

APPENDIX 6

Site Auditor's letter

13 August 2010

Our Ref: AS121198

Barangaroo Delivery Authority
Attn: Sonja Shand
Level 3, Foreshore House
66 Harrington Street
The Rocks NSW 2000

Dear Sonja

Re: Contamination Audit, Headland Park, Barangaroo**1 Introduction**

As a NSW-EPA accredited Contaminated Sites Auditor, I am conducting a contamination audit in relation to the northern portion of the site known as "Barangaroo", at Millers Point, NSW. Barangaroo is a large site to be developed in stages and for a variety of uses, with different portions subject to separate audits. The portion of Barangaroo that is the subject of this audit is Headland Park, which includes Northern Cove. The site location is shown on Attachment 1.

I have prepared this letter to provide my comments on the progress of the audit to date and the future audit activities. It is understood that this letter is to be part of the submission of the Headland Park Main Works Project Application. I previously prepared "Site Audit Report Overarching Remedial Action Plan, Barangaroo" and Site Audit Statement GN439A dated 2 June 2010 (ENVIRON 2010). The Overarching RAP identifies strategies and remedial options for remediation of the whole Barangaroo site. Contamination assessment and remediation of Headland Park must be conducted in accordance with the Overarching RAP.

This review letter is based on a review of the documents listed below and observations made during a site visit on 18 March 2010, as well as discussions with BDA.

- 'Report to Sydney Harbour Foreshore Authority on Geotechnical Investigation for Proposed Redevelopment of Wharves 3-8 at Hickson Road, Darling Harbour East, NSW' dated 21 August 2006, by Jeffery and Katauskas Pty Ltd (J&K)
- Report 'Land at Millers Point, Ownership and Usage' dated 1 June 2007, by Rosemary Broomham
- Final Report 'Environmental Site Assessment, East Darling Harbour, Sydney, NSW' dated 21 June 2007, by Environmental Resources Management Australia Pty Ltd (ERM)
- Report 'Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW' dated July 2008, by ERM
- Report 'Draft Stage 2 Remedial Action Plan for Barangaroo, Hickson Road, Sydney' dated September 2008, by ERM
- 'Overarching Remedial Action Plan for The Barangaroo Project Site, Sydney' dated 1 June 2010 by ERM (the Overarching RAP)

- Draft 'Remedial Action Plan, Barangaroo Headland Park and Northern Cove Hickson Road, Sydney, NSW' dated August 2010 by JBS Environmental (JBS 2010a), and earlier draft dated May 2010.
- Draft 'Human Health and Ecological Risk Assessment Barangaroo Headland Park and Northern Cove Hickson Road, Sydney, NSW' dated August 2010 by JBS (JBS 2010b).

The last two documents have only recently been received and review is very preliminary, especially of the risk assessment.

2 Site Details

2.1 Location

The site details are as follows:

Street address:	Hickson Road , Millers Point, NSW 2000
Identifier:	Lot 1, part Lot 5 and part Lot 6 in DP 876514
Local Government:	Sydney
Owner:	Barangaroo Delivery Authority
Site Area:	approximately 8 ha

The current zoning of the site was identified by JBS as "Zone B4 Mixed Use and RE1 Public Recreation".

2.2 Adjacent Uses

The site is located within an area of mixed uses as follows:

- North: Sydney Harbour.
- South: open space concrete/hardstand.
- East: Commercial and residential properties including across Hickson Road, a sandstone cut face marks part of the boundary.
- West: Darling Harbour.

2.3 Site Condition

Based on information presented in the various reports and observations made during a site visit, the current site features are:

- The site is flat, at an elevation a few metres above Darling Harbour water level.
- The site is covered by hard surfacing including concrete and bitumen with only a few structures and large light towers. Former large warehouses that were previously on the site (Attachment 2) have been demolished.
- There are security gate houses on the eastern side of the site on the Towns Place (No 3 Gatehouse) and Hickson Road (No 4 Gatehouse) entries.
- There is a sewer pumping station in the north of the site.

- A temporary cruise passenger terminal has been constructed on the southern part of the site.

2.4 Proposed Development

The Draft RAP (JBS 2010a) briefly describes elements of the Headland Park design, which it notes has not been finalised yet. It includes open space areas to be created partly with imported material, a carpark and cultural facility to be created within a void in the fill, and a submerged Northern Cove area.

3 Environmental Investigation Results

The following brief summary is based on review of the ERM investigations as listed in Section 1.

3.1 Site History and Contaminants of Concern

The site has been used for wharf/ port related activities since the 1800s. Original finger wharves were removed and the site was largely filled between 1951 and 1972.

The primary potential for contamination at the site is associated with uncontrolled fill used in various stages of site, including fill from the former gasworks that was located south of the site within the Barangaroo project site. Relevant contaminants of concern are:

- **General Fill:** could include metals, TPH, BTEX, PAHs, PCBs, OCPs, VOCs, SVOCs, asbestos
- **Fill from Gasworks Wastes:** could include metals, TPH, BTEX, PAHs, phenols, sulphate, cyanide, ammonia.

There is also potential for Acid Sulphate Soils (ASS) and hazardous building materials such as lead, PCBs, asbestos to be present.

3.2 Soil Conditions

An overview of soil contaminant conditions over the Barangaroo site was presented in ENVIRON 2010. Soil conditions in the area of Headland Park including Northern Cove have been assessed at approximately 70 locations by ERM.

Subsurface conditions are similar at Headland Park to the rest of Barangaroo, with fill increasing in thickness towards the harbour. Headland Park features shallower fill in the east near the sandstone face, and appears to have less natural sediment between fill and sandstone bedrock than further south in Barangaroo.

In considering the soil analytical data relevant to Headland Park, the Auditor notes:

- Most detections of contaminants were recorded at the northern end of the site near former Warehouse 3.
- The most common contaminants are PAHs including benzo(a)pyrene. These are contaminants associated with gasworks and appear to have been placed with fill.

- While there is a high proportion of samples with elevated PAH concentrations near former Warehouse 3, the concentrations were generally much lower than at the former gasworks site.
- Most of the high concentrations of TPH recorded were associated with PAHs. There appears to be few detections of volatiles (TPH C6-C9, BTEX) in the Headland Park area.
- Lead is the main metal contaminant, but there were relatively few high concentrations of lead recorded. Most were with or near high PAH concentrations.
- While there were a few elevated concentrations of other metals, mainly copper, mercury and zinc, there do not appear to be any indications of major metal contamination in soil (although some dissolved metal concentrations in groundwater exceed groundwater trigger values).
- While most high concentrations recorded were from samples from the upper 5m, there were more samples analysed from the upper 5m, and sufficient high concentrations were detected lower in the fill to indicate that contamination is associated with the full depth of fill.

In the Auditor's opinion, soil contamination at the site has been sufficiently characterised for the purpose of preparing a RAP. The Draft RAP (JBS 2010a) notes that data gaps have been identified and additional investigations may be required. Spatial coverage is low in the area of the substation, and also to the north east of former Warehouse 4, and there is limited analysis at depth in materials that are proposed to remain on site.

3.3 Groundwater

Groundwater samples were collected by ERM from 10 wells in up to three rounds of sampling in 2006, 2007 and 2008. Groundwater was analysed for the contaminants of concern, though not all samples were analysed for all analytes.

Groundwater at the site is shallow, generally within 3mBGL, and is subject to tidal fluctuations. It is noted that wells in Headland Park are around the north and west site boundaries near the harbour, and analytical results may reflect dilution by tidal flushing.

In review of the results, the Auditor notes:

- Free tar, PAHs and TPH were recorded in many wells in the former gasworks area but much lower concentrations were recorded in Headland park
- Dissolved metals especially zinc and copper exceeding ANZECC trigger values were recorded in many wells across the site. Concentrations are relatively low.
- Higher molecular weight PAHs including benzo(a)pyrene were recorded in three wells, widely spaced and with other wells between them, in the Headland Park area. Detections were in the 2007 sampling round only.
- Ammonia was also detected in association with PAHs in the well in the north east of the site (MW25). Ammonia was detected on both sampling rounds at approximately 4 mg/L.

- The lower molecular weight PAH Naphthalene was detected in two other wells, both in the former Warehouse 4 area. These detections were also in the 2007 sampling round only.

The Draft RAP (JBS 2010a) notes that groundwater investigations are required in the vicinity of the proposed carpark. The Auditor considers that further groundwater investigations are also required near potential contaminant source areas to inform the amount of source removal required.

4 Draft Remediation Action Plan

4.1 Remediation Planning Process

Barangaroo is a large site to be developed in stages and for a variety of uses. Headland Park is the northern-most portion of Barangaroo. Review of the Overarching RAP has been conducted (ENVIRON 2010).

The process for remediation planning which has been adopted at the site comprises:

- 1 Environmental investigations, conducted in 2006-2008 as referenced in Section 1.
- 2 Definition of remediation goals through preparation of a Human Health and Ecological Risk Assessment (HHERA). A draft has been prepared (JBS 2010b) and is in the early stage of review.
- 3 Preparation of a RAP. A draft RAP has been prepared (JBS 2010a) and is in the process of review. Preliminary comments are made in Section 4.2.
- 4 Finalisation of the HHERA.
- 5 A data gap assessment will need to be conducted, probably followed by additional soil and groundwater investigations.
- 6 Finalisation of RAP.
- 7 Detailed design of Headland Park and associated features.
- 8 Preparation of a Remedial Works Plan (RWP) including technical details on implementation of the RAP.

It is anticipated that I will prepare a Part B Site Audit Statement regarding the appropriateness of the plan of remediation at completion of all eight tasks above.

Following remediation, I would then prepare a Part A Site Audit Statement regarding the suitability of the site for its intended use.

4.2 Remediation Strategy and Methodology

The Draft RAP (JBS 2010a) is currently in the process of review. The RAP documents procedures to be followed to remove contamination risks to future site users and the surrounding environment. The Draft RAP includes:

- Criteria to be applied to current in-site soils, derived from risk assessment, to determine which soils can be left in place and not cause future adverse impact to groundwater leaving the site. A list of samples which exceed the derived criteria is included, as is a figure showing the “Area...with Levels of Soil Constituents Exceeding Protection of Surface Water EIL”. This figure shows five separate areas. Depths are not shown and full extent of excavation would require further data assessment.
- Excavated soil can be classified for reuse on site or disposed off-site.
- Site Acceptance Criteria to be applied to soil to be retained or accepted onto Headland Park. Criteria are listed for nine different zones in relation to their final proximity to the surface, carpark, cultural facility etc, and Northern Cove. It is understood that soil will be classified as being suitable for use in one or more zones prior to being imported to Headland Park.
- Proposal to capture/treat leachate seepage water from the imported material, so that contamination cannot migrate via groundwater.
- Establishment of a water treatment plant for water collected during construction dewatering, and sampling and analysis from the outlet prior to discharge or reuse.
- Remedial options assessment, which concludes that consolidation and isolation of soil by on-site containment within a properly designed barrier and ongoing management is the preferred option. I consider that the option of on-site treatment to lessen the requirement for ongoing management should be considered further.
- An outline of items to be included in the RWP.
- A validation plan.
- Ongoing monitoring and management is envisaged, with preparation of a long term environmental management plan after completion of the validation report.

The proposed remediation strategies are generally consistent with the Overarching RAP.

5 Conclusions and Recommendations

The proposed remediation and validation approach is considered generally appropriate. The proposed remediation strategies in the Draft RAP are generally consistent with the Overarching RAP.

Completion of the HHERA, a data gap assessment and probably further investigation, and further design of the proposed Headland Park and associated features are required before preparation of a RWP.

I recommend that the remaining stages of remediation planning be completed. I will prepare a Part B Site Audit Statement upon completion of the tasks listed in Section 4.1.

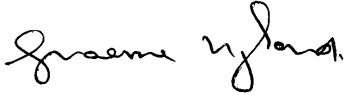
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Consistent with Department of Environment, Climate Change and Water (DECCW and formerly NSW EPA) requirement for staged “signoff” of sites that are the subject of progressive assessment, remediation and validation, I advise that:

DRAFT

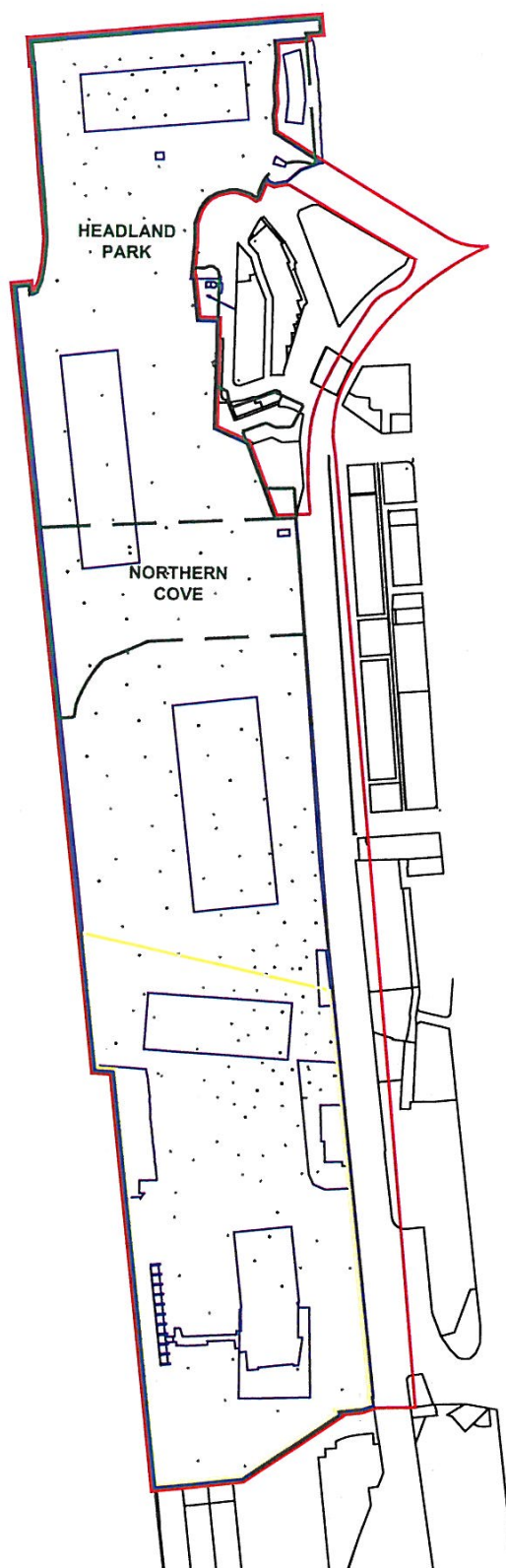
- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the remediation and validation I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

Yours faithfully
ENVIRON Australia Pty Ltd



Graeme Nyland
Accredited Auditor 9808

Enc:
Attachment 1: Site Location
Attachment 2: Former Site Layout



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				Legend ◆ Sample Points — The Headland Park Site — Northern Cove — The Barangaroo Project Site — The Barangaroo Site — Stage 1 Development	 FIGURE 2 Site Boundaries			
					Client : Barangaroo			
					Project Name : Barangaroo Delivery Authority			
0	Original Issue	KMJ	17.6.10		File Name : 41181-002	Scale : NTS	Project Number : 41181	A4
Rev	Description	By	Date					

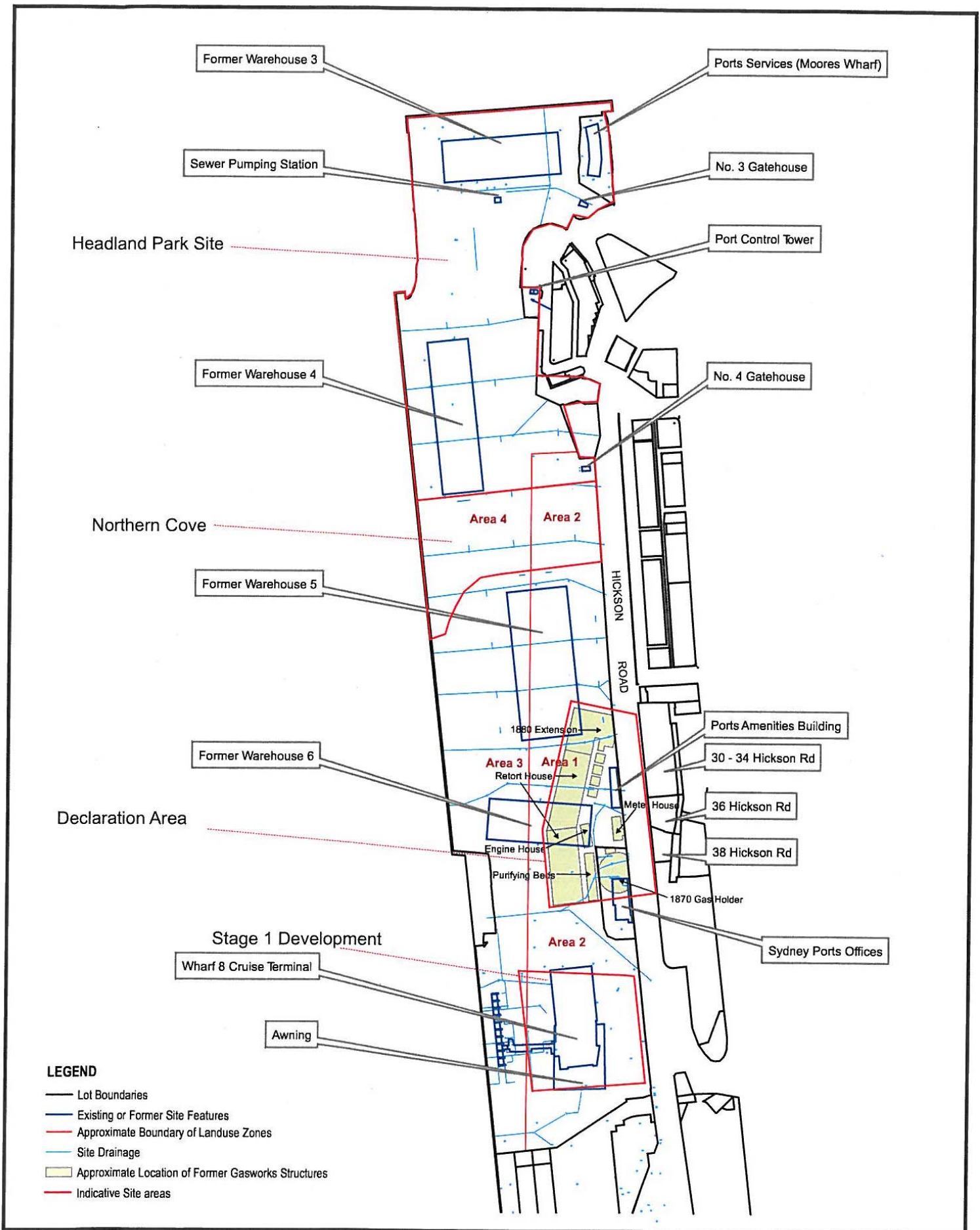


Figure 2 Site Layout