PRELIMINARY REPORT

Indicative Remediation Action Plan
Site 9
Sydney Olympic Park

Prepared for

Sydney Olympic Park Authority

7 Figtree Drive Sydney Olympic Park, NSW 2127

4 DECEMBER 2002

S: 50244/004/DELIVERABLE\R002-A.DOC

URS

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Introduction

SECTION 1

1.1 Preamble

URS Australia Pty Ltd (URS) was engaged by the Sydney Olympic Park Authority (SOPA) to prepare a Remediation Action Plan (RAP) for Site 9, located on the corner of Sarah Durack Avenue and Olympic Boulevard, Homebush Bay, NSW (the site)(see Figure 1). The RAP has been prepared as part of a proposed redevelopment of the site for commercial land use.

1.2 Objective

The objective of the RAP is to:

- define the site remediation goals (to ensure the site will be suitable for the proposed land use);
- determine the most appropriate remediation method to achieve the defined remediation goals; and
- demonstrate how the remediation goals will be achieved on-site.

The RAP has been developed based on information from a previous URS investigation and on the proposed future land use, as detailed in Sections 2 – 4 of this report.

Background

SECTION 2

2.1 Site Identification and Layout

The site is located on the corner of Olympic Boulevard and Sarah Durack Avenue, Sydney Olympic Park, bounded by the Golf Driving Range to the East and 'P3' car park to the North. Access is gained via Sarah Durack Avenue (via the Golf Driving Range entrance).

The site comprises an approximately rectangular plot of land and is approximately 4,836 m^2 in area. At the time of the investigation, the majority of the site was covered with a thin layer of asphalt, while the remaining area consisting of lightly vegetated garden beds. A drainage easement runs along the site parallel to the car park facility. An electronic parking ticket machine is located at the north-western end of the site, in an area surrounded by short grass.

Figures 1 and 2 illustrate the location and layout of the site, respectively.

2.2 Site History

The scope of the previous URS investigation did not include a review of the site history, previous land uses or previous investigations. However, the Homebush Bay district is known to have received extensive amounts of fill and waste during the previous use of the area for landfilling

2.3 Previous Investigations

To the knowledge of URS, the only previous investigation conducted at the site was by URS and is detailed in the report *Environmental and Geotechnical Investigation - Site 9, Sydney Olympic Park (27 November, 2002)*. The results of this investigation are summarised in Section 4.0.

2.4 Adjacent Land Use

The site is located in a commercial/industrial area. The surrounding land use is as follows:

- North P3 Car Park;
- East Golf Driving Range;
- South Olympic Boulevard; and
- West Sarah Durack Avenue.

2.5 Proposed Development

SOPA has indicated that the site area has been selected for possible redevelopment as a commercial office block, or the like. The layout or construction of the proposed redevelopment is not known, although SOPA have indicated that a one level basement car park is proposed as part of the development.

Site Conditions and Physical Environment

SECTION 3

3.1 Topography and Drainage

The site is essentially flat. The majority of the site is covered with a thin layer of asphalt, while the remaining area consists of lightly vegetated garden beds. A drainage easement runs along the site parallel to the car park facility. Drainage easement is likely to feed into Boundary Creek, which is located to the south of the site.

3.2 Geology

The 1:100 000 Sydney Geological series sheet indicates that the site is underlain by the Ashfield Shale (Wianamatta Group). This formation typically weathers to form clays of medium to high plasticity.

The previous URS investigation encountered between 3.0 m and 7.0 m of fill (although this is thinner in some sections of the site) in a clayey matrix overlying residual natural clay. The fill generally comprises soft to firm clay, with some glass, wood, fabric and foam. The residual clay layer was typically soft to firm, of high plasticity, light grey with orange mottling. The residual material was typically underlain by low strength shale. Depth to bedrock varied between 5.7 m and 9.3 m below the ground surface (bgs).

3.3 Hydrogeology

Groundwater was encountered at the northern and southern ends of the site at between 5.5 m and 6 m below the surface during the URS investigation. The URS investigation included the installation of only one groundwater monitoring well. Consequently, a groundwater flow direction can not be determined. However, given the topography of the area surrounding the site and the location of Boundary Creek, it is likely that groundwater flow is in a (generally) southerly direction.

4.1 Environmental Assessment Guidelines

4.1.1 General

The NSW Environment Protection Authority (EPA) holds the primary technical responsibility for the regulatory management of contaminated sites in NSW. This responsibility is vested in the NSW EPA by the provisions of numerous NSW Acts and Regulations, as well as through various NSW government policies, guidelines and undertakings. In particular, the Contaminated Land Management Act 1997 (CLM Act) specifically addresses the management of contaminated land and establishes a process for investigating and (where appropriate) remediating contaminated land which represents a significant risk of harm to human health or the environment. The CLM Act provides for the accreditation of auditors to ensure appropriate standards of managing contaminated land. The accreditation and responsibilities of a site auditor are detailed in the *Guidelines for the NSW Site Auditor Scheme (NSW EPA, 1998)* (Auditor Guidelines). In auditing a site, the auditor is required under the CLM Act to have due regard to the guidelines provided by the NSW EPA.

4.1.2 Soil Guidelines

In accordance with the recommendations of the Auditor Guidelines and Section 105 of the CLM Act, the analytical results for soil samples collected during the URS investigation (November, 2002) have been evaluated against the following guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure Health Investigation Levels (1999)* (NEPM);
- *Guidelines for Assessing Service Station Sites (NSW EPA, 1994)* (Service Station Guidelines);
- *Guidelines for the NSW Site Auditor Scheme (NSW EPA, 1998)* for provisional phytotoxicity-based investigation levels for sandy loams pH 6 - 8 (Phytotoxicity Guidelines); *and*
- *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Waste (NSW EPA, 1999)* (Waste Guidelines).

NEPM

The NEPM provides risk-based Health Investigation Levels (HILs) for selected organic and inorganic chemicals in table 5-A of Schedule B (1) - *Guideline on the Investigation Levels for Soil and Groundwater*. These levels are for a variety of exposure settings including residential, open-space (including parks and secondary schools) and commercial/industrial land uses and do not necessarily take into account environmental concerns.

The HILs have been developed to be protective of human health and are based on an assessment of potential exposure via ingestion of soil and dermal contact. The investigation level considered most appropriate (for the proposed commercial land use) is the HIL Level F.

The NEPM guidelines provide HILs for total petroleum hydrocarbons (TPH) as aliphatic and aromatic hydrocarbons for a range of land uses. However, the analysis of aliphatic and aromatic hydrocarbon fractions is not the routine analytical method for TPH. Therefore, the Service Station Guidelines for the TPH $C_6 - C_9$ and $C_{10} - C_{36}$ fractions have been applied (see following section).

NSW EPA Service Station Guidelines

The Service Station Guidelines specify '*Threshold Concentrations for Sensitive Land Use - Soils*' for TPH C_6-C_9 and C_{10}-C_{36} fractions, benzene, toluene, ethyl-benzene, total xylenes (BTEX), lead, benzo[a]pyrene and total polyaromatic hydrocarbons (PAHs). The Service Station Guidelines have been developed for sensitive land use, and are therefore not directly applicable to the proposed (low sensitivity) commercial land use. However, in the absence of more appropriate guidelines, the Service Station Guidelines for TPH C_6-C_9 and C_{10}-C_{36} fractions are adopted as investigation guidelines for the site.

NSW EPA Phytotoxicity Guidelines

Phytotoxicity has been chosen by the NSW EPA as '*... the indicative environmental effect to be dealt with in the context of urban development*'. The Phytotoxicity Guidelines are a screening level for chemical concentrations above which there may be conditions that could have an adverse effect on urban ecology. However, these guidelines have significant limitations for the following reasons:

- the differing natures of soils and fauna/flora; and
- the guidelines are applicable only to loamy soils with a pH of between 6 and 8.

Guidance provided in the Auditor Guidelines indicates that the Phytotoxicity Guidelines should be used to screen the chemical concentrations for soils within planted areas. The Phytotoxicity Guidelines are not applicable to areas where there will not be plantings, such as beneath internal roadways. However, since the layout of the proposed development is not known, all soil results have been assessed against the Phytotoxicity Guidelines.

NSW EPA Waste Management Guidelines

The Waste Guidelines provide guidance on the classification and disposal of liquid and non-liquid wastes and are based on material types, chemical concentrations and results of leachability tests (TCLP), or a combination of the three. These guidelines allow for the classification of non-liquid wastes as:

- *Inert waste*, which may be disposed of to landfill;
- *Solid waste*, which may be disposed of to an appropriately licensed landfill;

- *Industrial waste*, which may be disposed of to an appropriately licensed landfill; or
- *Hazardous waste* [1], which must be appropriately stored or treated.

4.1.3 Groundwater Guidelines

Analytical results for groundwater have been evaluated against the *Australian Water Quality Guidelines for the Protection of Aquatic Ecosystems* (ANZECC/ARMCANZ, 2000). These guidelines specify trigger values for the protection of aquatic ecosystems and are not directly applicable to assessing groundwater quality. However, in the absence of groundwater quality guidelines, these guidelines are referenced for assessment purposes.

The groundwater at the site is considered to be fresh and the likely receiving waters (Boundary Creek) slightly disturbed (based on the adjacent residential and parkland uses). Therefore, it is considered that the ANZECC/ARMCANZ (2000) trigger values for the protection of fresh waters (95 % Level of Protection) are appropriate. The ANZECC/ARMCANZ (2000) Interim Indicative Working Levels (IIWLs) have been used where there are no trigger values. However, these are of low reliability and are for reference only.

4.2 Summary of Investigation Results

4.2.1 Soil

Sampling Program

Six boreholes (BH111 to BH116 inclusive) were drilled at the site to allow the collection, field screening and analysis of selected soil samples. Field screening was conducted using a photoionisation detector (PID), which measures the concentration of volatile organic compounds in soil vapours. The locations of the boreholes are illustrated in Figure 2.

One sample from each borehole and one field duplicate was submitted for analysis to Australian Laboratory Services (ALS), a NATA accredited laboratory.

Analytical Suite

Soil samples collected during the URS investigation (November, 2002) were variably analysed for the following chemicals of potential concern:

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1 An Application for Consent to Dispose of Hazardous Waste must be submitted to the NSW EPA Waste Registration and Licensing Section.

- Inorganics - arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc;
- Total petroleum hydrocarbons (TPH);
- Benzene, toluene, ethyl benzene and xylene (BTEX); and
- Polycyclic aromatic hydrocarbons (PAHs).

One sample was submitted for toxicity characteristic leaching procedure testing (TCLP) for benzo(a)pyrene and lead. The purpose of the tests was to ascertain the likely classification of the impacted materials for off-site disposal to landfill.

The soil analytical results are presented in Tables 1 – 4.

Extent of Impacts

The URS investigation (November, 2002) indicated the following:

- Fill materials are variably impacted with concentrations of TPH, ethyl benzene and xylene which significantly exceeded the Service Station Guidelines. Field observations (odour and PID readings – as noted in the borehole logs) indicate that this impact may extend into the underlying residual clays; and
- Concentrations of inorganics and PAHs were not detected above the relevant guidelines for the proposed commercial/industrial future land use. However, concentrations of some of the inorganics were above the EILs. Soils containing concentrations of inorganics above the EILs should not be used within the top 1 m of soils in landscaped areas of the potential future development.

Waste Classification

Section 5 describes the approach to the remediation of the site. Part of this approach involves off-site disposal (to landfill) of requiring excavation as part of the commercial development construction. Therefore, an assessment of this material with respect to classification for off-site disposal was conducted.

Assessment of the material for disposal to landfill was conducted in accordance with the Waste Guidelines and was based on a combination of:

- total chemical concentrations only; and
- total chemical concentrations and TCLP results.

This assessment indicated that the material requiring off-site disposal to landfill is classifiable as Inert to Industrial Waste.

4.2.2 Groundwater

Sampling Program

One monitoring well was installed within borehole location BH112. One sample and one field duplicate sample were collected from this monitoring well for analysis by ALS.

Analytical Program

The groundwater samples collected during the URS investigation (November, 2002) were analysed for the following chemicals of potential concern:

- Inorganics - arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc;
- TPH;
- BTEX; and
- PAHs.

The analytical results are presented in Table 5.

Results

Concentrations of inorganics and PAHs were detected slightly above the relevant Trigger Values or IIWLs. Elevated TPH concentrations were also detected. However, due to the limited amount of groundwater intersected under the site, and the limited potential for the groundwater under the site to be used as a resource, the chemical concentrations in groundwater are not considered to be significant.

4.2.3 Analytical QA/QC

The URS (November, 2002) report indicated that the analytical data quality was of sufficient quality for the purposes of the investigation.

Remedial Approach

SECTION 5

5.1 Remediation Goal

The remediation goal for the site is to ensure that the land is suitable for the proposed commercial land use. This section details the approach used to achieve this objective.

5.2 Remediation Approach

5.2.1 General

Two remedial approaches are considered to allow redevelopment of the site as a commercial office block:

- Excavation of all impacted soils from under the site area; and
- Risk assessment to determine whether the soil and groundwater under the site can be retained.

As is discussed in URS investigation report (November, 2002), due to the limited amount of groundwater intersected under the site, and the limited potential for the groundwater to be used as a resource, the slightly elevated chemical concentrations in groundwater are not considered to be significant. Consequently, remediation of groundwater is not considered warranted. However, an allowance should be made for a collection and treatment/disposal system for any groundwater which may seep into the basement.

5.2.2 Preferred Approach

The URS investigation (November, 2002) found that site soils variably contained concentrations of TPH, ethyl benzene and xylene above the Service Station Guidelines (sensitive land use). The Service Station Guidelines were developed for sensitive land use types, where potential exposure pathways to impacted soils include ingestion, inhalation (of vapours diffusing from soil) and adsorption, such as may be present in a residential garden. Potential exposure to impacted soils is less likely at a commercial site due to:

- Greater proportion of the site being sealed, reducing the potential for ingestion, inhalation and adsorption;
- Different land use (less recreational, no market gardening, limited child usage); and
- Less residence time at the site.

On the basis of the (likely) restriction of potential exposure pathways to the impacted soils under a commercial land use setting, URS consider that the site soils are unlikely to pose a risk to the health of future occupants. However, in the absence of EPA endorsed guidelines for Industrial/Commercial land use, and to quantify the potential risks posed (and how they might be mitigated through remedial or construction measures), URS propose that a site specific human health risk assessment be conducted supported by additional sampling. The risk assessment should consider:

- The development layout and occupant usage;
- Chemical concentrations in the soil, water and vapour phases; and
- Exposure pathways, including relations to the building and basement design and sealing.

Depending on the results of risk assessment, the amount of soil requiring excavation may conceivably be limited to only that requiring excavation to construct the proposed development.

5.2.3 Associated Issues

Soil Material Disposal

Regardless of the results of the proposed risk assessment and the consequential remedial measures which may or may not be required, an (as yet) unspecified volume of site soils is likely to be excavated and removed from site as part of the development construction. It is proposed that this material be disposed of off site to an appropriately licensed landfill facility. Due to the odourous nature of the material, it is recommended that additional soil samples be collected from the excavation area footprint and analysed for the potential chemicals of concern to achieve a density necessary for comprehensive statistical characterisation of the material that will be excavated and disposed of off-site. This will allow in-situ classification of the materials and direct loading of the material into trucks for off site disposal. This approach will minimise the requirement for on site stockpiling, and thus reduce the potential for odour and stormwater issues associated with the site works.

Environmental Management Plan

If impacted soil is retained on site (around and underneath the development footprint), an Environmental Management Plan (EMP) will be required to ensure future site workers and the environment are not adversely impacted during works which intersect potentially impacted soils.

6.1 Introduction

This section describes the processes involved in remediating the site using the approach detailed in Section 5.0.

6.2 Remediation Preparation

6.2.1 Documentation and Approvals

Remediation of the site (as required by the development layout and results of the risk assessment) will commence only after the relevant approvals have been received and a detailed Site Management Plan (SMP) prepared. The approvals which will be required prior to initiating remediation include:

- Council approval for demolition and remediation;
- A strategy to remove stormwater and excavation waters from site (eg disposal to sewer); and
- Approval from landfill to dispose the excavated impacted materials.

The SMP will provide guidance on the following issues associated with the site remediation:

- Health and Safety – protocols to ensure workers are adequately protected;
- Environmental – management and monitoring of soil, groundwater, stormwater, noise and dust generated during works;
- Traffic – vehicle movements within, to and from the Site;
- Work and Quality Protocols – approach and verification of works to ensure the reliability of the analytical data generated during validation;
- Acid Sulfate Soils – assessment, management and treatment of acid sulfate soils if required; and
- Contingency Planning – approach to encountering unexpected conditions during site works.

The SMP will be prepared by the remediation contractor in association with the appointed environmental consultant.

6.2.2 Site Works

Preparatory works will be conducted at the site prior to remediation beginning. These works will be detailed in the SMP and include the following:

- Disconnection/blanking off of services which pass through the site;

- Demolition of existing structures;
- Installation of noise and dust monitoring stations and conducting limited background monitoring;
- Installation of decontamination and office sheds;
- Designation of roadways and installation of traffic signs;
- Grading and shaping of the Site and construction of a sediment dam for the management and retention of sediment and stormwater;
- Installation of stormwater discharge equipment (hosing, pumps, meters and sampling ports);
- Briefing Site personnel on the health and safety protocols and related emergency procedures;
- Establish security and visual barriers around the Site; and
- Additional soil sampling and laboratory analysis to allow in-situ classification of soils requiring excavation and off site disposal.

6.3 Remediation Works

Remediation works will comprise removal and disposal of the soils to allow the development construction, or to the extent required by the risk assessment, which ever is greater. As discussed in Section 5.2.3, it is proposed that this material be loaded directly into trucks for off site disposal to landfill.

Depending on the results of the risk assessment, there may also be a requirement to place a layer of clean material in unsealed (landscaped) areas of the site to mitigate potential exposure of future site users to the underlying impacted soils.

Validation/Development Sampling

SECTION 7

7.1 Introduction

Regardless of the volume of soils required to be excavated (on the basis of the results of the human health risk assessment), validation sampling will be conducted to determine the soil chemical concentrations at the limit of the excavation areas. This validation sampling will be conducted to either:

- Ensure remedial goals prescribed by the risk assessment are attained (where remediation works beyond the limit of the development excavation areas are required); or
- Assess the chemical concentrations in soil at the limit of the excavation areas to confirm the validity of the risk assessment (where no remedial works are required).

Under either a remediation or non-remediation approach, sampling of the following materials will be required:

- Soil within the excavation base and walls; and
- Soil used to back fill excavations or as landscaping material.

7.2 Excavation Sampling

The excavations will be sampled following removal of the material as required by the risk assessment. The samples will be collected on a surveyed 20 m grid laid across the base of the excavations. The walls of the excavation will be sampled where the 20 m grid surveyed across the base of the excavation meets the walls. Samples will collected from the upper 0.5 m interval and subsequent 1.5 m intervals down the face of the excavation walls.

Field duplicate samples will be collected at the rate of one duplicate sample for every ten validation samples. Duplicate samples will also be collected for inter-laboratory analysis. All samples collected will be analysed for:

- Inorganics - arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc;
- TPH;
- BTEX;
- PAHs;
- Volatile organic compounds (VOCs); and
- Semi-volatile organic compounds (SVOCs).

A survey of each of the excavation areas will be conducted by a registered surveyor.

7.3 Back Fill and Landscape Material

Material used to backfill or landscape the site will be validated prior importation. Only VENM will be imported to the site. To validate this material, samples will be collected and analysed for:

- TPH;
- BTEX;
- inorganics (arsenic, cadmium, chromium, copper, lead, mercury, zinc);
- organochlorine pesticides (OCP);
- polychlorinated biphenyls (PCBs); and
- other site specific chemicals of concern.

The full analytical suite for the validation samples collected from the potential VENM sources will be determined by a visual inspection and overview of the site history for each source site.

Validation samples will be collected at the rate of 1 sample per 250 m^3 of imported VENM. This sampling density is considered appropriate for sites which, on the basis of site history and site inspection, have no potential sources of contamination. The sampling density will be increased to 1 sample per 100 m^3 of VENM should the source site have an industrial history. However, VENM sourced from industrial sites will only be considered if an environmental assessment or validation report indicates that the site is uncontaminated. Field duplicate samples will be collected for intra-laboratory analysis at the rate of 1 duplicate sample for every 20 validation samples. Field triplicate samples will be collected at the same rate for inter-laboratory analysis.

Material used in the growing medium of landscaped areas should meet the NSW EPA Phytotoxicity Guidelines.

7.4 Reporting

A report will be prepared following the removal of the soils and sampling of the final excavation area. This report will detail the process of remediation and excavation sampling and will be structured in accordance with the requirements of the *Guidelines for Consultants reporting on Contaminated Sites (NSW EPA, 1997).*

An EMP will also be prepared if impacted soils are retained on site.

Limitations

SECTION 8

URS Australia Pty Ltd (URS) has prepared this report for the use of the Sydney Olympic Park Authority (SOPA) in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work dated 18th October, 2002.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between the 26th and 27th of November, 2002 and is based on the information available at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing or other means of sub-surface investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment. The borehole logs indicate the inferred ground conditions only at the specific locations tested. The precision with which conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of conditions as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report and our experience. Future advances in regard to the understanding of chemicals and their behaviour, and changes in regulations affecting their management, could impact on our conclusions and recommendations regarding their potential presence on this site.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, URS must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

This remediation action plan addresses the issues in relation to the remediation works at the site.

This investigation addresses the likelihood of hazardous substance contamination resulting from past and current known uses of the subject facility. Given the limited and mutually agreed scope of work, URS does not guarantee that hazardous materials do not exist at the subject property. Similarly, a property

which appears to be unaffected by hazardous materials at the time of our assessment may later, due to natural phenomena or human intervention, become contaminated.

As a result, certain conditions such as those listed hereafter may not have been revealed:

- naturally occurring toxins in the sub-surface soils, rocks, water or the toxicity of the on-site flora;
- toxicity of substances common in current habitable environments such as stored household products, building materials and consumables;
- sub-surface contaminant concentrations that do not exceed present regulatory standards but may exceed future standards; and/or
- unknown site contamination such as dumping or accidental spillage which may occur following the site visit by URS.

Subsurface conditions can vary across a particular site and cannot be explicitly defined by these investigations. It is unlikely therefore that the results and estimations expressed in this report will represent the extremes of conditions within the site or the conditions at any location removed from the specific points of sampling. Subsurface conditions including contaminant concentrations can also change in a short time.

The information in this report is considered to be accurate at the date of issue and is in accordance with conditions at the site at the dates sampled.

This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of this report.

No warranty or guarantee of property conditions is given or intended. URS makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

References

SECTION 9

ANZECC/ARMANC, 2000 *'Australian Water Quality Guidelines for the Protection Of Aquatic Ecosystems'*;

National Environment Protection Council Service Corporation, 10 December 1999 *'National Environment protection (Assessment of Site Contamination) Measure 1999'*;

New South Wales Department of Mines, 1983 *'1:100 000 Sydney Geological Series Map Sheet 9130'*.

New South Wales Environment Protection Authority, December 1994 *'Guidelines for Assessing Service Station Sites'*;

New South Wales Environment Protection Authority, September 1995 *'Sampling Design Guidelines'*;

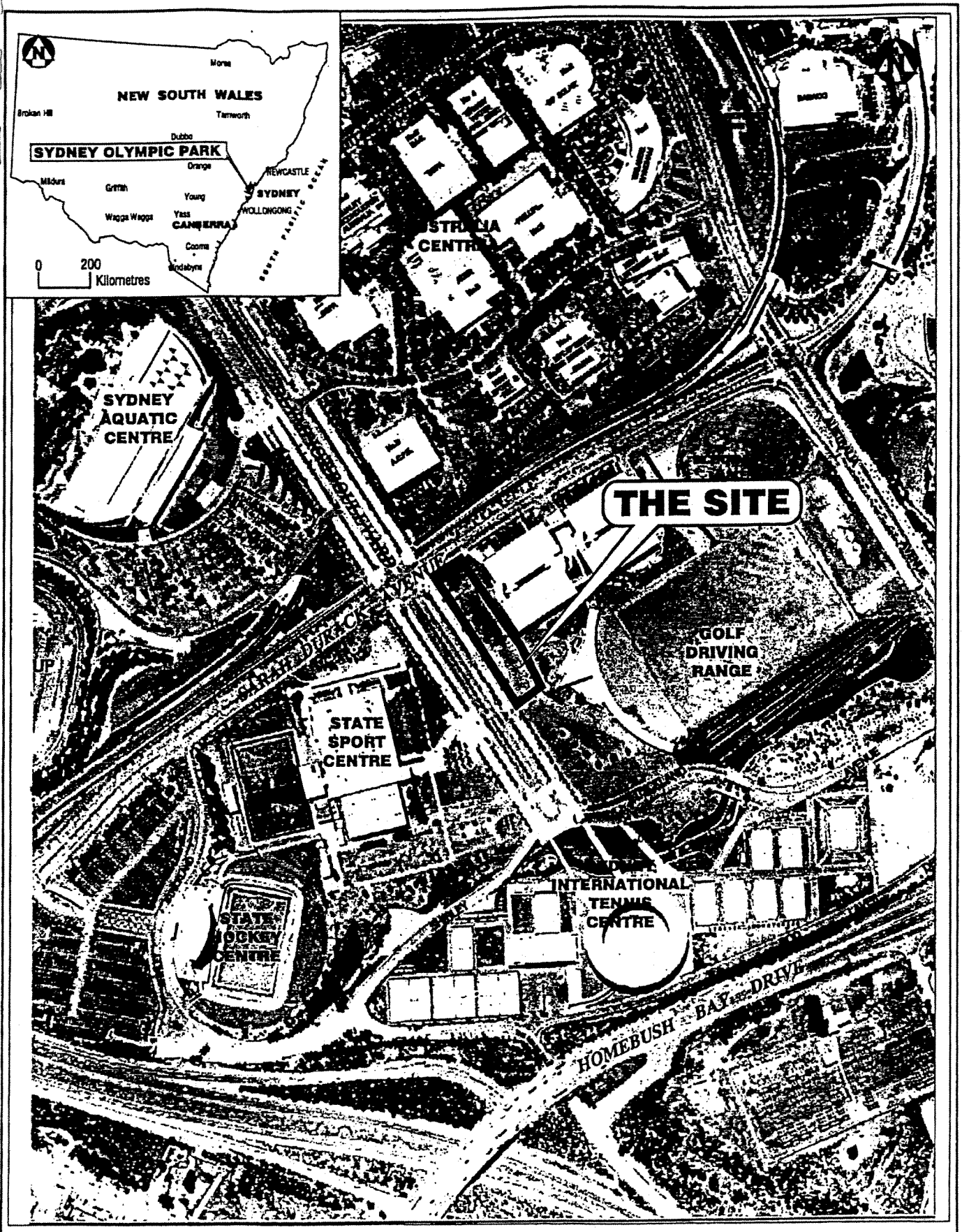
New South Wales Environment Protection Authority, November 1997 *'Guidelines for Consultants reporting on Contaminated Sites'*;

New South Wales Environment Protection Authority, June 1998 *'Guidelines for the NSW Site Auditor Scheme'*;

New South Wales Environment Protection Authority, May 1999 *'Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes'*;

URS Australia Pty Ltd, 27 November, *2002 'Environmental and Geotechnical Investigation - Site 9, Sydney Olympic Park'*.

Figures



CLIENT
SYDNEY OLYMPIC PARK AUTHORITY

PROJECT
DEVELOPMENT SITE 9

TITLE
SITE LOCATION PLAN

A4

0 25 50 75 100 200
metres

DESIGNED: MM	APPROVED:	PROJECT: 50244-004	URS	FIGURE
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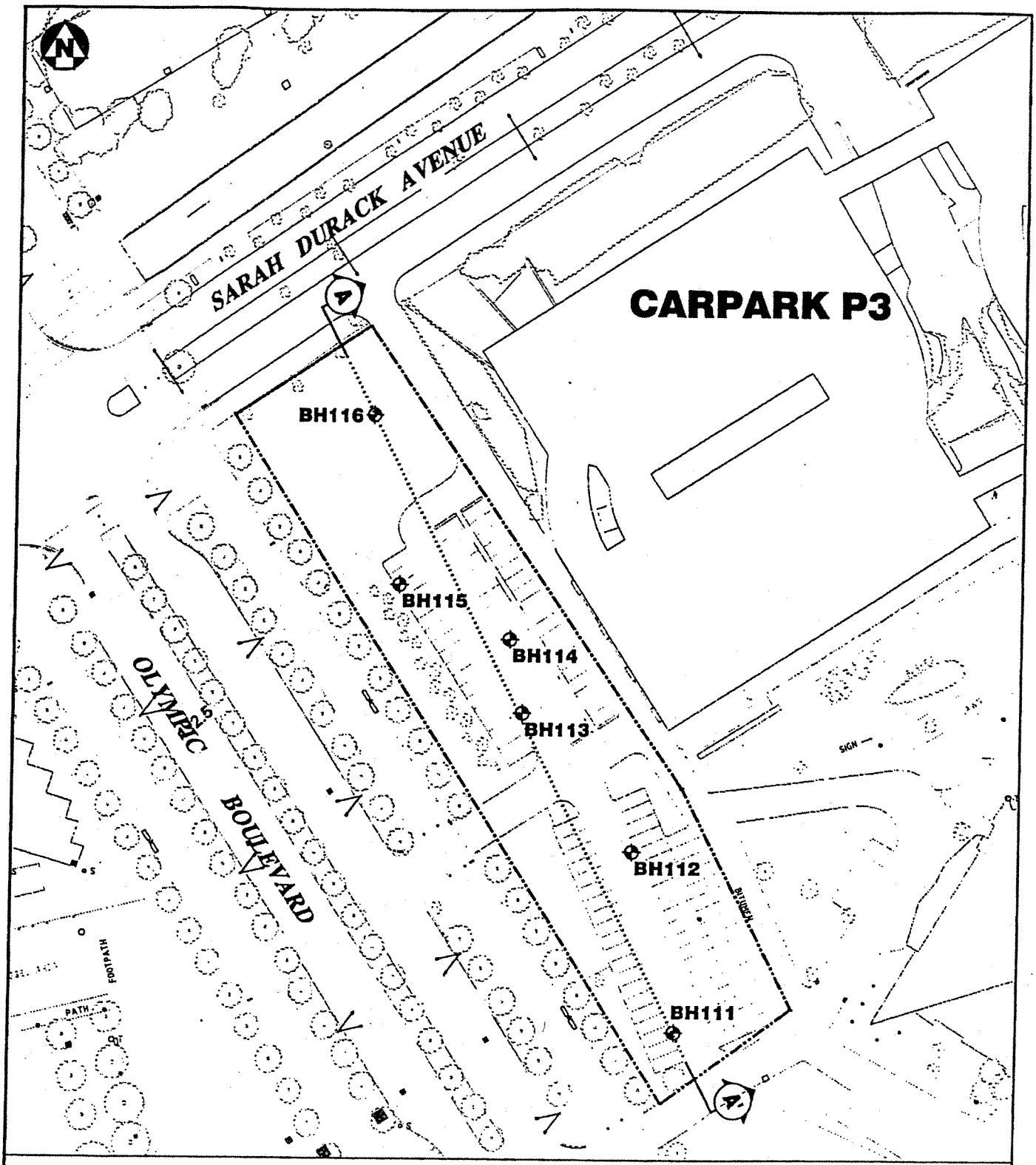
DATE: 19-11-02	STATUS: DRAFT	REVISION: A		



LEGEND

BH116 BOREHOLE LOCATION

SITE BOUNDARY

A CROSS SECTION LOCATION

CLIENT
SYDNEY OLYMPIC PARK AUTHORITY

PROJECT
DEVELOPMENT SITE 9

TITLE
BOREHOLE LOCATION PLAN

A4

0 5 10 15 20 25 50
metres

DESIGNED: MM	APPROVED: MM	PROJECT: 50244-004	URS	FIGURE
DRAWN: HC	DATE: 24/12	CAD FILE: 002.DWG		2
DATE: 19-11-02	STATUS: DRAFT	REVISION: A		

Table 5.1
Soil Analytical Results - Heavy Metals

Sample Location					BH111_4.5	BH111_7.5	BH112_6.0	BH113_3.0	BH114_7.5	BH115_1.5	BH116_6.0
Date					11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02
	Units	LOR	NEPM HIL F	NEPM EIL							
Arsenic	mg/kg	1	500	20	10	10	7	7	6	7	7
Cadmium	mg/kg	1	100	3	***11***	***7***	<1	<1	<1	<1	1
Chromium (VI)	mg/kg	1	500	1	***39***	***54***	***32***	***11***	***11***	***16***	***203***
Copper	mg/kg	1	5000	100	***102***	***111***	22	31	50	41	87
Nickel	mg/kg	1	3000	60	13	21	3	17	35	32	23
Lead	mg/kg	1	1500	600	222	363	49	26	33	38	***892***
Zinc	mg/kg	1	35000	200	***1390***	***1910***	***2460***	69	***289***	118	***1690***
Mercury	mg/kg	0.1	75	1	0.2	0.3	0.2	0.2	0.3	0.2	0.5

Notes:
LOR - Laboratory Limit of Reporting.
NEPM HIL F - Soil Guideline for Sites with Proposed Commerical/Industrial Landuse.
NEPM EIL - Soil Guideline for Ecological Impact Assessment.
1390 - Sample Concentration Above the NEPM EIL.

Table 5.3
Soil Analytical Results - PAHs

Sample Location				BH111_4.5	BH111_7.5	BH112_6.0	BH113_3.0	BH114_7.5	BH115_1.5	BH116_6.0
Date				11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02	11-Nov-02
	Units	LOR	NEPM HIL F							
Polynuclear Aromatic Hydrocarbons										
Napthalene	mg/kg	0.5		<0.5	21	6.4	<0.5	21.8	<0.5	3.9
Naphthalene	mg/kg	0.5		<0.5	12.2	3.3	<0.5	6.2	<0.5	0.9
2-Methylnaphthalene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	2.2	<0.5	<0.5
Acenaphthene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	1.2	<0.5	<0.5
Flourene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	1.8	<0.5	<0.5
Phenanthrene	mg/kg	0.5		<0.5	18	0.6	<0.5	7.1	2	<0.5
Anthracene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	1.5	0.5	<0.5
Flouranthene	mg/kg	0.5		0.6	<5.0	<0.5	<0.5	2	1.7	1
Pyrene	mg/kg	0.5		0.7	<5.0	<0.5	<0.5	3.6	1.6	1.1
N-2-Fluorenylacetamide	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Benz (a) anthracene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	1	0.7	<0.5
Chrysene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	1.1	0.6	<0.5
Benzo (b) & (k) flouranthene	mg/kg	1		<1	<1	<1	<1	<1	<1	<1
7.12-Dimethylbenz(a)anthracene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (a) pyrene	mg/kg	0.5	5	<0.5	<5.0	<0.5	<0.5	0.8	0.5	<0.5
3-Methylcholanthrene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno (1.2.3.cd) pyrene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz (a.h) anthracene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (g.h.I) perylene	mg/kg	0.5		<0.5	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5
PAHs (Total)	mg/Kg	-	100	1.3	51.2	10.3	ND	50.3	7.6	6.9

Notes:
LOR - Laboratory Limit of Reporting.
NEPM HIL F - Soil Guideline for Sites with Proposed Commerical/Industrial Landuse.
ND - Not Detected.

Prepared By: MXM
Checked By: [illegible]

Table 5.5
Soil Analytical Results - TCLP

Sample Location			BH111_7.5
Date			11-Nov-02
	Units	**LOR**	
Benzo(a)pyrene	ug/L	2	< 2
Lead	mg/L	0.1	0.3

Notes:
LOR - Laboratory Limit of Reporting.

APPENDIX 10
ENVIRONMENTAL AND GEOTECHNICAL