



# Remediation Action Plan

**Wentworth Point Ferry  
Wharf  
1 Burroway Road  
Sydney Olympic Park  
NSW 2127**

**Lot 1 DP859608**

**Prepared for:**

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R00	28 <sup>th</sup> April 2014	<b>David Lane</b> Director	

## Executive Summary

DLA Environmental (DLA) was commissioned by Mr Matthew Bentley of Iconic Management Pty Ltd, to prepare a Remediation Action Plan (RAP). The purpose of the RAP is to make the property identified as Wentworth Point Ferry Wharf, 1 Burroway Road, Sydney Olympic Park, NSW, 2127 (the Site) suitable for the proposed residential land use.

The Site is located approximately thirteen (13) kilometres west of the Sydney CBD, at 1 Burroway Road, Sydney Olympic Park, NSW, 2127 (Lot 1 DP859608). The Site comprises of open space parkland, Sydney Olympic Park Ferry Terminal and associated outdoor car parking. The Site is a deferred matter under Auburn Local Environment Plan (ALEP) 2010. The zoning and land use provisions of Sydney Regional Plan No.24 – Homebush Bay Area apply to this land.

The Site is planned for redevelopment, as part of the Wentworth Point Master Plan involving residential, retail, maritime, public transport infrastructure and open space developments. The proposed development is for residential use with minimal opportunity for soil access. Land use to the east, south and west includes warehousing, industrial yards and natural reserve. To the north is Parramatta River.

This RAP has been prepared to address minor localised contamination identified during the Environmental Site Assessment and Waste Characterisation of the Site undertaken by DLA IN November 2012, May and August 2013. Elevated concentrations of Benzo(a)Pyrene (B(a)P), Polycyclic Aromatic Hydrocarbons (PAH's) and Total Recoverable Hydrocarbons (TRH's), which exceeded the NEPM 1999 Health Investigation Levels (HIL). Underlying natural clays on the Site were classified as Acid Sulphate and required a Management Plan to be implemented during excavation.

Based on the NSW EPA requirements, the primary objectives of the remediation program at the Site are:

- To negate any appreciable risk of human exposure to contaminated soils or soil vapour and therefore prevent the site from requiring management under the Contaminated Land Management Act 1997 or the NSW EPA;
- To halt the possible migration of contaminants from impacted soil;
- The remediation strategy is technically feasible;

- The proposed remediation work is environmentally justifiable;
- To have regard to the principles of ecologically sustainable development in line with Section 9 of the CLM Act 1997;
- To minimise waste generation under the Waste Avoidance and Resource Recovery Act 2001; and,
- To provide an end product desirable for the preferred intended land use through the removal of sources of contamination, visually inspected, remediated and validated.

The Site Acceptance Criteria (SAC) for the Site is based on the approach outlined in NSW DECC Contaminated Sites: Guidelines for the NSW Site Auditor Scheme - 2006 2nd Edition (NEHF D) and Schedule B1 Guidelines on the Investigation Levels for Soil and Groundwater from the National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM) 2013 – *Residential B*.

The Soil Landscape Map of Sydney (Soil Landscape Series Sheet 9030, Scale 1:100,000, 1989), prepared by the Department of Land and Water Conservation of NSW, indicates that the Site to be in an area of disturbed terrain and underlain by Quaternary fluvial sediments overlying Hawkesbury sandstone. The fluvial sediments comprise of silty to peaty quartz sand, silt and clay, with ferruginous and humic cementation and shell layers.

The 'disturbed terrain' classification is adopted in large scale filled areas which often occur during reclamation of low lying swamps for urban development, in areas which may have been mined or dredged or have undergone heavy disturbance through general urban development or the construction of dams and levees. Disturbed terrain fill can include dredged estuarine sand and mud, demolition rubble, ash, industrial and household waste. The majority of landforms within these areas are not expected to encounter acid sulphate soils materials; however localised occurrences may occur at depth. Disturbance of these materials will result in a risk that will vary with elevation and depth of disturbance.

A search of the NSW OEH groundwater works database indicated there are eight (8) registered bores within 500m of the Site. The bores are located to the south of the Site and are registered solely for monitoring purposes. The recorded standard water depths were between 0.7 and 1.4m below ground level (BGL).

It is expected that potential human receptors are limited to future occupants of the building and construction workers. Environmental receptors include Homebush Bay to the west of the site and the Parramatta River to the north.

As a result of the findings from the Assessment processes, the area of remediation is limited to fill material within five (5) 'hotspot' locations that contains elevated concentrations of PAH compounds and TRH. The Acid Sulphate Soils should also be handled in accordance with a Management Plan. It is expected that the majority of the contamination will be removed during the basement excavations and disposed of under waste classifications, therefore validation sampling should be undertaken at the level of contamination and following excavation works to confirm the extent of contamination has been recognised.

The site remediation strategy selected must be the most cost-effective solution, which does not bring about unacceptable long-term liabilities, and which does not impose unreasonable constraints on future site developments or present operations. Based on the analysis undertaken, it is considered that Council requirements are the constraining factor that limits the selection of a remediation method; therefore Excavate and Dispose option is the optimal strategy for remediation of the Site.

The main remedial activities to be undertaken during these works will include the removal of in-situ fill and VENM from the basement excavation. Any unexpected finds of contamination not identified by the previous assessments will be documented. The soils will be excavated with the excavation site being validated upon removal.

All soils being excavated and removed from Site will require classification for off-site disposal in accordance with the 2009 NSW DECCW Waste Classification Guidelines and any relevant exemption. Authorisation for disposal will be obtained prior to any material leaving the site. Any additional material to be disposed of will require classification prior to disposal. The disposal Contractor will provide tip dockets to the Project Manager following disposal.

At the completion of the remedial works a Validation Report documenting the works as completed will be prepared. Validation criteria should reflect the future land use of the site and be in accordance with the NEPM Residential B HILs. Soil validation sampling will be carried out in accordance with the EPA NSW Contaminated Sites: Sampling Design Guidelines (1995).

Following visual inspection of the basement area, validation soil samples are to be analysed for PAH and TRH compounds. A systematic sampling methodology will be utilised to validate the residual soils on the walls of the excavation at the level of the identified contamination. Remediation of soils will be deemed successful on compliance with the site acceptance criteria; that concentrations comply with the relevant criteria for Residential B land use scenario, as defined by Schedule B1 within the NEPM amendment measure 2013.

If there are events or discoveries made at the site that would prevent the proposed remediation works complying with the validation criteria, or if the selected remedial strategy is not able to precede then the following actions can be taken:

### ***Unsuitable Soils Identified Outside the Excavation Area***

If the excavation for the basement is complete and the walls fail validation, the following may be considered:

- Continue controlled excavation until validation is achieved. DLA will undertake a visual inspection of the area and carry out soil sampling on completion of the excavation and following the removal of asbestos and PAH contaminated soils.

A major component of the remedial works shall involve the installation and maintenance of an Environmental Management Plan (EMP). The EMP will provide details of the environmental protection and pollution control measures to be implemented during the operational phase of the remedial works.

The Site can be made suitable for the intended land-use through remedial action as part of the redevelopment works in accordance with State Environmental Planning Policy No.55 Managing Land Contamination: Planning Guidelines SEPP 55.

In conclusion the RAP:

- Has been developed in a manner consistent with current industry practice;
- Has selected a preferred remediation strategy based on the site-specific issues and currently available technologies that will allow the Site to be made suitable for the intended land use;
- Has presented an information and consultation program to ensure the stakeholders are informed of the works as they proceed; and,

- Has outlined the means of validation of the completed works.

## TABLE OF CONTENTS

<b>1.0</b>	<b>Introduction.....</b>	<b>1</b>
1.1	General.....	1
1.2	Objectives of the Remedial Action Plan.....	1
1.3	Remediation Goals.....	2
<b>2.0</b>	<b>Site Details.....</b>	<b>3</b>
2.1	Site Identification.....	3
2.2	Geology and Hydrogeology.....	3
	2.2.1 <i>Potential receptors</i> .....	4
2.3	Boundaries and Surrounding Land Use.....	4
2.4	Proposed Land Use.....	4
2.5	Potential for Historical Contamination.....	4
<b>3.0</b>	<b>Contamination Status.....</b>	<b>5</b>
3.1	Previous Investigations.....	5
3.2	Areas Requiring Remediation.....	12
<b>4.0</b>	<b>Remediation Options.....</b>	<b>13</b>
4.1	Overview.....	13
4.2	Selecting Remediation Technologies and Methods.....	14
4.3	Applicable Remediation Technologies/Methods.....	15
	4.3.1 <i>Option 1 – Excavate and Dispose</i> .....	15
	4.3.2 <i>Option 2 – Cap and Contain</i> .....	16
<b>5.0</b>	<b>Selection of Preferred Remedial Strategy.....</b>	<b>18</b>
5.1	Technical Appraisal.....	18
	5.1.1 <i>Option 1 – Excavate and Dispose</i> .....	19
	5.1.2 <i>Option 2 – Cap and Contain</i> .....	20
5.2	Economic Appraisal.....	20
	5.2.1 <i>Strategy A – Excavate and Dispose</i> .....	21
	5.2.2 <i>Strategy B – Cap and Contain</i> .....	21
5.3	Preferred Strategy.....	21
<b>6.0</b>	<b>Implementation of Selected Remedial Strategy.....</b>	<b>23</b>
6.1	Introduction.....	23
6.2	Stakeholder Consultation.....	23
6.3	Remediation Work.....	24
6.4	Waste Classification and Disposal.....	24
6.5	Validation.....	24
6.6	Remediation Contingency.....	25
<b>7.0</b>	<b>Environmental Management Plan.....</b>	<b>26</b>
7.1	Introduction.....	26
7.2	Erosion Sedimentation Control Plan.....	26
7.3	Noise Control Plan.....	27
7.4	Dust Control Plan.....	28

7.5	Odour Control Plan.....	28
7.6	Health and Safety.....	29
7.6.1	<i>Work Health and Safety</i> .....	29
7.6.2	<i>Personal Hygiene and Decontamination</i> .....	30
7.6.3	<i>PM10 Dust</i> .....	31
7.6.4	<i>Community Health and Safety</i> .....	31
7.7	Traffic Control Plan.....	32
7.8	Hours of Operation.....	33
7.9	Emergency and Out of Hours Contact Numbers.....	33
<b>8.0</b>	<b>Remediation Works Management .....</b>	<b>34</b>
8.1	Regulatory Approvals/Licences.....	34
8.2	Environmental Protection and Pollution Control.....	34
8.2.1	<i>General</i> .....	34
8.2.2	<i>Buffer Zone</i> .....	35
8.3	Community Relations Plan.....	35
8.3.1	<i>Communications Plan</i> .....	35
8.3.2	<i>Complaint Response Measures</i> .....	36
8.4	Staged Progress Reporting.....	37
<b>9.0</b>	<b>Conclusion .....</b>	<b>38</b>
<b>10.0</b>	<b>References.....</b>	<b>39</b>

**FIGURES**

**Figure 1** Site Location

## 1.0 INTRODUCTION

### 1.1 General

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This RAP has been prepared using experience, knowledge and current industry practice in remediation of similar sites.

### 1.2 Objectives of the Remedial Action Plan

The NSW EPA indicates that a Remedial Action Plan should:

- Set remediation goals that ensure the remediated site will be suitable for the proposed use and will pose no unacceptable risk to the human health or the environment;
- Document the procedures and plans to be implemented to reduce the risk of significant harm to acceptable levels;
- Establish the environmental safeguards required in completing the remediation in an environmentally acceptable manner; and,
- Identify necessary approvals and licences required by regulatory authorities.

This report provides:

- A description of the site, and the surrounding environment, including a summary of the site geology and hydrogeology;

- A summary of the contamination status;
- A review of the currently available remediation/management options which could achieve the remediation goals, as well as the limitations of each method and comparison of the options;
- Details of the preferred remediation strategy, and an outline of the methodology for the implementation of the selected strategy;
- An outline of regulatory approvals and licenses which may be required to adopt the preferred remedial strategy; and,
- Conclusions.

### 1.3 Remediation Goals

Based on the NSW EPA requirements, the primary objectives of the remediation program at the Site are:

- To negate any appreciable risk of human exposure to contaminated soils or soil vapour and therefore prevent the site from requiring management under the Contaminated Land Management Act 1997 or the NSW EPA;
- To halt the possible migration of contaminants from impacted soil;
- The remediation strategy is technically feasible;
- The proposed remediation work is environmentally justifiable;
- To have regard to the principles of ecologically sustainable development in line with Section 9 of the CLM Act 1997;
- To minimise waste generation under the Waste Avoidance and Resource Recovery Act 2001; and,
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## 2.0 SITE DETAILS

### 2.1 Site Identification

The Site is located approximately thirteen (13) kilometres west of the Sydney CBD, at 1 Burroway Road, Sydney Olympic Park, NSW, 2127 (Lot 1 DP859608). The Site comprises of open space parkland, Sydney Olympic Park Ferry Terminal and associated outdoor car parking. The Site is a deferred matter under Auburn Local Environment Plan (ALEP) 2010. The zoning and land use provisions of Sydney Regional Plan No.24 – Homebush Bay Area apply to this land.

Refer **Figure 1** – Site Location

The Site is planned for redevelopment, as part of the Wentworth Point Master Plan involving residential, retail, maritime, public transport infrastructure and open space developments. The proposed development is for residential use with minimal opportunity for soil access.

### 2.2 Geology and Hydrogeology

The Soil Landscape Map of Sydney (Soil Landscape Series Sheet 9030, Scale 1:100,000, 1989), prepared by the Department of Land and Water Conservation of NSW, indicates that the Site to be in an area of disturbed terrain and underlain by Quaternary fluvial sediments overlying Hawkesbury sandstone. The fluvial sediments comprise of silty to peaty quartz sand, silt and clay, with ferruginous and humic cementation and shell layers.

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A search of the NSW OEH groundwater works database indicated there are eight (8) registered bores within 500m of the Site. The bores are located to the south of the Site

and are registered solely for monitoring purposes. The recorded standard water depths were between 0.7 and 1.4m below ground level (BGL).

### **2.2.1 Potential receptors**

It is expected that potential human receptors are limited to future occupants of the building and construction workers. Environmental receptors include Homebush Bay to the west of the site and the Parramatta River to the north.

## **2.3 Boundaries and Surrounding Land Use**

Land use to the east, south and west includes warehousing, industrial yards and natural reserve. To the north is Parramatta River.

## **2.4 Proposed Land Use**

The development at the Site is part of the Wentworth Point Master Plan involving residential, retail, maritime, public transport infrastructure and open space developments.

## **2.5 Potential for Historical Contamination**

The Site is reclaimed land therefore contamination may only be associated with the fill materials. However previous industrial land use including the production of highly toxic chemicals within the Homebush Bay suburb could pose a potential historical contamination source.

A search was conducted of all records pertaining to section 58 of the Contaminated Land Management Act 1997 and revealed that the Site is not encumbered by any notices from the NSW OEH with regard to contaminated land. Multiple sites are listed within the vicinity of the Site in the suburbs of Rhodes, Homebush Bay and Concord

The industrial premises bordering the Site could potentially be a source of contamination able to migrate onto the Site. **Activities in proximity to the Site include a previous recycling facility and**

## 3.0 CONTAMINATION STATUS

### 3.1 Previous Investigations

The following investigations have been documented for the Wentworth point Ferry Wharf Site:

- Environmental Site Assessment and Waste Characterisation\_R03, DLA 2014
- Material Suitability: Wentworth Point Ferry Wharf, August 2013.

Forty four (44) soil samples from the initial investigation, with an additional total of thirty eight (38) soil samples from the secondary Site investigation were submitted to Envirolab Services at Chatswood for a range of laboratory analyses. A further five (5) soil samples were collected in August 2013. The sample locations were selected using both a systematic and judgemental strategy to both adequately cover the Site and specifically target areas

#### ***Aromatic Hydrocarbons (BTEX)***

##### ***Primary Investigation – 15<sup>th</sup> November, 2012.***

Forty three (43) samples obtained during the primary Site investigation were analysed for Monocyclic Aromatic Hydrocarbons (BTEX fractions), associated with petrol contamination. BTEX was not detected above the Laboratory LOR (Limit of Reporting) in any sample.

##### ***Secondary Investigation – 23<sup>rd</sup> May 2013.***

Twenty eight (28) soil samples underwent laboratory analysis for BTEX detection. No samples recorded concentrations of BTEX compounds above the LOR and hence, were below the NEPM and more sensitive ENM guidelines.

##### ***Third Investigation – 27<sup>th</sup> August 2013***

Five (5) soil samples underwent laboratory analysis for BTEX detection. No samples recorded concentrations of BTEX compounds above the LOR and hence, were below the NEPM and more sensitive ENM guidelines.

**Total Recoverable Hydrocarbons (TRH)**

**Primary Investigation – 15<sup>th</sup> November, 2012.**

Forty three (43) samples were analysed for volatile and semi-volatile TRH compounds. Concentrations of C<sub>6</sub>-C<sub>9</sub> volatile hydrocarbons were not detected above the laboratory LOR. Semi-volatile TRH compounds were detected above the LOR in eight (8) samples, however, no samples exceeded the Site criteria (EPA, 1994).

Refer to **Table 6a** below.

**Table 6a – TRH Detections (mg/kg)**

Sample ID	C <sub>6</sub> -C <sub>9</sub>	C <sub>10</sub> -C <sub>14</sub>	C <sub>15</sub> -C <sub>28</sub>	C <sub>29</sub> -C <sub>36</sub>	C <sub>10</sub> -C <sub>36</sub>
WP1 (1.0)	<25	<50	110	240	350
WP2 (2.0)	<25	<50	560	250	810
WP3 (3.0)	<25	<50	130	<100	130
WP5 (3.0)	<25	<50	140	<100	140
WP6 (2.0)	<25	<50	140	<100	140
WP6 (3.0)	<25	<50	110	<100	110
WP10 (1.0)	<25	<50	150	<100	150
WP10 (2.0)	<25	<50	110	<100	110
<b>SAC Criteria (mg/Kg)</b>	<b>65</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>1000</b>

**Secondary Investigation – 23<sup>rd</sup> May 2013.**

Twenty eight (28) samples were submitted to Envirolab for TRH chemical evaluation. Comparable to the primary investigation, no concentrations of C<sub>6</sub>-C<sub>9</sub> family of hydrocarbons registered levels above the laboratory LOR. TRH compounds of the semi-volatile chains were identified in seven (7) of the analytes. Sample BH5\_1.5 demonstrated a C<sub>10</sub>-C<sub>36</sub> concentration of 1755mg/kg, exceeding the NEPM criteria of 1000mg/kg. All other samples complied with the NEPM assessment criteria.

Refer to **Table 6b** below.

**Table 6b – TRH Detections (mg/kg)**

Sample ID	C <sub>6</sub> -C <sub>9</sub>	C <sub>10</sub> -C <sub>14</sub>	C <sub>15</sub> -C <sub>28</sub>	C <sub>29</sub> -C <sub>36</sub>	C <sub>10</sub> -C <sub>36</sub>
BH1_0.5	<25	<50	100	190	315
BH2_3	<25	<50	390	240	655
BH2_4	<25	<50	130	<100	205
BH4_0.5	<25	<50	<100	130	205
BH4_1.5	<25	<50	150	130	305
BH5_0.5	<25	<50	<100	200	275
BH5_1.5	<25	<50	1200	530	<b>1755</b>
<b>SAC Criteria (mg/Kg)</b>	<b>65</b>	--	--	--	<b>1000</b>

**Third Investigation – 27<sup>th</sup> August 2013**

Five (5) samples were submitted to Envirolab for TRH chemical evaluation. Comparable to the primary investigation, no concentrations of C<sub>6</sub>-C<sub>9</sub> family of hydrocarbons registered levels above the laboratory LOR. No concentrations of C<sub>10</sub>-C<sub>36</sub> family of hydrocarbons registered levels above the LOR. All samples complied with the NEPM assessment criteria.

**Polycyclic Aromatic Hydrocarbons (PAH)**

**Primary Investigation – 15<sup>th</sup> November, 2012.**

Forty three (43) soil samples were analysed for B(a)P and total PAH compounds within the natural and fill soil profiles. Concentrations of BaP and Total PAH were detected in forty one (41) samples. Four (4) samples exceeded the B(a)P HIL, namely:

- WP2 at a depth of 2.0m;
- WP5 at a depth of 3.0m;
- WP6 at a depth of 2m, and;
- WP10 at a depth of 2m.

One (1) sample, WP2 at a depth of 2.0m, exceeded the total PAH HIL.

Refer to **Table 6c** below.

**Table 6c – PAH's Results (mg/kg)**

Sample ID	B(a)P	PAH
HIL (mg/Kg)	4	80
95% UCL	2.2	22.3
Max.	12	150.9
No. of Exceedences	4	1
Std Dev.	2.2	25.3

**Secondary Investigation – 23<sup>rd</sup> May 2013.**

Twenty eight (28) soil samples were analysed for B(a)P and total PAH compounds from the ten (10) newly implemented boreholes. Concentrations of B(a)P and PAH were recognised across all samples, with NEPM exceedances for B(a)P concentration present in four (4) soil samples. Furthermore, two (2) samples – BH2\_3 and BH5\_1.5 – were shown to contain exceeding levels of total PAH compared to the NEPM criteria of 80mg/kg.

Refer to **Table 6d** below.

**Table 6d – PAH's Results (mg/kg)**

Sample ID	B(a)P	PAH
HIL (mg/Kg)	4	80
95% UCL	3.957	41.98
Max.	22	274.1
No. of Exceedences	4	2
Std Dev.	4.499	48.57

**Third Investigation – 27<sup>th</sup> August 2013**

Five (5) samples were analysed for B(a)P and total PAH compounds from the five (5) newly implemented boreholes. No concentrations of B(a)P and PAH were detected indicating compliance with the NEPM criteria of 80mg/kg.

**Heavy Metals**

**Primary Investigation – 15<sup>th</sup> November, 2012.**

Forty three (43) soil samples were analysed for heavy metal within the natural and fill soil materials. No sample exceeded the respective NEPM criteria for any heavy metals.

Refer to **Table 6e** below.

**Table 6e – Heavy Metals (mg/kg)**

Sample ID	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
<b>HIL (mg/Kg)</b>	<b>400</b>	<b>80</b>	<b>400</b>	<b>4000</b>	<b>1200</b>	<b>60</b>	<b>2400</b>	<b>28000</b>
<b>95% UCL</b>	<b>12.2</b>	<b>-</b>	<b>14</b>	<b>25</b>	<b>45.3</b>	<b>0.15</b>	<b>10.4</b>	<b>73.3</b>
<b>Max.</b>	<b>28</b>	<b>nd</b>	<b>29</b>	<b>55</b>	<b>280</b>	<b>0.6</b>	<b>29</b>	<b>150</b>
<b>No of Exceedences</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Std Dev.</b>	<b>5.7</b>	<b>-</b>	<b>5.8</b>	<b>13.3</b>	<b>42.2</b>	<b>0.1</b>	<b>7.6</b>	<b>39.6</b>

**Secondary Investigation – 23<sup>rd</sup> May 2013.**

Twenty eight (28) soil samples were analysed for chemical determination of heavy metals. No individual sample detected exceeded levels of any of the eight (8) heavy metals in accordance with the NEPM guidelines. Moreover, all samples complied with the maximum parameters of the ENM guidelines, a more sensitive criterion, reinforcing the absence of heavy metal contamination at the Site.

Refer to **Table 6f** below.

**Table 6f – Heavy Metals (mg/kg)**

Sample ID	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
<b>HIL (mg/Kg)</b>	<b>400</b>	<b>80</b>	<b>400</b>	<b>4000</b>	<b>1200</b>	<b>60</b>	<b>2400</b>	<b>28000</b>
<b>95% UCL</b>	<b>16.69</b>	<b>-</b>	<b>17.65</b>	<b>29.61</b>	<b>22.72</b>	<b>0.404</b>	<b>12.86</b>	<b>81.72</b>
<b>Max.</b>	<b>24</b>	<b>nd</b>	<b>25</b>	<b>55</b>	<b>90</b>	<b>0.6</b>	<b>41</b>	<b>8</b>
<b>No of Exceedences</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Std Dev.</b>	<b>6.339</b>	<b>-</b>	<b>4.563</b>	<b>11.67</b>	<b>48.21</b>	<b>0.146</b>	<b>6.234</b>	<b>33.98</b>

*nd = non-detect*

**Third Investigation – 27<sup>th</sup> August 2013**

Five (5) soil samples were analysed for chemical determination of heavy metals. No individual sample detected exceeded levels of any of the eight (8) heavy metals in accordance with the NEPM guidelines. Moreover, all samples complied with the maximum parameters of the ENM guidelines, a more sensitive criterion, reinforcing the absence of heavy metal contamination at the Site.

**Pesticides and Polychlorinated Biphenyls (PCBs)**

**Primary Investigation – 15<sup>th</sup> November, 2012.**

Seven (7) samples were analysed for Pesticides and PCB's; no detections were detected above the LOR in any sample analysed from the fill soil materials. Therefore, no sample exceeded the respective criteria for OCP's, OPP's or PCB's.

**Secondary Investigation – 23<sup>rd</sup> May 2013.**

Eleven (11) soil samples were sent for Organochlorine and Organophosphorus pesticide analysis, in combination with PCB analysis. The result is equal to that of the primary investigation, with no samples being either detected above the LOR or in exceedance of referenced criteria.

**Third Investigation – 27<sup>th</sup> August 2013**

Two (2) soil samples were sent for Organochlorine and Organophosphorus pesticide analysis, in combination with PCB analysis. The result is equal to that of the primary investigation, with no samples being either detected above the LOR or in exceedance of referenced criteria.

**Electrical Conductivity (EC), pH and Foreign Materials**

**Primary Investigation – 15<sup>th</sup> November, 2012.**

Forty two (42) soil samples were analysed for EC and pH and twenty one (21) samples were analysed for foreign materials. No sample exceeded the Excavated Natural Material (ENM) exemption requirements for EC, pH or foreign materials. Refer to **Table 6g** below.

**Table 6g – EC, pH and Foreign Materials Results (mg/kg)**

Sample ID	EC (dS/m)	pH	Foreign Materials (%)
SAC (mg/Kg)	-	-	-
ENM Criteria Max Value / Range	3.0	4.5-10	0.1
ENM Criteria Max. Mean	1.5	5-9	0.05
Sample Max / Range	2.2	6.9-9.4	<0.05
Sample Mean	0.69	8.3	<0.05

1 dS/m = 1000 µS/cm

**Secondary Investigation – 23<sup>rd</sup> May 2013.**

Seventeen (17) samples per submitted for the three (3) inorganic parameters required for ENM assessment: EC, pH and foreign materials. All samples recorded levels of EC

and percentages of foreign materials below the ENM assessment criteria. Two (2) samples registered pH outside the maximum ENM range of 4.5 to 10. These samples were BH3\_1.5 and BH4\_0.5, which demonstrated a pH of 10.9 and 10.8 correspondingly.

Refer to **Table 6h** below.

**Table 6h – EC, pH and Foreign Materials Results (mg/kg)**

Sample ID	EC (dS/m)	pH	Foreign Materials (%)
SAC (mg/Kg)	-	-	-
ENM Criteria Max Value / Range	3.0	4.5-10	0.1
ENM Criteria Max. Mean	1.5	5-9	0.05
Max / Range	1.5	8.1-10.9	<0.05
Mean	0.56	8.79	<0.05

1 dS/m = 1000 µS/cm

### ***Soil Asbestos Analysis***

#### ***Primary Investigation – 15<sup>th</sup> November, 2012.***

A total of nine (9) soil samples were submitted for analysis for asbestos contaminated material and asbestos fibres. No asbestos fibres or asbestos contaminated material was detected in any of the soil samples analysed.

#### ***Secondary Investigation – 23<sup>rd</sup> May 2013.***

Due to the lack of asbestos detected in samples of the primary investigation, further asbestos analysis for the second phase of sampling on the Site was deemed unnecessary.

### ***4.2.3 Acid Sulphate Soil Analysis***

Two (2) soil samples collected from the black, grey, silty estuarine sediments and five (5) of the natural underlying clay samples at the Site were submitted to Envirolab for SPOCAS analysis. Both samples complied with the acid trail action criteria (TPA); however, both estuarine samples exceeded the sulfur trail action criteria (S<sub>POS</sub>). Three (3) of the five (5) natural clays exceeded the sulfur trail action criteria (S<sub>POS</sub>).

Refer to **Table 6i** following.

**Table 6i – Acid Sulphate Soil Analysis**

Sample ID	Depth (m)	TPA (mol H <sup>+</sup> /t)	S <sub>POS</sub> (%w/w)
WP1	2.0	<5	<b>0.1</b>
WP1	3.0	<5	<b>0.06</b>
BH1	7.0	<5	0.02
BH2	5.5	<5	<b>0.04</b>
BH3	5.0	<5	0.02
BH4	8.5	<b>20</b>	<b>0.19</b>
BH5	8.8	<5	<b>0.07</b>
<b>Criteria</b>		<b>18</b>	<b>0.03</b>

### QA/QC Observations

Laboratory QA/QC on all samples analysed included calculation of %RPD, matrix spike recovery and blank determinations. All %RPD, matrix spike recovery and blank determinations were within acceptable limits. The Field Quality Plan was followed throughout sampling. Therefore, it is considered that sampling techniques, transportation and the analytical data generated is of an acceptable degree of accuracy, representativeness, comparability, completeness and precision for the purpose of assessing the soil quality.

Refer to **Appendix B** Data Quality Assurance for a detailed summary of QA data.

### 3.2 Areas Requiring Remediation

As a result of the findings from the Assessment processes, the area of remediation is limited to fill material within five (5) 'hotspot' locations that contains elevated concentrations of PAH compounds and TRH. The Acid Sulphate Soils should also be handled in accordance with a Management Plan. It is expected that the majority of the contamination will be removed during the basement excavations and disposed of under waste classifications, therefore validation sampling should be undertaken at the level of contamination and following excavation works to confirm the extent of contamination has been recognised.

## 4.0 REMEDIATION OPTIONS

### 4.1 Overview

With regard to site remediation, the NSW EPA endorses the policy of the 1992 Australian and New Zealand Environment and Conservation Council (ANZECC) and National Health and Medical Research Council (NHMRC) Guidelines for the Assessment and Management of Contaminated Sites. Furthermore, the threshold concentrations presented in the NSW DECC Second Edition 2006 Guidelines for the NSW Site Auditor Scheme and the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (NEPM) are considered as appropriate basis for determining soil clean-up criteria to avoid ongoing potential liability.

In accordance with the above publications, the Site preferred order for site remediation options and management is:

- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material, or;
- Consolidation and isolation of the soil on-site by containment with a properly designed barrier;
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

The following Sections of the RAP look at the particular circumstances available to the Site and compare the feasibility of the remediation hierarchy to the most suitable alternatives available.

## 4.2 Selecting Remediation Technologies and Methods

A risk management approach has provided the basic principle of the remediation technologies/methods selected for the Site. This approach is consistent with the strategy outlined in the Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC, 1992) and the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013, which are endorsed by NSW EPA.

A contaminated site, as defined by the NEPM 2013 and the ANZECC 1992, is a site at which hazardous substances occur at concentrations above background levels, and where assessment indicates it poses, or is likely to pose, an immediate or long term hazard to human health or the environment.

Wherever human health is at risk, either on or off-site, or the off-site environment is at risk, a contaminated site should be remediated to the extent necessary in order to minimise such risks in both the short and long terms. However, in cases where there is no threat to human health and the environment is not at risk, it may be appropriate to accept a strategy of managing contaminants on the site, or use planning controls to manage and minimise risk.

Environmental and Human Health Risk is based on exposure to potential hazards and is defined as:

Risk = Hazard x Exposure

The elimination of the risk can be achieved by the removal of the hazard and/or the exposure pathway. Remediation is defined as any measure that removes the risk to an acceptable level by negating the hazard or exposure pathway.

Therefore, remediation can involve removal of the hazard (i.e. no risk remains) or alternatively, management of the risk by removal of the exposure pathway even if the hazard remains. Exposure pathways to contaminated material can be managed by undertaking a physical action (e.g. erection of a fence, installation of cap etc) and/or a management plan, which prevents exposure to contaminants (e.g. use of planning controls, management of site activities etc).

Planning controls are a means to control future changes in the land use. These controls can take several forms, from leasing/selling arrangements through to specific

planning legislation controls. For example, if contaminated soil is buried/capped in a particular zone, that zone may be designated to have a particular land use, e.g. public open space or roadways. This enables the material to be placed in less sensitive land use areas (i.e. under roadways) within the residential land.

### **4.3 Applicable Remediation Technologies/Methods**

There are ranges of different remediation technologies that are available for the remediation of contaminated sites. Some of these technologies are proven while others have not yet been successfully implemented in Australia, and/or there is limited local expertise for implementation.

DLA reviewed the hierarchy of remediation as detailed within Section 5.1; the two (2) relevant strategies most appropriate for consideration with regards to the remediation of the Site are as follows.

#### **4.3.1 Option 1 – Excavate and Dispose**

Landfill disposal is the simplest of all remediation methods, and involves the excavation of the contaminated materials, and disposal off-site to an EPA approved landfill disposal site with appropriate environmental safeguards. The formed excavation is generally then backfilled using clean, validated fill materials.

The EPA permits disposal of contaminated material subject to an approved landfill. The DECC *Waste Classification Guidelines* (2009) document sets out the methodology for assessing and classifying wastes to be disposed to landfill. Essentially, wastes are classified into General Solid (Non-putrescible), General Solid (Putrescible), General Solid – *Special Waste Asbestos*, General Solid – *Restricted Waste* and *Hazardous Waste*.

The principal test used for assessing waste is the Toxicity Characteristic Leaching Procedure (TCLP), which estimates the potential for the waste to release chemical contaminants into a leaching liquid. The EPA has set two standard pHs for the leaching solution:

- The pH of the solution used is dependent upon the pH of the waste. The TCLP simulates the effects of an acidic leaching medium, and involves agitation of soil

- in a solution of dilute acetic acid for a prescribed period, followed by analysis of the acid solution or “leachate” for the contaminants of concern; and,
- The second test used to complete the classification of wastes is the Specific Contaminant Concentration (SCC) test, which is a measure of the total concentration of the contaminants in the waste. In their document the EPA provide criteria for TCLP and SCC results for a range of contaminants for the various waste classifications. If the contaminant of concern is not included in the list, then the EPA advises to discuss the classification with them.

The selection of an appropriate landfill will normally depend largely upon the results of classification of the wastes. It is sometimes necessary for heavily contaminated soils to be pre-treated prior to disposal, to reduce the concentrations or minimise the mobility of the contaminants. Special criteria are sometimes applicable to certain categories of waste. Contaminants covered by Chemical Control Orders have restrictions placed on their handling and disposal.

#### **4.3.2 Option 2 – Cap and Contain**

On-site capping and containment involves the installation of a physical barrier around the contaminated area to migration pathways of contaminants. Any perched groundwater within the containment area may need to be collected and disposed of or recycled (possibly only after treatment) through the containment cell. The containment cell must be capped with an impermeable material so that the amount of surface water entering the cell is minimised.

Thus, when used in combination, capping and containment essentially involves the construction of an on-site landfill, which effectively isolates the contaminated soil from the surrounding area. The inclusion of an effective low permeability capping system and appropriate surface water controls/management should result in a minimisation of groundwater contained within the cell.

Several material types and mixtures have been developed to act as capping barriers. These include low permeability soil such as clay, soil/bentonite mixes, synthetic material liners and asphalt and concrete layers.

A Site Management Plan (SMP) would normally need to be implemented for a cap and contain Site to ensure that future owners and managers of the land are aware of the potential hazard and have appropriate control and reporting instruments in place. An SMP will limit excavation work, implement regular inspections and maintenance, or where necessary, provide for works to be conducted in strict accordance with appropriate occupational health and safety procedures.

The NSW DECC Contaminated Sites: Guidelines for the NSW Site Auditor Scheme Second Edition, 2006 provides a checklist to ensure the following technical issues associated with cap and containment is identified:

- That the design maximises the long term engineering security of the works and, where applicable, minimises the potential for leachate formation and/or;
- Does not include the erection of structures on the capped or contained area that may result in risk of harm to the public health or the environment, and;
- Includes a notification mechanism to ensure that the capped or contained areas are protected from any unintentional or uncontrolled disturbance that could breach the integrity of the physical barrier.

## 5.0 SELECTION OF PREFERRED REMEDIAL STRATEGY

The following section provides a rationale for the selection of the remedial (or management) strategies to be adopted for:

1 Burroway Road, Sydney Olympic Park, NSW, 2127 (Lot 1 DP859608).

In the following sections an assessment is made (including both a technical and economic appraisal) of the various broad options available for the remediation of the Site.

### 5.1 Technical Appraisal

Important considerations (from a technical perspective) in selecting and effectively implementing one of the available remediation strategies (as outlined in **Section 5**) for the Site are as follows:

**Human Health issues** - Works that involve the disturbance of contaminated soils can create health risk concerns to both site workers and the general public.

**Reliability** - this is a measure of the degree of certainty that the remedial system will succeed in meeting the site remediation goals (as outlined in **Section 1.3**) in both the short and long term.

**Regulatory Approvals** - any remediation system needs to be endorsed by the relevant regulatory authorities. The difficulty in obtaining regulatory approvals will be largely dependent upon the nature of the remediation system proposed.

**Disruptions to Site Structures and Activities** - remediation of the site will invariably involve some disturbance, both to the existing site structures, as well as to underground services present in the remediation area. For example, any work involving excavation of the contaminated soil mass will involve the removal of any structures located above the excavation zone.

**Contractor Experience** - the success and cost effectiveness of any remediation system will be at least partially dependent upon the experience contractors have in undertaking the type of remediation works proposed.

**Availability of Appropriate Disposal Sites (for excavation and off-site disposal) -** any works involving landfill disposal of contaminated soil will only be feasible if a landfill site is available which is licensed to accept the contaminated soils removed from site.

**Implementation Time Frame -** provides an indication as to the likely time frame involved in implementing each type of remediation strategy.

A summary of these issues, as they relate to each of the possible remedial strategies, is provided in **Table 5a**. Whilst any of the main remediation schemes outlined in Section 4 would be technically feasible, it should be noted that a number of limitations and risks are associated with each system.

**Table 5a - Remediation Options Technical Appraisal**

Technical Characteristics	Option 1 Excavate and Dispose	Option 2 Cap and Contain
<b>Human Health Risks</b>	Relatively low – excavation and direct off-site disposal will minimise personal contact	Soil disturbance minimal.
<b>Reliability</b>	Excellent – system ensures the removal of all contaminated materials	Sound - Design will ensure minimal access to the contaminated soils
<b>Regulatory Approvals</b>	Satisfactory – Waste will satisfy the 2009 NSW DECCW Waste Classification Guidelines. Compliance with Regulatory Authorities.	Satisfactory – this remediation option is endorsed by the EPA. Would require notification and some monitoring with implementation of a Site Management Plan.
<b>Site Suitability</b>	Good – Site is accessible by road transport, contaminated soils have either been stockpiled or identified	Moderate – Site has potential to be over excavated such that soils could be placed under basement slab
<b>Disruption to Site Structures and Activities</b>	Minor – Stockpiled materials can be loaded out directly and remainder involve shallow excavations	Minor – Increase to excavated volume would be minimal
<b>Ongoing Liabilities</b>	Minimal – all contaminated materials removed	If asbestos w/w% is below Site Specific criteria no additional maintenance is required
<b>Contractor Experience</b>	Good – relatively simple strategy involving only basic technologies	Good – Simple process to be accounted for in general works
<b>Availability of Disposal Sites</b>	Good – landfills available to accept waste	Good – landfills available to accept waste
<b>Implementation Time Frame</b>	Short	Short

### 5.1.1 Option 1 – Excavate and Dispose

Excavation and off-site disposal to landfill of contaminated soils has been the most common remediation method used in Australia to date. Its advantages are that it is quick, there are no long-term liabilities and there are no constraints on future land use. The number of truck movements on public roadways would be moderate; considering the shallow depth but widespread nature of the contaminated soil.

### 5.1.2 Option 2 – Cap and Contain

Capping and containment systems for contaminants have been used for remediation of many contaminated sites in and around Sydney. The NSW DECC has approved these strategies within many sites. The remediation method is a proven technology, which is reliable, has relatively low to moderate capital costs, and can be implemented, in a relatively short time frame.

The method has low health risks as it does not involve a substantial disturbance of the contaminated soils. There is a range of local contractors experienced in undertaking works of this nature.

The major disadvantages associated with this remediation method include maintenance requirements and notation that the site is regarded as containing contamination and is titled accordingly. Additionally the requirement for management would not be in compliance with the Council deferred commencement condition 2, which states that “the remediation strategy must not include onsite management of contamination”.

## 5.2 Economic Appraisal

Remediation Option	Element No.	Details of Remediation Element	Indicative Cost Estimate
Excavate, and Dispose	1	Site establishment	\$2,000.00
	2	Waste Classifications	\$6,500.00
	3	Landfill Disposal Fees including Transport to Landfill*	\$12,825,000.00
	4	Validation Reporting	\$8,500.00
	<b>Indicative total</b>		
Cap and Contain	1	Site Establishment	\$2,000.00
	2	Material Handling	\$10,800.00
	3	Cell Design	\$10,000.00
	4	Over excavation / disposal	\$85,000.00
	4	Capping works (Placement/compaction)	\$18,200.00
	5	Validation and Management Plan	\$13,500.00
	6	Monitoring and Maintenance (5 years)	\$60,000.00
<b>Indicative total</b>			<b>\$199,500.00</b>

\* this estimate of cost can be reduced with some soils be classified as VENM or ENM and being used as engineered fill on other sites.

### 5.2.1 Strategy A – Excavate and Dispose

The cost of this strategy would be calculated assuming a total of 67,500m<sup>3</sup> of soils would be excavated and disposed of offsite at a suitably licensed landfill facility. The cost of this strategy is offset against the need to dispose of these soils as part of the basement excavation or beneficial re-use on other pre-designated sites. It is expected that the soils will be classified as VENM, ENM and General Solid Waste.

### 5.2.2 Strategy B – Cap and Contain

The cost of this strategy is calculated assuming a total of 400m<sup>3</sup> of PAH and TRH contaminated soils and 25,000m<sup>3</sup> of acid sulphate soils would require management onsite.

The cost projection of the on-site containment is less than the strategy A option. However due to the design there are minimal locations for placement of contaminated or Acid Sulphate Soils.

## 5.3 Preferred Strategy

The site remediation strategy selected must be the most cost-effective solution, which does not bring about unacceptable long-term liabilities, and which does not impose unreasonable constraints on future site developments or present operations. Based on the analysis undertaken in the previous sections, it is considered that Council requirements are the constraining factor that limits the selection of a remediation method; therefore Excavate and Dispose option is the optimal strategy for remediation of the Site.

The contaminated areas would be subject to excavation and subsequent Validation immediately thereafter.

Relative benefits of the **Excavate and Dispose** strategy are as follows:

- The excavate and dispose strategy has low health risks as it only involves a minimal disturbance of the contaminated soils. Other remediation schemes involve stockpiling the entire contaminated soil mass and may result in the release of hazardous vapours, and thereby create a human health risk to remediation workers and nearby residents;

- The strategy would ensure end land-use suitability with no ongoing liability following remediation (i.e. the remediated site would be suitable for residential);
- Implementation of the remediation system does not impact the time frame for development, and;
- No future ongoing monitoring would be required.

The primary drawbacks to an Excavate and Dispose would be as follows:

- The strategy requires transportation of hazardous substances from the site.
- Increased costs.

## **6.0 IMPLEMENTATION OF SELECTED REMEDIAL STRATEGY**

### **6.1 Introduction**

The remediation strategy developed for the Site will be required to achieve three (3) main aims, namely:

- To negate any appreciable risk of human exposure to contaminated soils and therefore relieve the possibility for Significant Risk of Harm;
- To halt the migration of impacted soil;
- To remove all known contaminants from the Site, and;
- To provide an end product desirable for the preferred intended land use.

A ranges of technical inputs need to satisfy the functional requirements involved in providing the effective remediation of soils. Increasing the complexity of contamination treatment systems does not necessarily result in a higher level of efficiency. Site-specific constraints may heavily influence the choice of a preferred methodology.

The proposed strategy incorporates the following elements:

- Stakeholder consultation.
- Remedial work.
- Waste Classification and Disposal.
- Validation.

A brief outline of each of these elements is outlined in the following sections

### **6.2 Stakeholder Consultation**

The first stage to be undertaken after a letter of interim advice from a NSW EPA Accredited Site Auditor on the Remedial Action Plan is to secure all necessary approvals and submit notification to council. On approval of the remediation strategy the Stakeholders including on-site Management will be informed of the intentions and the progress at all stages of the remedial works.

### **6.3 Remediation Work**

Prior to the remediation activities, it will also be necessary to install environmental protection safeguards.

The main remedial activities to be undertaken during these works will include the removal of in-situ fill and VENM from the basement excavation. Any unexpected finds of contamination not identified by the previous assessments will be documented. The soils will be excavated with the excavation site being validated upon removal.

### **6.4 Waste Classification and Disposal**

All soils being excavated and removed from Site will require classification for off-site disposal in accordance with the 2009 NSW DECCW Waste Classification Guidelines and any relevant exemption. Authorisation for disposal will be obtained prior to any material leaving the site. Any additional material to be disposed of will require classification prior to disposal. The disposal Contractor will provide tip dockets to the Project Manager following disposal.

### **6.5 Validation**

At the completion of the remedial works a Validation Report documenting the works as completed will be prepared. Validation criteria should reflect the future land use of the site and be in accordance with the NEPM Residential B HILs. Soil validation sampling will be carried out in accordance with the EPA NSW Contaminated Sites: Sampling Design Guidelines (1995).

Following visual inspection of the basement area, validation soil samples are to be analysed for PAH and TRH compounds. A systematic sampling methodology will be utilised to validate the residual soils on the walls of the excavation at the level of the identified contamination.

Remediation of soils will be deemed successful on compliance with the site acceptance criteria; that concentrations comply with the relevant criteria for Residential B land use scenario, as defined by Schedule B1 within the NEPM amendment measure 2013.

## 6.6 Remediation Contingency

If there are events or discoveries made at the site that would prevent the proposed remediation works complying with the validation criteria, or if the selected remedial strategy is not able to precede then the following actions can be taken:

### ***Unsuitable Soils Identified Outside the Excavation Area***

If the excavation for the basement is complete and the walls fail validation, the following may be considered:

- Continue controlled excavation until validation is achieved. DLA will undertake a visual inspection of the area and carry out soil sampling on completion of the excavation and following the removal of contaminated soils.

## **7.0 ENVIRONMENTAL MANAGEMENT PLAN**

### **7.1 Introduction**

A major component of the remedial works shall involve the installation and maintenance of an Environmental Management Plan (EMP). The EMP will provide details of the environmental protection and pollution control measures to be implemented during the operational phase of the remedial works.

The pollution control measures have the objective of removing/minimising any adverse impact on the surrounding environment. Details of the pollution control measures to be implemented are documented in the EMP for the remediation works which is prepared (and approved) prior to commencement of remedial works.

In order to prepare the EMP for the remedial works a review will be undertaken to identify possible impacts on the surrounding environment. For each potential impact identified the range of pollution control measure(s) available for mitigating the impact was reviewed and the most practicable, efficient and cost effective were identified for implementation.

It was envisaged that there would be a series of control measures that would be common to the various elements of the remedial works. In addition, there are supplementary control measures that would be specific to particular elements of the remedial works.

In the following sections, outlines have been presented of the various pollution control measures that would be implemented during most elements of the remedial works. These form the basis of the Environmental Management Plan that should be read in conjunction with this document.

It is appropriate for the Contractor to develop EMP control measures for their component of the works based on the broad guidelines of the RAP.

### **7.2 Erosion Sedimentation Control Plan**

Erosion and run-off control measures will be implemented during all elements of remedial works undertaken. Typically, these measures will be designed to prevent the transport of pollutants (including sediments) out of the remediation area via stormwater/surface run-off.

Generally, no surface run-off and/or water from excavations/pits and trenches within the remediation area will be permitted to discharge, without regulatory authority approval, to the surrounding environment. Run-off control measures will be developed giving consideration to the site conditions in each remediation area, and are likely to include (but not necessarily be limited to) the following:

- Diversion drains, berms, sumps and pumping systems to prevent runoff entering or leaving excavation areas. All water in contact with works will be diverted through the treatment system;
- Truck cleaning areas for use in washing down all vehicles potentially coming into contact with contaminated soil leaving a remediation area; and,
- Use of silt fencing, hay bales and/or oil absorbing booms, as required.

### **7.3 Noise Control Plan**

The impact of noise associated with the site remediation works is acknowledged as a potentially important environmental effect. It will be necessary to minimise noise in accordance with EPA Standards. The methods used to control noise will be dependent upon the equipment being used for particular remedial activities however, it would be expected that the methods would include those commonly used during normal construction and demolition works.

Noise control measures will be developed giving consideration to the site conditions in each remediation area, and are likely to include (but not necessarily be limited to) the following:

- Site work will be restricted to the hours specified below;
- The use of construction vehicles on-site will be kept to a minimum;
- All equipment in operation in open areas on-site shall comply with the requirements of AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*; and,
- Noise monitoring may be conducted during the site remediation program.

## 7.4 Dust Control Plan

During the course of remediation works dust control measures shall be undertaken to ensure that dust generated from the site is controlled within acceptable levels. These control measures will be developed giving consideration to the site conditions in each remediation area, and are likely to include (but not necessarily be limited) to the following:

- All vehicles leaving the site will be cleaned on site to remove any potentially contaminated dust;
- Access to water sprays shall be available to water down the excavation/loading if dust generation becomes significant;
- During hot, dry and windy conditions, water sprays will be utilised during works across the Site,
- Water sprays will utilised during all civil works within areas known to contain asbestos contamination;
- Plastic sheeting shall be available to cover excavation faces and stockpiles; and,
- An ambient air-monitoring program shall monitor dust levels at the site boundary, as necessary.

## 7.5 Odour Control Plan

During the course of remediation works odour control measures shall be undertaken to ensure that possible odours generated on-site are controlled to within acceptable levels. These control measures will be developed giving consideration to the site conditions in each remediation area, and are likely to include (but not necessarily be limited) to the following:

- The prevailing weather conditions shall be considered in the manner in which work is undertaken;
- Plastic sheeting (such as VLDPE or PVC) will be made available at all times on-site to allow for any excavated or disturbed contaminated soils to be covered, if necessary to reduce odour;
- Odour masking agents (such as Biosolve) will be available for use on-site to suppress any nuisance odours not controlled by the above actions, so that ambient air quality at the site boundary is not adversely impacted.

## 7.6 Health and Safety

### 7.6.1 Work Health and Safety

A Work Health and Safety (WHS) plan is an essential part of all remediation projects, to ensure the health and safety of all personnel working on or visiting the site. All remediation work would be undertaken in accordance with the provisions set out by the *Work Health and Safety Act (2011)* and associated Regulations 2011, and any other regulations or directions set out by regulatory authorities.

Typically the WHS plan would consider a broad range of issues including (but not limited to) the following:

- Characterisation of potential hazards including hazardous materials and site activities (e.g. excavation);
- dust monitoring required within and at the boundary of the remediation area;
- Personnel and equipment movements to and from the remediation area;
- Training, instruction, and induction of site workers/visitors;
- Clear outline of responsibilities for health and safety; and,
- Emergency response plan for injuries or chemical exposure.

Prior to commencing any remediation works, a specific WHS Plan would be prepared by the Remediation Contractor covering the following aspects:

- Identification of the remediation area and exclusion zones;
- Induction of personnel;
- Hazard identification/locations;
- Identification of contaminants of concern and their physical and toxicological properties;
- Description of exposure pathways and personal protection requirements;
- Location of all underground/aboveground services;
- Details of specific work practice procedures to be followed within the designated contaminated areas;
- Monitoring protocols to identify a potentially hazardous practice;
- Emergency information; and,

- Incident reporting.

Work Health and Safety Planning involves the development and implementation of systems and procedures into a Health and Safety Plan included in a site Work Method Statement. The objectives of these documents are to ensure the health and safety of those undertaking specific tasks on site and the wider community if necessary.

A Health and Safety Plan should be developed for any site work and would typically include the following:

- A clear health and safety policy;
- Requirements for worker health assessments and inductions;
- Identified health and safety training requirements;
- Requirements for occupational health protection and monitoring;
- Site/location specific emergency plan;
- Site/location specific emergency contact details;
- Permit to work/clearance procedures, and
- Task specific safe work method statements.

The Project Manager will ensure that workers entering the site meet the standards of this Management Plan.

### **7.6.2 Personal Hygiene and Decontamination**

Appropriate hygiene and decontamination assists with minimising worker exposure and the transportation of potentially contaminated materials from the site to more sensitive home environments.

The following activities are prohibited while working in the hazardous materials area:

- eating;
- drinking;
- chewing gum, and;
- smoking.

Practices that involve contact between the hands and the mouth increase the risk of chemical ingestion. Hands should be thoroughly washed with soap and water after completing work activities and before meal breaks.

Personal decontamination is required to minimise workers' exposure to, and indirect transportation of potential chemicals of concern. Decontamination involves physically removing material from personnel and equipment. Protective equipment, tools and other equipment are decontaminated by cleaning with detergent water using a soft-bristle brush followed by rinsing with a sufficient quantity of water. Decontamination should be conducted before meal breaks, and at the end of a day's work.

### **7.6.3 PM10 Dust**

PM10 dust refers to any suspended particulate matter with an Equivalent Aerodynamic Diameter (EAD) of less than ten (10) micrometres (  $\mu\text{m}$  ). Particles with EAD of  $10 \mu\text{m}$  or less are classified as respirable and hence may affect health. Particles with a diameter larger than  $10 \mu\text{m}$  generally have nuisance and aesthetic impacts only. PM10 emission sources include industrial processes, fuel combustion, burning of vegetation, incineration and natural causes such as wind-blown dust. The wind-blown dust can be generated by bulk earthworks activities, stockpiles and construction sites.

PM10 monitoring will be conducted along the Site boundaries with a Dustrak 8520 on a daily basis during excavation of the embankment. This enables the evaluation of PM10 concentrations during operational hours. The NSW Environmental Protection Authority (EPA) recommend the air quality criteria for Respirable Particulates (PM10) not to exceed  $50 \mu\text{g}/\text{m}^3$  over an averaged 24 hour period and an annual average of less than  $30 \mu\text{g}/\text{m}^3$ . The standard average of  $50 \mu\text{g}/\text{m}^3$  is based on a high volume sample for a period of at least 24hrs, though is used in this case as a guideline to evaluate the performance of dust suppression measures during 'worst case' conditions during peak onsite activity.

### **7.6.4 Community Health and Safety**

The health and safety of the surrounding community is very important for any remediation works. While it is possible to control the activities of personnel within the remediation area (e.g. ensuring appropriate WHS procedures and equipment are utilised) it is not normally possible to control the activities of the surrounding community.

Therefore, to protect the community health and safety it is necessary to control the remedial works so that no fugitive emissions occur during the remedial works that could have an adverse impact on the surrounding community.

These controls are documented in the Environment Management Plan for the remedial works, although monitoring requirements to confirm the effectiveness of the measures may also be documented in the WHS Plan. The methodology that would normally be used to develop the control measures is described below.

Firstly, the portions of the community that may be impacted by any fugitive emissions will be identified. Secondly an assessment of the hazard posed by the contaminants and the proposed remedial methodology/technology would be undertaken. This assessment would define the hazard posed by the particular contaminants present in the remediation area using risk assessment techniques (i.e. identifying the hazard or contaminants and the exposure pathway that the potentially at risk community could be exposed to the hazard).

Once these have been identified, a review will be undertaken of control measures available to remove or minimise the risk posed to the surrounding community during the remedial works. Typically the control measures would comprise removal/minimisation of the exposure pathway to the community. As indicated above it may be necessary to undertake monitoring to confirm the effectiveness of the control measures, and if the monitoring indicates a possibility for exposure then contingency measures may need to be implemented. By way of example control mechanisms could include (but not necessarily limited to) the following:

- Site security measures to prevent access to the contaminated material by the public;
- Dust suppression measures to minimise inhalation and ingestion exposure; and,
- Not undertaking certain work if winds are unfavourable etc.

## **7.7 Traffic Control Plan**

Movement of excavation equipment, trucks and other vehicles involved in the remediation works, to and from the site will be strictly controlled and restricted to a minimum and only take place during approved working hours. All potentially contaminated vehicles leaving the site will be decontaminated in an appropriate truck

wash-down area. All vehicles will be visually free of soil before permission to leave a remediation area is granted.

## 7.8 Hours of Operation

Working hours for any on-site remedial works would be set in consultation with the Council, but it is envisaged the likely hours would be as follows:

- Mondays to Fridays                      7:00 am to 5:00 pm
- Saturdays                                      7:00 am to 3:00 pm
- Sundays and Public Holidays          No Work Permitted

## 7.9 Emergency and Out of Hours Contact Numbers

DLA Environmental	02-9476 1765
Ionic Management	02-8313 0210
NSW EPA	02-9995 5000
WorkCover NSW	02-4321 5000

## 8.0 REMEDIATION WORKS MANAGEMENT

### 8.1 Regulatory Approvals/Licences

Prior to the commencement of remedial work, all relevant regulatory approvals will need to be obtained. Such approvals/licenses will include (but may not be limited) to the following:

- Appropriate approvals for disposal of wastes to landfill e.g. contaminated soils, concrete demolition waste etc. in accordance with the POEO Act 1997.
- Regulatory Authority consent for Category 2 remedial activities, in accordance clause 9 (e) sub (ii) of State Environmental Planning Policy SEPP – No 55 – *Remediation of Land*. The remediation is considered to be Category 2 remediation as it is not work described or associated with conditions of Clause 9 (a-f) of SEPP 55. It is not a designated development, does not affect critical or threatened species or is not been undertaken in an area or zone under which any classifications under an environmental planning instrument applies.
- Consent from WorkCover NSW for any asbestos removal to be undertaken.

### 8.2 Environmental Protection and Pollution Control

#### 8.2.1 General

When the remedial works are being planned an assessment of potential mechanism for fugitive emissions from the remediation area will be completed. Contingency plans shall then be developed to deal with any identified emissions. The contingency plans will detail the response procedures to be implemented immediately after detection of a fugitive emission to the surrounding environment. The contingency plan will include details of the potential emissions identified and the appropriate response measures.

The following outlines some examples of unexpected situations that may arise and may require response measures:

- Dust, noise, odour levels measured at site boundary may exceed acceptable levels; or,
- Surface water run-off leaving the site which may require assessment.

Typically, in cases where fugitive emissions are identified, the Project Manager/Superintendent will stop work and appropriate situation specific responses will be taken. By way of example these could include: reducing dust by further water spraying, reducing machinery on-site to minimise noise, intercepting run-off with diversion drains and a pumping system, backfilling an excavation to remove an unpleasant odour etc.

### **8.2.2 Buffer Zone**

Wherever possible, a buffer zone will be established around remedial works. The effect of this buffer zone will to minimise the potential for impacts on the surrounding open space and residential areas as well as the community as a whole. The location and layout of the buffer zone will be determined by consideration of (but not necessarily limited to) the following:

- Hazards associated with, and exposure pathways to the main contaminants in the remediation area;
- Surrounding land uses;
- Prevailing weather conditions; and,
- Existing physical barriers (e.g. fences, buildings etc).

Access to the area within the buffer zone would be restricted to persons directly involved in the remedial works. If it is not possible to establish an adequate buffer zone in some areas where remedial works are to be undertaken, consideration will be given to other means of ensuring that there are no adverse impacts on the surrounding land users. This could include, for example minimising or restricting the extent of any excavations or other activities that would effectively limit exposure to contamination.

## **8.3 Community Relations Plan**

### **8.3.1 Communications Plan**

Extensive consultation will be conducted on the Project. Meetings with stakeholders will be kept on the Project flowing to involved groups. It is envisaged that the remediation program will be developed in consultation with the stakeholders prior to implementation.

It is likely that the plan would intend to:

- Provide the stakeholders with information about the remedial works project;
- Engagement of a community engagement specialist as required,
- Enable the stakeholders to raise questions/concerns and other suggestions regarding the remedial works project; and,
- Co-ordinate matters of concern in relation to the remedial works project with Council and Regulatory Authorities with a stake in the project.

### **8.3.2 Complaint Response Measures**

A complaint response system has been developed for dealing with any complaints received.

The system includes:

- Identification of the individuals (e.g. Project Manager etc) with overall responsibility of ensuring all complaints are dealt with in an appropriate manner;
- A clearly documented procedure for receiving, logging and passing on details of any complaints to the appropriate personnel. Refer to Environmental Management Plan;
- Clearly defined roles for personnel working on the project in relation to complaint reporting and response;
- A complaint register, which will record details of complaints, the party making the complaint, the parties, notified of the complaint, and actions arising from the complaint;
- Mechanisms for advising Council and Regulatory Authorities of complaints in their jurisdiction;
- Mechanisms for disseminating information (as appropriate) to the local community and/or committee regarding complaints and the response to the complaints; and,
- Procedure for following up on the satisfactory resolution of any complaints.

## 8.4 Staged Progress Reporting

It is envisaged that staged progress reporting will be undertaken throughout the remedial works program. It is likely that these will comprise preparation and submission of regular status reports to the appropriate interested parties. The status reports would be expected to include a summary of:

- Results of any monitoring work undertaken during the reporting period;
- Details of the work undertaken during the reporting period;
- Details of any environmental incidents during the reporting period and the actions arising from these incidents;
- Details of any unexpected situations encountered in undertaking the remedial work during the reporting period and the response to these situations;
- Details of any variations required to the RAP for which approval has been sought; and,
- Updates on project schedule.

Additionally, the occurrence of any event which causes or is likely to cause substantial pollution of the environment or represents a human health risk would be notified to the appropriate Regulatory Authority(s) as soon as practicable after it becomes known to the Project Manager, Remediation Contractor or Council. Should such an event occur a written report shall be supplied to the appropriate Regulatory Authority(s) within 21 days of the event. Such a report would include full details of the incident, including time and duration of the event, the type and volume of any pollutants discharged, any remedial activities undertaken and any measures taken to prevent or mitigate against a recurrence of such an event.

Upon completion of the site remediation works, a Validation Report shall be prepared and issued. The report will be prepared in accordance with the NSW EPA's *Guideline for Consultants Reporting on Contaminated Sites (1997)* and the *EPA Guidelines for the NSW EPA Site Auditor Scheme (Second Edition, 2006)*.

## 9.0 CONCLUSION

The Site can be made suitable for the intended land-use through remedial action as part of the redevelopment works in accordance with State Environmental Planning Policy No.55 Managing Land Contamination: Planning Guidelines SEPP 55.

In conclusion the RAP:

- Has been developed in a manner consistent with current industry practice;
- Has selected a preferred remediation strategy based on the site-specific issues and currently available technologies that will allow the Site to be made suitable for the intended land use;
- Has presented an information and consultation program to ensure the stakeholders are informed of the works as they proceed; and,
- Has outlined the means of validation of the completed works.

## 10.0 REFERENCES

- Australian and New Zealand Guidelines for the Management of Contaminated Sites, 1992, Australian and New Zealand Environment and Conservation Council and National Health and Medical Research Council (ANZECC/NHMRC 1992).
- Australian and New Zealand (ANZECC) Guidelines for Fresh and Marine Water Quality, 2000, Australian and New Zealand Environment and Conservation Council (ANZECC 2000).
- Health - Based Soil Investigation Levels, 1998, Imray, P & Langley, A, National Environmental Health Forum Monographs, Soil Series No. 2 (2nd Ed), South Australian Health Commission (NEHF 1998b).
- Contaminated Sites: Assessing Service Station Sites, 1994, NSW Environment Protection Authority (NSW EPA 1994).
- Contaminated Sites: Sampling Design Guidelines 1995, NSW Environment Protection Authority (NSW EPA 1995).
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, 1997, NSW Environment Protection Authority (NSW EPA 1997).
- Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, 2nd Edition, 2006.
- Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination (NSW DEC 2007).
- National Environment Protection (Assessment of Site Contamination) Amendment Measure 2103 (NEPM).
- Contaminated Sites: Guidelines on Significant risk of Harm from Contaminated land and the Duty to Report, 1999, NSW Environment Protection Authority (NSW EPA 1999).
- Managing Land Contamination: Planning Guidelines, SEPP 55 - Remediation of Land (1998), Department of Urban Affairs and Planning/ NSW EPA.
- Contaminated Land Management Act (1997), NSW Government, Sydney, NSW.
- Waste Classification Guidelines, NSW DECCW 2009.

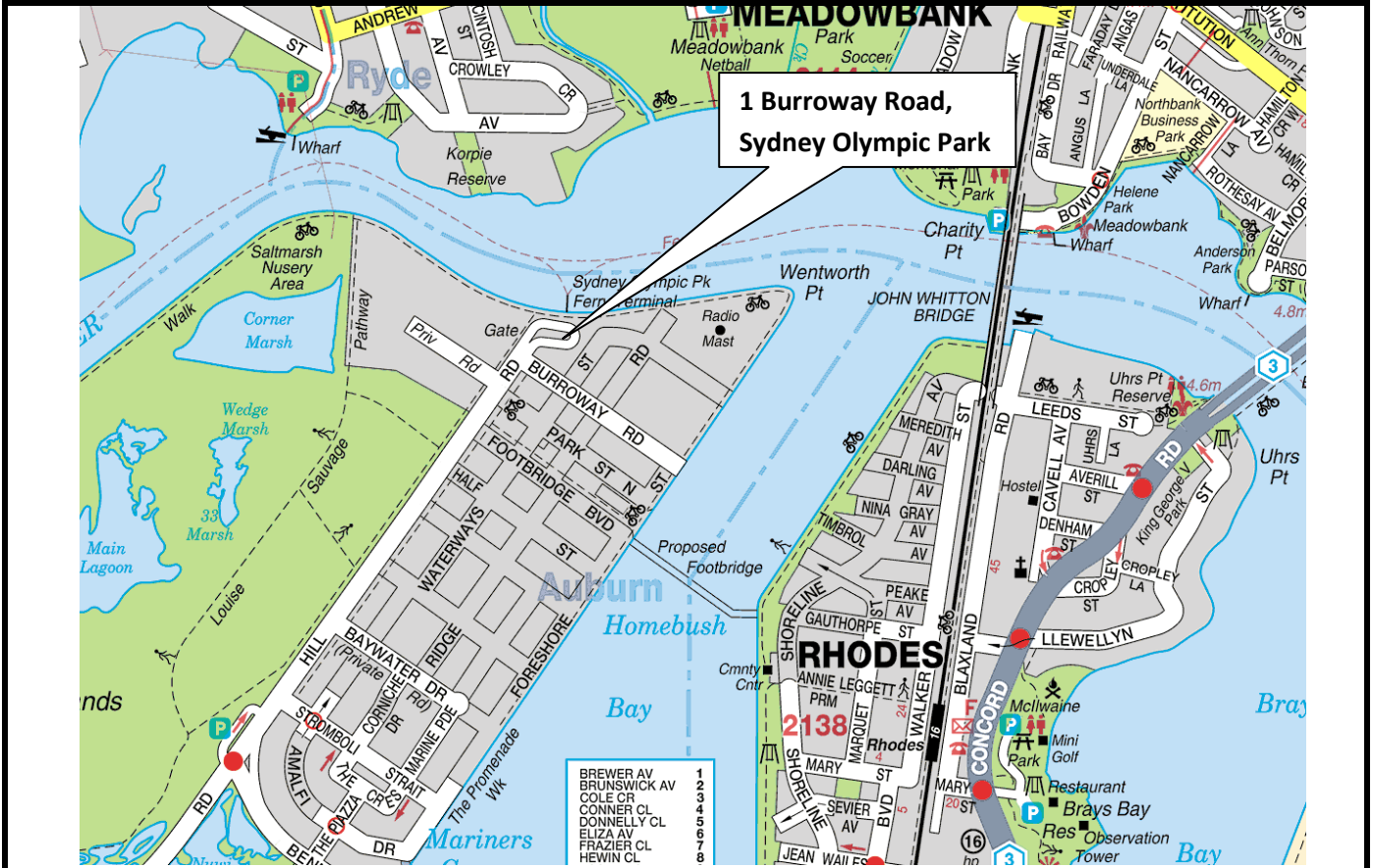
### Checklist Information Required for Completion of Remediation Action Plan


Item	Description	Addressed
	<b>Planning information</b>	
	Designated development (EP&A Act 1997):	NA
	EPA licence:	NA
	SEPP 55 requirements: <b>Council Requirements</b>	YES
	Planning instruments (Council contaminated land policies, DCPs, etc.):	YES
	ANZECC 1992 remediation hierarchy:	YES
	DNR Part 3A permit:	NA
	Work Cover Dangerous Goods Branch (UST removal):	NA
	Chemical Control Orders:	NA
	Others:	NA
	<b>Remedial Action Plan</b>	
	Remediation goals:	YES
	Discussion of the extent of remediation required:	YES
	Discussion of possible remedial options and how risk can be reduced:	YES
	Rationale for the selection of recommended remedial option:	YES
	Proposed testing to validate the site after remediation:	YES
	Contingency plan if the selected remediation strategy fails:	YES
	Interim site management plan (fencing, warning signs, storm water, etc.):	YES
	Environmental Management Plan (operation phase): <b>included</b>	YES
	Remediation schedule:	YES
	Hours of operation:	YES
	Contingency plans to respond to site incidents or offsite impacts:	YES
	Identification of regulatory compliance requirements:	YES
	Names/phone numbers to contact during remediation:	YES
	Community relations plans, where applicable:	YES
	Staged progress reporting, where appropriate:	YES
	Long-term site management plan:	NA

# Figure 1

## Site Location

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 Unit 2B 30 Leighton Place Hornsby 2077	<b>DESIGNED:</b> DLA	<b>SITE LOCATION</b>		
	<b>COMPILED:</b> PS	<b>CLIENT:</b> PSM	<b>DRAWING:</b> 25/1/2013	
	<b>PROJ. No.</b> DL2999	<b>LOCATION:</b> 1 Burroway Road, Sydney Olympic Park	<b>FIGURE:</b> 1	