps, non-odorous material or foaming agents, or place into sealed drums. • Where possible, solid covers will be used in preference to suppressant foams and sprays • Dispose of stockpiles off-site as soon as practicable. • Use water spray on excavated or stockpiled material to mitigate particulate emissions. • Cover open excavations overnight. • Collect and treat run-off water, or promptly store in sealed containers.
Manage trucks to minimise fugitive odours/air emissions	• Load material promptly and with care to reduce loading times and spillage. • Use sealed trucks to control potential for spilling material through the site or off-site. • Cover loads prior to leaving loading zones, with odour suppressant foam and automatic tarps. Where possible, solid covers will be used in preference to suppressant foams and sprays. • Immediately clean truck and loading areas upon loading. • Use truck and wheel wash facilities prior to leaving the site.
Undertake monitoring and response	• Undertake detailed air quality / odour monitoring on and off-site to allow works/controls to be modified as required. • Undertake weather monitoring and modify works based on weather conditions, if required.

Attachment 2 - Air Quality Monitoring Program

Air Quality Monitoring Program

Ambient air quality monitoring around the Barangaroo site has been undertaken since October 2011 in accordance with the Air Quality & Odour Management Sub-Plan and EPL for the site. The monitoring has the following objectives:

- Allow a real time assessment of the various activities on the site, which can then be related back to operational changes to reduce offsite impacts; and to
- Allow reactive dust mitigation measures to be implemented based on real time monitoring data.

The monitoring is undertaken generally in accordance with the following guidelines and Australian Standards:

- The EPA's Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2005a);
- AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method;
- AS 3580.9.8-2008 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser;
- AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment; and
- AS 2923-1987 Ambient air - Guide for measurement of horizontal wind for air quality applications.

Details of the relevant monitoring equipment and locations are provided in **Table 1** and **Figure 1**.

Table 1 Ambient Monitoring Agenda

Parameter	Equipment	Frequency	Locations	EPA Criteria	Sampling Method	Timing
TSP	HVAS	24 hours every 6 days	EPL points 5, 8, 13	90 µg/m ³ as an annual ave	AM-15 AS3580.9.3 – 2003	Throughout remediation*
PM ₁₀	TEOM	Continuous	EPL points 5, 8, 13	50 µg/m ³ as a 24 hour ave** 30 µg/m ³ as an annual ave	AM-22 AS3580.9.6 - 2003	Throughout remediation*
Heavy Metals	HVAS	24 hours every 6 days	EPL points 5, 8, 13	***	AM-15 AS3580.9.3 – 2003	Throughout remediation*
PAH (speciated)	HVAS	24 hours every 6 days	EPL points 5, 8, 13	N/A	AM-15 AS3580.9.3 – 2003	Throughout remediation*
VOC (speciated)	Summa	As needed	As needed	***	USEPA TO-15	Throughout remediation*
VOCs	PID	Daily	EPL points 5, 8, 13	N/A	N/A	Throughout remediation*
Odour	Field Olfactometer	Morning, followed by afternoon if odour exceeds trigger level	Odour locations 2 to 5	N/A	N/A	Throughout remediation*
Met station	-	Continuous	EPL point 5	Site complies with <i>Approved Methods</i>	AM-1 to 4 USEPA (2000) EPA 454/R-99-005	Throughout remediation*

* Or as agreed with the EPA

** 24 hour average of a calendar day defined as midnight to midnight.

*** Too many criteria to list; criteria based on DEC (2005a)

Figure 1 Approximate Barangaroo South Monitoring Locations



The monitoring plan would be expected to address emissions of NO_x, particulates, VOCs and PAHs, which would be tested via stack emission testing undertaken in accordance with the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2005b). Suggested concentration limits and sampling frequencies are provided in **Table 2**; the final nature of the sampling program would be determined by the EPA and specified in the EPL.

Table 2 Suggested Monitoring Frequency and Concentration Limits for OCSs

Pollutant	100 th Percentile Concentration Limit	Monitoring Frequency
NO _x	N/A	Post-commissioning stack testing followed by stack test sampling every alternate month
Total particulates	20 mg/Nm ³	
VOCs as n-propane equivalent	20 mg/Nm ³	
PAHs	N/A	
VOCs as n-propane equivalent	20 mg/Nm ³	Post-commissioning CEMS between OCS filters to detect and manage any carbon bed breakthrough