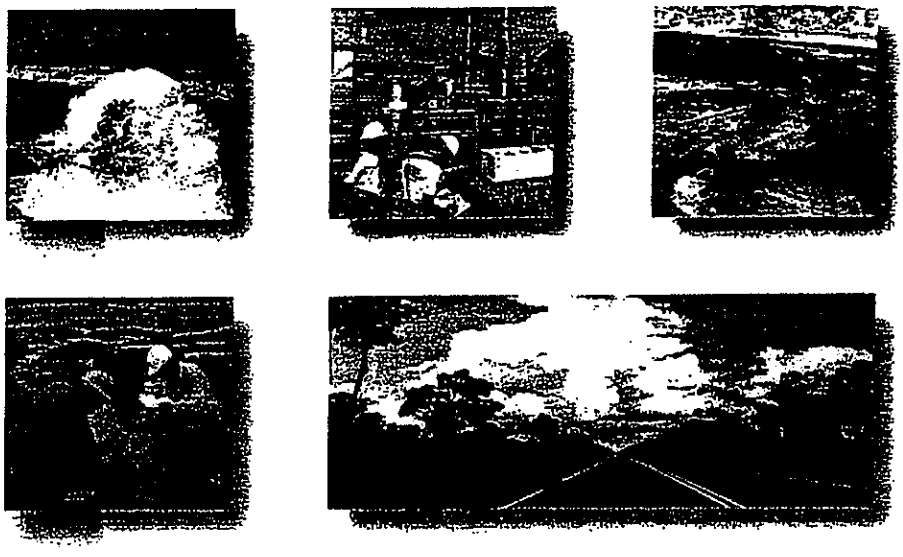
Site Contamination Assessment
Site 3, Sydney Olympic Park Town Centre
Homebush, NSW



HLA-Envirosciences Pty Limited
Environmental, Planning,
Engineering & OHS Services

Site Contamination Assessment
Site 3, Sydney Olympic Park Town Centre
Homebush, NSW

Prepared for:

Sydney Olympic Park Authority
7 Figtree Drive,
Homebush, NSW 2127

HLA-Envirosciences Project No: J1938

by

Rachael Casson
Environmental Scientist

Alex Latham
Senior Environmental Scientist

7 June 2002

DRAFT REPORT

This document was prepared for the sole use of Sydney Olympic Park Authority, and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of HLA-Envirosciences Pty Limited and Sydney Olympic Park Authority.

HLA's professional opinions contained in this report are subject to modification if additional information is obtained, through further investigation, observations, or validation testing and analysis during remedial activities.

From a technical perspective, the subsurface environment presents very substantial uncertainty. It is a heterogeneous, complex environment, in which small surface features or changes in geologic conditions can have significant impacts on water and chemical movement. Major uncertainties also present difficulties in source characterisation assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance.

CONTENTS

FIGURES

TABLES

APPENDICES

DISTRIBUTION

EXECUTIVE SUMMARY

Introduction

HLA-Envirosciences Pty Limited (HLA) was engaged by the Sydney Olympic Park Authority (SOPA) to conduct a Site Contamination Assessment of Development Site Number 3 (herein referred to as Site 3), which is located on Australia between Herb Elliot Avenue and Parkview Drive, Homebush, NSW (Figure 1). The purpose of the investigation was to evaluate any subsurface contamination at the site related, in particular, to the use of imported fill of unknown origin and content on-site. The investigation has been undertaken prior to the possible divestment of the site for future Residential and/or Commercial and Industrial land use as defined by the *Guidelines for the Site Auditor Scheme* (NSW EPA 1998). For future planning purposes, HLA has also used data collected to classify site soils for possible future excavation and off-site disposal of soils excavated for development purposes.

Site History and Use

Review of the available site history documentation indicated that the site has predominantly remained undeveloped since 1930, excluding the use of the site as a livestock holding area (associated with the former State Abattoir) and the filling of a channel in the southern portion of the site.

Previous investigations conducted in the area have not identified Site 3 as a known or possible historic industrial/putrescible landfill or dioxin dumping site.

The northern portion of the site is currently used as a vehicle car park, while the southern portion is open space. The Olympic Park Rail Line defines Site 3's eastern boundary.

Geology and Hydrogeology

The general soil stratigraphy encountered across the site typically comprised mixed fill (predominantly reworked clay with sand, silt and/or gravel) overlying weathered shale grading to unweathered shale. The maximum depth of the investigation (5.4 metres below ground surface (mbgs)) and the greatest depth of fill material (5.2mbgs) was encountered in the northern portion of the site in Borehole BH03. Groundwater was not encountered in the mid or northern portions of the site.

Significant geological differences were noted in the southern portion of the site, specifically in Boreholes BH10 and BH11, where sand was encountered beneath the surface fill to a maximum depth of 4.0m (BH11) and groundwater was encountered (within this sand layer between 1.8m and 2.8mbgs). The groundwater is likely related to a remnant drainage channel, identified in the aerial photograph review of the southern potion of the site, or associated with seepage waters accummulating within a zone of relatively higher permeability.

Sampling Program

Analysis was undertaken of 26 soil samples obtained from 23 sample locations (includes 20 fill samples and five natural soil samples) for a range of potential contaminants of concern including heavy metals, cyanide, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), phenols, organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and Volatile Organic Compounds (VOCs). The analysis did not identify any elevated levels above adopted site evaluation criteria, except for the detection of nickel concentrations above provisional phytotoxicity based investigation levels (PBILs) in the soil sample obtained from the fill material at a depth between 0.9 to 1.0mbgs at BH01, which is located in the northern portion of the site.

Site Suitability and Waste Classification

Subsurface investigations found no evidence of putrescible or industrial waste disposal areas beneath Site 3. The fill material appeared to predominantly comprise reworked soils. No asbestos containing materials were identified.

The results of the investigation indicate that subsurface soil conditions at the site are suitable for either residential land use (with minimal soil access) and or commercial/industrial land use.

If future land development includes the removal and off-site disposal of soil, soils may be disposed of as *Inert Waste*, per NSW EPA (1999) classifications[1].

[1] Although BaP was not detected in any soil sample, HLA note that the PQL for BaP is above the criteria set by the NSW EPA (1999) for *Inert Waste*. However given that elevated TPH concentrations were not reported and no visible signs of PAH contamination were noted (i.e. ash or slag), HLA consider that it is suitable to classify the site soils as *Inert Waste*.

1.0 INTRODUCTION

1.1 Background

HLA-Envirosciences Pty Limited (HLA) was engaged by the Sydney Olympic Park Authority (SOPA) to conduct a Site Contamination Assessment (SCA) of Development Site number 3 (herein referred to as Site 3), which is located at the corner of Australia Avenue and Parkview Drive, Homebush, NSW (Figure 1).

This investigation was preformed to evaluate whether gross contamination to the site soils is present including determination of the extent of landfill materials (if any). The obtained information may assist possible future property divestment.

1.2 Objectives

HLA understood the objectives of this investigation were to:

- Evaluate the condition of the site with regard to potential soil contamination, relating to former site activities and the placement of imported fill of unknown origin /content at Site 3;
- Provide advice on the suitability of the site for proposed Residential (with minimal soil access) and/or Commercial/Industrial development by comparing soil analytical data against the soil investigation levels (SILs) provided in the NSW EPA (1998) Contaminated Site Guideline: Guidelines for the NSW Site Auditor Scheme and National Environment Protection (Assessment of Site Contamination) Measure (NEPM, 1999); and
- Provide preliminary information on soil conditions with respect to possible future off-site disposal by comparing results to the NSW EPA (1999) Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes.

HLA notes that per SOPA directives, the scope of work performed during this assessment will not necessarily fulfill all requirements of the NSW EPA Guidelines for the NSW Site Auditor Scheme, the work conducted however, will satisfy the objectives outlined above.

2.0 SCOPE OF WORK

The following scope of work was completed during the course of the investigation:

- Review of background (site history, land use and previous environmental investigations undertaken) information on the site, as provided by SOPA. Because of the availability of historical information, a historical title search was not performed.
- Soil sampling from 23 soil bore locations across the site (BH01 to BH23);
- An analytical program incorporating analysis for heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc, mercury, beryllium and manganese) total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, total xylenes (BTEX), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), poly aromatic hydrocarbons (PAHs), total phenols and volatile organic compounds (VOCs); and
- Preparation of this report, detailing the methodologies used, review of the results and conclusions regarding the land use suitability of the site.

All investigative work was conducted in accordance the following applicable guidelines:

NSW EPA (1995) Sampling Design Guidelines – were generally followed during design of the sampling and analysis plan and predetermination of data quality objectives (DQOs).

NSW EPA (1998) Guidelines for the NSW Site Auditor Scheme – were used to apply the NSW EPA decision processes for assessing redevelopment of urban sites.

NSW EPA (1997) Guidelines for Consultants Reporting on Contaminated Sites – were generally followed throughout the investigations and during preparation of this report.

NEPM (1999) Assessment of Site Contamination – was considered throughout the entire investigation.

ANZECC (1996) Guidelines for the Laboratory Analysis of Contaminated Soils – were used to ensure laboratory analysis of samples obtained from the site was conducted using appropriate methods to acceptable levels of accuracy and precision.

3.0 SITE DESCRITPTION

Site 3 comprises an area of approximately 1.2ha, of which approximately 80% is covered with healthy looking grass (excluding the grass sprayed with weed control around the perimeter of the fence) and the remaining 20% is covered with a mixture of asphalt and gravel surfaces, which is currently utilised for vehicle parking. Site 3 is also sparsely covered with established fig trees, which appeared to be healthy and not suffering stress. The site is not occupied by any building or infrastructure and no other notable activities/operations were observed. Site 3 is located immediately adjacent the Olympic Park rail corridor. The current site layout and boundaries are depicted on Figure 2.

The topographical grade of Site 3 slopes toward the south east. The surface of the site comprises three distinct levels:

- The highest is the asphalted car park in the northern portion of the site (BH05, BH06, BH07).
- The second highest level is at the entrance to the site (Parkview Avenue) and the gravel surfaced car park (BH01, BH02, BH03 and BH04).
- The lowest level is situated in the southern portion of the site.

The car park areas were identified during the site inspection to likely contain the greatest amounts of fill. This is consistent with information provided by SOPA to HLA. It is understood that *"from previous site investigation work undertaken in 1990, it is known that the depth to residual clay soil is 1-2 metres from the surface"* although *"since this investigation was undertaken, the area has been re-worked during the Olympic development period. In particular, a significant amount of clean fill material has been used to build up the levels of Site 3"*.

SOPA have not provided the legal description of the site nor the current zoning.

4.0 SITE HISTORY

The following site history information was compiled from information supplied by SOPA.

4.1 Previous Investigations

Numerous environmental investigations have been conducted in the Homebush Bay area. The following reports were reviewed by HLA and contained information pertinent to the subject site.

Coffey Partners International Pty Ltd (Coffey) – Soil and Groundwater Contamination Investigation Volume 1 – Introduction and Summary, 1991.

This report provides an introduction to the entire environmental investigation conducted by Coffey across an area of 660ha, including and around Site 3. The only pertinent information provided that is significant to this investigation included:

- No soil sampling was conducted in Site 3.
- The likelihood that dioxin dumping was conducted at varying locations across Homebush Bay. The dioxins were sourced from the former Union Carbide site at Rhodes.
- Geology of the region comprised: fill overlying weathered shale that graded to shale proper; that was underlain by Sandstone.
- Regional groundwater flow direction generally followed local topography as well as being significantly influenced by the brick pit.

Coffey Partners International Pty Ltd (Coffey) – Soil and Groundwater Contamination Investigation Volume 2 – Historical Research, 1991.

Coffey reviewed various council records, State Government records, previous investigations and aerial photographs for the Homebush Bay area. The review concentrated on identifying landfill operations. Numerous filled areas were identified, however Site 3 was not located in any of these areas. No other pertinent information was obtained for Site 3.

CH2MHILL Australia Pty Ltd (CH2MHILL) – Olympic Site – Homebush Bay, Dioxin Review Report, 1997.

This report identified areas around Homebush Bay that dioxins were known or suspected to have been dumped. Site 3 was not among these areas. No other pertinent environmental information relating Site 3 was noted.

Johnstone Environmental Technology (JET) – Report on Investigations into Possible Acid Contamination in Soils at the Detention Basin Bank, Australia Centre, Homebush.

JET investigated an 'unsubstantiated' rumour that drums of battery acid were buried in a trench along the south western bank of the detention basin (approximate location of HLA Borehole BH11). JET did not identify the presence of acids within soils in this area.

4.2 Aerial Photographs

The following information was derived from reviewing copies of historical aerial photographs for the site and surrounding area. The copied photographs were provided by SOPA[2].

Photograph Details	Description
1930 Black and White	The site is clear of both vegetation and infrastructure. A drainage line transects the southern portion of the site in a south west to north east direction. It is unclear where the channel ends. Surrounding land use comprises a mix of agricultural, commercial/industrial (includes brick pit and abattoir)
1942 Black and White	The aerial photograph is grainy and of poor quality. It is evident, however, that the site remains undeveloped. The edges of the drainage line are evident, although lack of reflective surfaces and visible trees in the channel suggests that the channel does not contain water or has been filled. Surrounding land use remains the same.
1955 and 1965 Black and White	The site and surrounding land use remains predominantly the same as 1942.
1978 Black and White	The site appears to be occupied by live stock holding areas. The channel, running across the site is still evident, however the upper reaches, to the south have been notably filled. Regionally commercial/industrial land use has increased.
1995 Colour	The site appears as it is in 2002. The rail line that currently exists on the eastern boundary of the site. The entire channel has been completely filled and no longer evident. The development of 2000 Olympic infrastructure has increased in the region.

4.3 Site History Summary

From the limited site history investigation[3], Site 3 appears to have been predominantly undeveloped between 1930 and 2002. Exceptions include the construction of the rail line adjacent the Site's eastern boundary after 1995, use of the site as a live stock holding area during the operation of the former state abattoir, and the filling of the drainage channel in the southern portion of the site. No other filling was evident.

Review of pertinent literature indicates that no known or suspected industrial/putrescible landfills are present beneath Site 3.

[2] As the photos supplied were photomontage copies and not original stereopairs, HLA has not stereoscopically viewed the photos and therefore can not evaluate site surface level changes.

[3] The agreed scope of work did not include the review of historical land ownership records, council information or NSW EPA records.

5.0 SITE CONDITION AND SURROUNDING ENVIRONMENT

5.1 Surrounding Land Use

Land use surrounding the site is summarised as follows:

- East - The site is bounded by the Olympic Park Rail corridor with commercial/industrial land opposite. The south eastern section of the rail line is higher than the nearby surface level of the site and the north eastern section is lower.
- South – Olympic Park Rail line with a water retention collection pit opposite.
- West – Australia Avenue with commercial/industrial properties opposite.
- North – Parkview Drive with a groundlevel car park opposite.

5.2 Visible Evidence of Contamination

Other than evidence of filling, no other visual evidence of contamination was noted, including surface staining and/or chemical storage. No evidence of plant stress was noted.

5.3 Topography and Drainage

The site and regional topography slopes predominantly to the south east. A surface depression was noted in the middle of the lower section of the site (i.e. the southern portion). Aerial photographs reveal a drainage collection area to the south of the site and it is expected that surface drainage flows to this point.

6.0 GEOLOGY AND HYDROGEOLOGY

6.1 Regional Geology

The regional geology of the site consists of Middle Triassic aged Ashfield Shale of the Wianamatta Group (DMR 1983a). The Ashfield Shale consists of black to dark grey shale and laminite (DMR 1983a). Ashfield Shale is generally deeply weathered, producing low permeability clays and silts (DMR 1983b).

Major exposure of the Ashfield Shale can be seen in the nearby brick pit to the north.

Review of the Coffey (1991) soil and groundwater investigation of the area indicates that Hawkesbury Sandstone lies at depth beneath the Ashfield Shale (>15m).

6.2 Site Lithology

Borehole logs from HLA's site investigation describing the shallow subsurface soil profile encountered during the investigation are included in Appendix A. Generally the soil strata comprised fill material overlying stiff silty clay grading to weathered shale and shale (bedrock). As anticipated from site observations, the depth of soil fill material was typically greatest in the north western portion of the site. The maximum depth of fill recorded at the site was 5.2 metres below ground surface (mbgs) in BH03. The fill material predominantly comprised reworked clay, sand, silt and gravel and may be related to earthworks associated with the development of the region for the 2000 Sydney Olympics. Asbestos containing material was not observed in the fill material during the subsurface investigation.

The natural soil profile consisted of predominantly stiff red/brown or red/grey, low to medium plasticity clay grading to low to high strength shale bedrock.

Saturated soils (associated with perched water) were encountered in two boreholes, BH10 and BH11, at depths of 1.8 and 2.8mbgs respectively, within the sand strata. The groundwater is possibly associated with the filled remnant drainage line, identified in the review of historic aerial photographs or related to seepage water accumulating within a zone of relatively higher permeability.

The encountered geology and hydrogeology is consistent with previously conducted investigations and published geological information for the site.

6.3 Regional Hydrogeology

The scope of work did not include a search of registered water bores by the DLWC groundwater bore database, therefore HLA does not know if groundwater is utilised in the vicinity of the site.

Previous groundwater studies conducted in the vicinity of Site 3, indicate that there are two distinct non-connected groundwater systems, a shallow discontinuous perched aquifer within the fill material and a deeper aquifer within the fractures of the shale bedrock.

Previous groundwater investigations also conclude that the natural groundwater flow direction has been greatly influenced by the open cut brick pit t, which behaves as a receiving sink/basin.

Any groundwater occurring in the shales and clays underlying the site is likely to be confined to zones of relatively higher permeability (i.e. fractures, clayey gravel and sandy clays) and therefore limited in extent.

6.4 Site Hydrology

As previously stated in Section 6.2, perched groundwater was encountered during site investigation in two borehole locations only (BH10 and BH11), within the natural poorly sorted sand layer. From review of historical aerial photographs of the site, it appears that a creek historically drained through the southern portion of the site.

Groundwater was not encountered at any other sampling locations, conducted to a maximum depth of 5.4mbgs.

7.0 POTENTIAL AREAS AND CONTAMINANTS OF CONCERN

Based on the available site history and the site inspection the contaminants of concern associated with the imported fill material potentially include:

- Total petroleum hydrocarbons (**TPHs**) and benzene, toluene, ethylbenzene and xylenes (**BTEX**).
- Organochlorine pesticides (**OCPs**).
- Polychlorinated biphenyls (**PCBs**).
- **Heavy metal** (including arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel and zinc).
- Polycyclic aromatic hydrocarbons (**PAHs**) and total **phenols**.
- Volatile organic compounds (**VOCs**).

8.0 SAMPLING AND ANALYSIS PLAN

The site occupies an area of approximately 1.2 ha. The number of sampling points conducted (23) complies with the recommended minimum density required by the NSW EPA (1995) Sampling Design Guidelines (21 for 1.0ha and 25 for 1.5ha). The number of locations selected is considered appropriate to achieve the primary objective of the investigation, which is to provide an indication of the extent and location of potential contamination (if any) on site. An approximate 23 m grid pattern was used during the investigation so as to detect a circular hot spot diameter of approximately 27 metres with 95% confidence. The sampling analysis plan developed is considered to meet the objectives of the SCA requirements.

Field sampling was conducted in accordance with HLA's in-house sampling procedures. The methodology adopted for the field program is described below:

- Sampling of soil from 23 boreholes (designated BH01 to BH23). Boreholes were drilled using a I-350 rotary drill rig with solid flight augers. Augers were advanced to the depth of native soils or refusal. The maximum depth of the investigation was 5.4mbgs at BH03.
- A new pair of disposable nitrile gloves were worn for the collection of each individual sample to eliminate cross contamination whilst handling the soil.
- Samples were collected from the surficial material and at one metre intervals and/or at targeted levels (depending on noted lithology changes or suspected contamination).
- Samples were packed into acid washed, solvent rinsed laboratory supplied jars sealed with a teflon lined screw top lid, labelled and immediately placed on ice in a chilled cooler.
- Samples were transported on ice to Australian Laboratory Services (ALS) and Labmark Laboratories Pty Ltd (Labmark) under chain of custody protocols.
- Sampling equipment was decontaminated prior to the collection of each individual sample to minimise the risk of cross contamination. Decontamination consisted of washing the equipment with a phosphate free detergent solution (Decon 90) followed by rinsing with potable water.
- Screening of soil samples for volatile organic compounds (VOCs) was undertaken in the field using a portable photo-ionisation detector (PID). The PID was calibrated with isobutylene gas (103 ppm) before each day of field sampling was undertaken (a record of calibration is included in Appendix A).
- Boreholes were reinstated using auger cuttings and resurfaced with concrete where necessary in paved areas.
- Detailed borehole logs were maintained by the field scientist during drilling and are included in Appendix A.

Per SOPA's requested scope of work groundwater testing was not conducted.

A summary of the sample analytical program is tabulated below:

Sample Location	Depth Interval (m)	Sample Type	Analyses Conducted					
			TPH / BTEX	Metals	PAHs & Phenols	OCPs / PCBs	VOCs	Cyanide
BH01	0.9 - 1.0	Push Tube	✓	✓		✓		
DUP01	DUP of BH01_0.9-1.0	Push Tube	✓	✓		✓		
BH02	0-0.2	Grab		✓				
BH03	1.8 – 2.0	Grab	✓	✓				
BH04	0.4 – 0.5			✓				
BH05	0.4 – 0.5	Grab		✓	✓	✓		✓
DUP02	DUP of BH05_0.0-0.4	Grab		✓				
BH06	0 – 0.3	Grab		✓				
BH06	0-0.3Lab	Grab		✓				
BH07	0.9 – 1.0	Grab		✓				
BH08	0.9 – 1.0	Grab		✓	✓			✓
BH09	2.8 – 3.0	Grab		✓				
BH10	1.8 – 2.0	Grab	✓	✓			✓	
BH11	3.8 – 4.0	Grab		✓	✓			✓
BH12	0 – 0.2	Grab		✓				
BH13	0.8 – 1.0	Grab		✓				
BH14	0 – 0.2	Grab	✓	✓		✓		
BH15	1.8 – 2.0	Grab		✓	✓			✓
BH16	0.8 – 1.0	Grab		✓				
BH17	0.8 – 0.9	Grab		✓		✓		
BH18	1.7 – 2.0	Grab		✓				
BH18	3.3 – 3.6	Grab		✓				
BH19	0.8 – 1.0	Grab		✓			✓	
BH20	0.1 – 0.3	Grab		✓				
BH21	0 – 0.2	Grab		✓				
BH22	0 – 0.2	Grab		✓				
BH23	0.03 – 0.2	Grab	✓	✓	✓	✓		✓
BH23	1.8 – 2.0	Grab	✓					
QW01	-	Rinsate sample	✓	✓	✓			

Note:
Metals are As, Be, Cd, Cr, Cu, Hg, Mn, Ni, Pb and Zn, unless noted otherwise.

The primary laboratory retained for the project was ALS of Smithfield, NSW, while the secondary laboratory Labmark Laboratories Pty Ltd (Labmark). ALS and Labmark (and the sub-contracted laboratory, Sydney Analytical Laboratories (SAL)) are NATA accredited for all analyses conducted. All analysis and Laboratory QC was conducted in accordance with Schedule B(3) NEPM Guideline on Laboratory Analysis of Potentially Contaminated Soil (December 1999). Further laboratory information regarding analytical methods and internal QA/QC are provided in Appendix B.

9.0 QUALITY ASSURANCE AND CONTROL

9.1 QA/QC and Data Validation

A QA/QC program was designed to evaluate the overall quality and reliability of the data used in this assessment, including whether sampling and laboratory analysis procedures conducted were appropriate. Further detail is provided in Appendix B and includes the Data Quality Objectives (DQOs) for this investigation.

9.2 Data Useability

Based on an assessment of field and laboratory QA/QC data (refer Appendix B), the field investigation procedures and reported analytical results are considered to have produced valid and representative concentrations of the analysed compounds at the sample locations tested.

10.0 BASIS FOR ASSESSMENT CRITERIA

10.1 Soil Evaluation Criteria

The current assessment criteria used in NSW to evaluate soil analytical results are based on the NSW EPA (1998) *Guidelines for the NSW Site Auditor Scheme*, NSW EPA (1994) *Guidelines for Assessing Service Station Sites* and the National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM 1999). These combined guidelines present a range of Health-Based Soil Investigation Levels (SILs), provisional Phytotoxicity-Based Investigation Levels (PBILs), Ecological Investigation Levels (EILs), sensitive land use thresholds and expected background concentration ranges for urban redevelopment sites in NSW. Application of these guidelines is briefly described below.

SILs

The SILs described in the NSW EPA (1998) and NEPM (1999) guidelines are based on the National Environmental Health Forum (NEHF) levels devised by Imray and Langley (1996). A series of guideline levels are provided for various substances for the protection of human health based on four specific land use and exposure scenarios including:

- SIL_1 Residential with gardens and accessible soil (home-grown produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day care centres, preschools and primary schools, or town houses or villas.
- SIL_2 Residential with minimal access to soil including high-rise apartments and flats.
- SIL_3 Parks, recreational open space, playing fields including secondary schools.
- SIL_4 Commercial or industrial.

PBILs & EILs

The PBILs (NSW EPA 1998) and EILs (NEPM 1999) have been devised for the protection of plants, and are designed to be applied as single number criteria indicative of environmental effect. Their use has significant limitations since phytotoxicity depends on soil and species parameters; therefore they are intended to be applied as a screening guide only. The NSW EPA decision process for assessing urban redevelopment sites stipulates that the PBILs need to be considered on sites used for either residential purposes, or land uses including parks, recreational open space and secondary schools.

NSW EPA (1994) Sensitive Land Use Guidelines

For the assessment of petroleum hydrocarbon contamination, the NSW EPA (1998) guidelines refer to the use of the NSW EPA (1994) *Guidelines for Assessing Service Station Sites*. These guidelines contain threshold concentrations for contaminants in soil and provide for the protection of human and environmental health assuming a sensitive land use. SILs specifically for the lower volatility aliphatic and aromatic petroleum hydrocarbon components are provided in NEPM (1999) for the various land use scenarios described above.

The NSW EPA assessment process also stipulates that aesthetic issues, impact of contaminants on ground and surface water, potential degradation of building structures and affects of chemical mixtures need to be considered.

Adopted Site Evaluation Criteria

Based on proposed future land uses of the site, for either residential (with minimal soil access) or commercial land use, the analytical results obtained during the investigation have been compared to both the NSW EPA (1998) SIL_2 and SIL_4 guidelines in conjunction with the NSW EPA (1994) sensitive land use guidelines. Soil data has also been compared to SIL_5 (PBILs) guideline values to determine suitability of the soil for plant growth. The site evaluation criteria have been appended to the tables of analytical results (Tables 1 to 5) for comparison.

11.0 RESULTS

11.1 On-site Volatile Organic Compound (VOC) Screening

VOC concentrations were measured in the field using a calibrated photoionisation detector (PID), as a field screening device to identify potentially contaminated soils. The PID was used to test headspace vapours in samples stored in plastic zip lock bags. VOCs greater than 5.0ppm (levels below 5.0ppm are regarded as background levels) were not detected in any of the soil samples screened. All VOC screening results are provided on the bore logs in Appendix A.

11.2 Soil Analytical Results

The results of the laboratory analysis of soil are presented in Tables 1 to 5. Laboratory analytical reports and chain of custody documentation are provided in Appendix B. Figure 2 illustrates all soil sample locations. Results are summarised below.

11.3 Heavy Metals and Cyanide – Table 1

A total of 26 soil samples plus three duplicate samples were submitted for analysis. All detected metals concentrations (Table 2) were below NSW EPA SIL_2 and SIL_4 guidelines.

Nickel concentrations exceeding PBIL in BH01 at a depth between 0.9 and 1.0mbgs. A statistical analysis of nickel data for the site indicated that there is a 95% probability that the arithmetic average concentration of nickel in the fill material across the site will not exceed 36mg/kg. As this concentration is significantly below PBIL criteria of 60mg/kg (refer Table 9). This hot spot exceedance is considered acceptable in terms of size and proposed future land use.

Using total metal concentrations in conjunction with Toxicity Characteristic Leaching Procedure (TCLP) results the fill material is classified as *Inert Waste* per NSW EPA (1999) criteria, as all concentrations are below the maximum values for leachable concentration (TCLP1) and total concentration (SCC1).

11.4 TPH and BTEX – Table 2

A total of seven samples (including one duplicate sample) were analysed for TPH and BTEX. Concentrations of both TPH and BTEX were below NSW EPA sensitive land use criteria and the maximum total concentration for *Inert Waste* (SCC1) guidelines in all samples submitted. It is noted that TPH concentrations (596mg/kg), below site evaluation criteria, were detected in BH23 at a depth between 0.03 and 0.2m.

11.5 PAHs and Phenols – Table 3

A total of five samples were analysed for PAHs and total phenols. Analytical testing of the select samples did not detect either PAH or phenol concentrations above laboratory PQLs, and were therefore below SIL_2 and SIL_4 guidelines.

Total PAH concentrations were also below SCC1, while reported benzo (a) pyrene (BaP) concentrations were below the maximum total concentration without TCLP (CT2 - Solid Waste)[4].

11.6 OCPs and PCBs – Table 4

A total of six samples (including one duplicate sample) were analysed for OCPs and PCBs. All samples analysed reported concentrations of OCPs and PCBs below laboratory practical quantitation limits and therefore below SIL_2 and SIL_4 guidelines.

OCP concentrations were also below CT1, while PCB concentrations were below SCC1, classifying the soil as *Inert Waste (NSW PA, 1999)*.

11.7 VOCs – Table 5

Two samples were tested for VOCs. Laboratory testing did not detect VOCs above laboratory practical quantitation limits in either sample.

12.0 ASSESSMENT OF RISK

Based on the results of this investigation, soil conditions at the site do not pose a significant risk of harm to human health as defined in the NSW EPA Guidelines on Significant Risk of Harm and the duty to report. The elevated nickel concentration, encountered at one location only (BH01), above provisional phytotoxicity based investigation levels, is not considered significant in the context of the investigation as:

- The sampling plan conducted enables detection a circular hot spot with a diameter of approximately 27 metres with 95% confidence;
- Stressed vegetation was not observed within a 27m diameter of BH01 where elevated nickel concentrations were noted (note the Fig tree in the north western corner of the site, see Figure 2). In addition, the general healthy condition of grasses covering the site, indicates that there is unlikely to be a phytotoxicty issue in site soils;
- Future site use includes mixed residential with minimal soil access and commercial/industrial, indicating likely limited vegetation establishment at the site; and

[4] HLA note that the PQL for BaP is above the criteria set by the NSW EPA (1999) for *Inert Waste*.

- Based on statistical analysis of the nickel data generated by this study, there is a 95% probability that the arithmetic average concentration of nickel in the fill material will not exceed 36mg/kg, which is significantly below PBIL criteria of 60mg/kg (refer Table 9).

HLA notes the limitations of using total metal concentrations alone to determine site phytotoxicity issues. Given the above observations, however, HLA does not consider further site specific testing is warranted.

HLA considers that the potential for impact from observed site sources to site groundwater is low, given the following:

- The absence of soil impact at the site, particularly in the fill material; and
- Leachability of metals is low, as was proven by the limited TCLP testing results;
- Perched groundwater was encountered in the southern portion of the site in two borehole locations only, BH10 and BH11. The groundwater encountered here is inferred to be associated with the remnant creek that drained toward Homebush Bay. Groundwater in the northern portion of the site is expected to exist at depth (<10mbgs) in shale; and
- The shale (proper) bedrock encountered beneath the majority of the site is of low permability reducing the vertical and horizontal movement of any contaminants.

13.0 CONCLUSIONS

Mixed fill material was encountered at variable depths across the site and predominantly comprised reworked clays with sand, silt and gravel. There was no evidence of putrescible or industrial waste disposal areas. No asbestos containing materials were observed.

The results of the investigation indicate that subsurface soil conditions at the site are suitable for either residential land use (with minimal soil access) and or commercial/industrial land use.

If future land development includes the removal and off-site disposal of soil, soils may be disposed of as *Inert Waste*, per NSW EPA (1999) classifications[5].

[5] Although BaP was not detected in any soil sample, HLA note that the PQL for BaP is above the criteria set by the NSW EPA (1999) for *Inert Waste*. However given that elevated TPH concentrations were not reported and no visible signs of PAH contamination were noted (i.e. ash or slag), HLA consider it suitable to classify the waste as *Inert Waste*.

14.0 REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC, August 1996), *Guidelines for the Laboratory Analysis of Contaminated Soils*.

Coffey Partners International Pty Ltd (1991). *Homebush Bay Soil and Groundwater Contamination Investigation Volume 1 – Introduction and Summary*. Report No.:E104/1-FA. June 1991.

Coffey Partners International Pty Ltd (1991). *Homebush Bay Soil and Groundwater Contamination Investigation Volume 2 –Historical Research*. Report No.:E104/1-FA. March 1991.

Coffey Partners International Pty Ltd (1991). *Homebush Bay Soil and Groundwater Contamination Investigation Volume 5 – Groundwater*. Report No.:E104/1-FA. May 1991.

CH2MHILL Australia Pty Ltd (1997). *Dioxin Review Report – Olympic Site – Homebush Bay*. Report No.: 100926.003. July 1997.

Johnstone Environmental Technology (1994) – *Report on Investigations into Possible Acid Contamination in Soils at the Detention Basin Bank, Australia Centre, Homebush*. JET 0281-03, Sept'

NEPM 1999. *National Environmental Protection Measure (Assessment of Site Contamination)*. National Environment Protection Council, December.

NSW Environment Protection Authority (December 1994), *Guidelines for Assessing Service Station Sites*.

NSW Environment Protection Authority (September 1995), *Sampling Design Guidelines*.

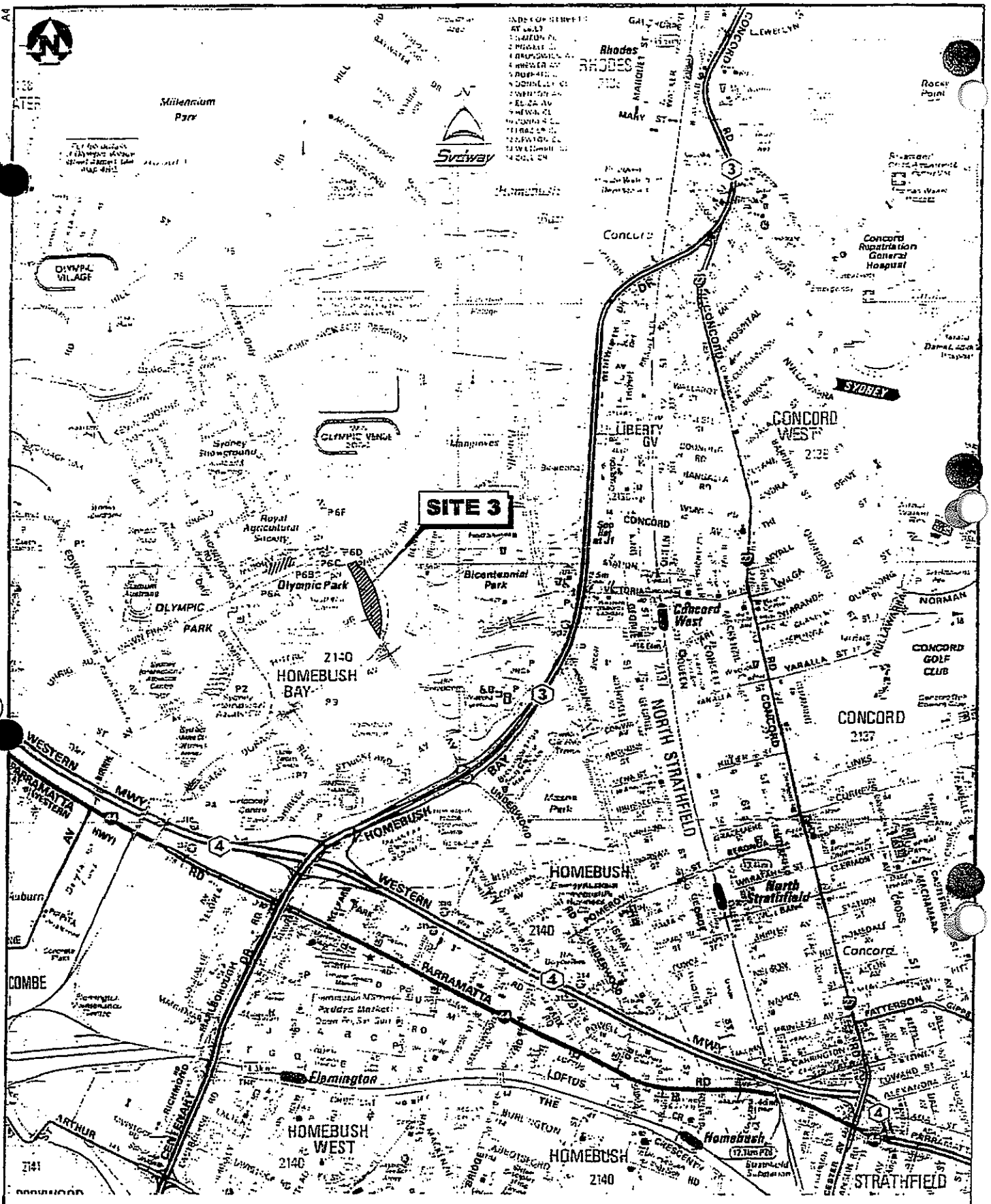
NSW Environment Protection Authority (November 1997), *Guidelines for Consultants Reporting on Contaminated Sites*.

NSW Environment Protection Authority (June 1998), *Guidelines for the NSW Site Auditor Scheme*.

NSW Environment Protection Authority (May 1999), *Assessment, Classification and Management of Liquid and Non-Liquid Wastes*.

Imray, P. And Langley, A. (1996), *Health-Based Soil Investigation Levels*. National Environmental Health Forum Monographs, Soil Series No 1. South Australia Health Commission, Adelaide.

FIGURES



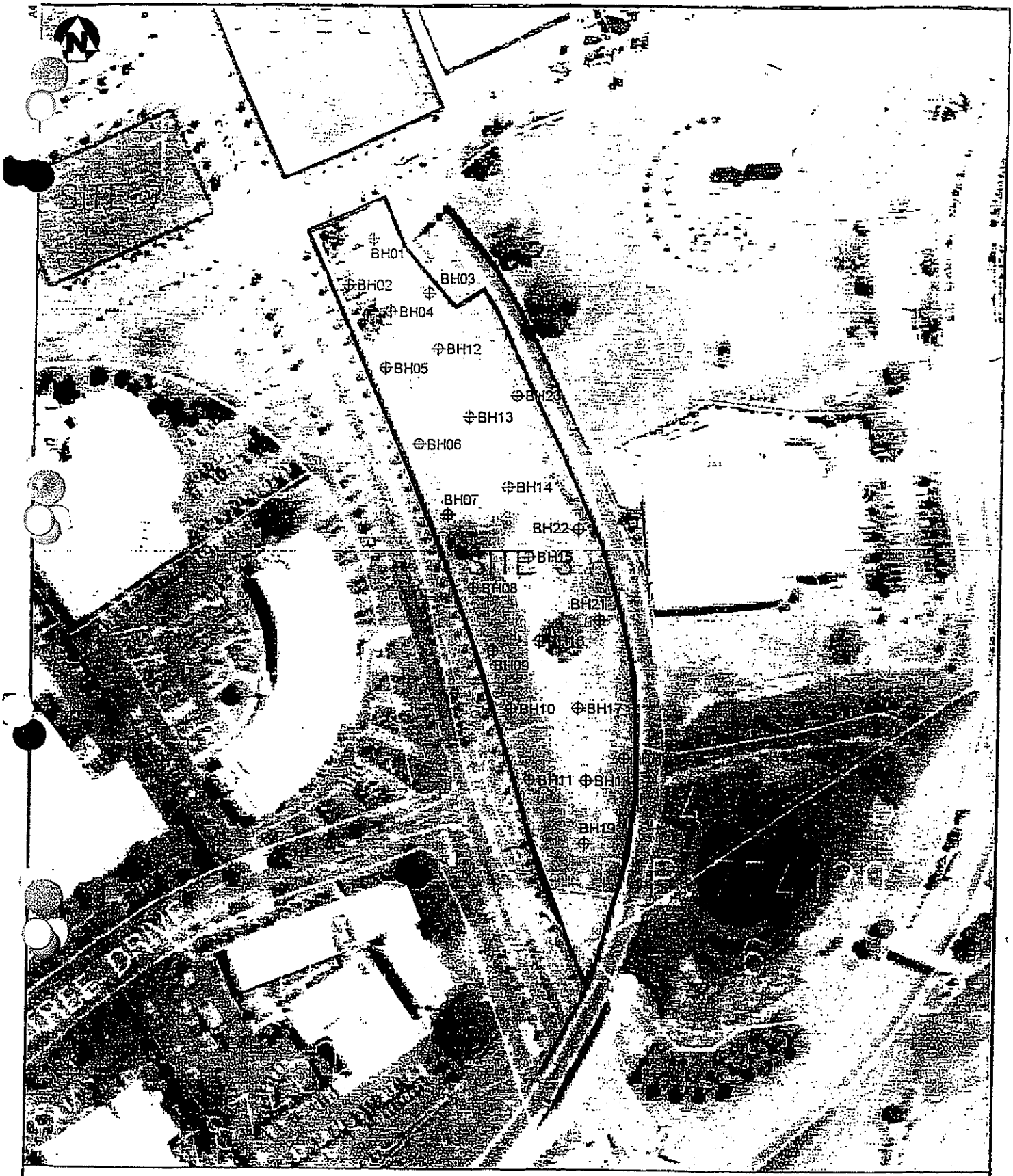
Reference: Sydways Map 274, New South Wales.

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble, NSW 2073
61 2 9988 4422

SITE LOCATION MAP
Sydney Olympic Park Authority
Sample and Analysis Plan
Homebush Bay, New South Wales

FIGURE 1

DRAWN	PROJECT-FILE NUMBER	APPROVED	DATE	REVISED DATE
LJE	J1938-003		June 2002	



LEGEND

⊕BH01 BOREHOLE SAMPLE LOCATION

0 25 50 75 100
metres

Source: Plan supplied by Sydney Olympic Park Authority.

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble, NSW 2073
61 2 9988 4422

SITE LAYOUT & SAMPLING LOCATION PLAN
Sydney Olympic Park Authority
Contaminated Site Assessment - Site 3
Homebush Bay, New South Wales

FIGURE **2**

DRAWN	PROJECT-FILE NUMBER	APPROVED	DATE	REVISED DATE
LJE	J1938-001		May 2002	

TABLES

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct	NSW EPA Guidelines						SITE 3				
Sample ID							BH01_0.9-1.0		DUP01	BH02_0-0.2	BH03_1.8-2.0
Depth (mbgs)							0.9-1.0		BH01_0.9-1.0	0-0.2	1.8-2.0
Material Type	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	Fill	Fill	Fill	Fill	Fill
Date Sampled							13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(SIL_2) (mg/kg)	(SIL_4) (mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)
As	400	500	20	10	0.5	500	3	----	2	11	6
Be	80	100	3	2	0.1	100	<1	----	<1	<2	1
Cd	80	100	NA	NA	0.1	100	<1	----	<1	<2	<1
Cr	NA	NA	NA	NA	NA	NA	137	----	164	23	10
Cr VI	400	500	400	10	0.5	1900	<1	<0.01	----	<1	----
Cu	4000	5000	100	NA	NA	NA	49	----	47	76	33
Mn	6000	7500	NA	NA	NA	NA	851	----	945	1160	769
Ni	2400	3000	60	4	0.2	1050	[redacted]	<0.1	130	52	16
Pb	1200	1500	600	10	0.5	1500	5	<0.1	4	64	35
Zn	28000	35000	200	NA	NA	NA	62	----	56	123	79
Hg	60	75	1	0.4	0.02	50	<0.1	----	<0.1	<0.2	<0.1
Cyanide	2000	2500	-	32	1.6	5900	<1	----	<1	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

##_##Lab = Interlaboratory split sample analysed by secon[redacted]atory

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct							SITE 3				
Sample ID							BH04_0.4-0.5		BH05_0.4-0.5	DUP02	BH06_0-0.3
Depth (mbgs)	NSW EPA Guidlelines						0.4-0.5	0.4-0.5	0.4-0.5	BH05_0.4-0.5	0-0.3
Material Type	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	Clay	Clay	Fill	Fill	Fill
Date Sampled	(SIL_2)	(SIL_4)					13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)
As	400	500	20	10	0.5	500	13	<0.1	4	4	7
Be	80	100	3	2	0.1	100	<1	----	<1	<1	<1
Cd	80	100	NA	NA	0.1	100	<1	----	<1	<1	<1
Cr	NA	NA	NA	NA	NA	NA	17	----	8	9	14
Cr VI	400	500	400	10	0.5	1900	----	----	----	----	----
Cu	4000	5000	100	NA	NA	NA	19	----	40	35	40
Mn	6000	7500	NA	NA	NA	NA	6	----	287	401	386
Ni	2400	3000	60	4	0.2	1050	<1	----	26	37	21
Pb	1200	1500	600	10	0.5	1500	16	----	13	18	33
Zn	28000	35000	200	NA	NA	NA	7	----	44	61	54
Hg	60	75	1	0.4	0.02	50	<0.1	----	<0.1	<0.1	<0.1
Cyanide	2000	2500	-	32	1.6	5900	----	----	----	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

BH##_##Lab = interlaboratory split sample analysed by secondary laboratory

Labmark

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct							SITE 3				
Sample ID	NSW EPA Guidlelines						BH06_0-0.3 Lab	BH-7_0.9-1.0	BH08_0.9-1.0		BH09_2.8-3.0
Depth (mbgs)	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	0-0.3	0.9-1.0	0.9-1.0	0.9-1.0	2.8-3.0
Material Type							Fill	Fill	Fill	Fill	Clay
Date Sampled	(SIL_2)	(SIL_4)					13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	mg/L	(mg/kg)
As	400	500	20	10	0.5	500	3.5	8	14	<0.1	10
Be	80	100	3	2	0.1	100	----	<1	<1	----	<1
Cd	80	100	NA	NA	0.1	100	<0.5	<1	<1	----	<1
Cr	NA	NA	NA	NA	NA	NA	11	7	31	----	20
Cr VI	400	500	400	10	0.5	1900	----	----	<1	<0.01	<1
Cu	4000	5000	100	NA	NA	NA	26	23	14	----	18
Mn	6000	7500	NA	NA	NA	NA	----	161	301	----	11
Ni	2400	3000	60	4	0.2	1050	16	3	10	----	2
Pb	1200	1500	600	10	0.5	1500	19	12	35	----	20
Zn	28000	35000	200	NA	NA	NA	47	29	23	----	8
Hg	60	75	1	0.4	0.02	50	0.09	<0.1	<0.1	----	<0.1
Cyanide	2000	2500	-	32	1.6	5900	----	<1	----	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

##/## Lab = Interlaboratory split sample analysed by secondary laboratory

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct							Site 3				
Sample ID	NSW EPA Guidlelines						BH10_1.8-2.0	BH11_3.8-4.0		BH12_0-0.2	BH13_0.8-1.0
Depth (mbgs)	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	1.8-2.0	3.8-4.0	3.8-4.0	0-0.2	0.8-1.0
Material Type							Sand	Sand	Sand	Fill	Clay
Date Sampled							13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(SIL_2) (mg/kg)	(SIL_4) (mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)
As	400	500	20	10	0.5	500	4	3	----	4	4
Be	80	100	3	2	0.1	100	<1	1	----	2	<1
Cd	80	100	NA	NA	0.1	100	<1	<1	----	<1	<1
Cr	NA	NA	NA	NA	NA	NA	7	4	----	4	7
Cr VI	400	500	400	10	0.5	1900	----	----	----	----	----
Cu	4000	5000	100	NA	NA	NA	14	29	----	22	12
Mn	6000	7500	NA	NA	NA	NA	294	58	----	918	21
Ni	2400	3000	60	4	0.2	1050	9	6	----	24	<1
Pb	1200	1500	600	10	0.5	1500	15	59	<0.1	13	18
Zn	28000	35000	200	NA	NA	NA	45	48	----	100	3
Hg	60	75	1	0.4	0.02	50	<0.1	<0.1	----	<0.1	<0.1
Cyanide	2000	2500	-	32	1.6	5900	----	----	----	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

BH##_##Lab = Interlaboratory split sample analysed by secondary laboratory Labmark

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct							SITE 3				
Sample ID	NSW EPA Guidlelines						BH14_0-0.2		BH15_1.8-2.0		BH16_0.8-1.0
Depth (mbgs)	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	0-0.2	0-0.2	1.8-2.0	1.8-2.0	0.8-1.0
Material Type							Fill	Fill	Fill	Fill	Fill
Date Sampled	(SIL_2)	(SIL_4)					13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)
As	400	500	20	10	0.5	500	3	----	59	<0.1	5
Be	80	100	3	2	0.1	100	<1	----	<1	----	<1
Cd	80	100	NA	NA	0.1	100	<1	----	<1	----	<1
Cr	NA	NA	NA	NA	NA	NA	7	----	17	----	15
Cr VI	400	500	400	10	0.5	1900	----	----	----	----	----
Cu	4000	5000	100	NA	NA	NA	70	----	64	----	63
Mn	6000	7500	NA	NA	NA	NA	321	----	252	----	333
Ni	2400	3000	60	4	0.2	1050	27	<0.1	8	----	13
Pb	1200	1500	600	10	0.5	1500	13	----	39	<0.1	30
Zn	28000	35000	200	NA	NA	NA	36	----	41	----	61
Hg	60	75	1	0.4	0.02	50	<0.1	----	<0.1	----	0.2
Cyanide	2000	2500	-	32	1.6	5900	----	----	<1	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

##Lab = interlaboratory split sample analysed by secondary laboratory

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct							SITE 3				
Sample ID	NSW EPA Guidlelines						BH17_0.8-0.9	BH18_1.7-2.0	BH18_3.3-3.6	BH19_0.8-1.0	BH20_0.1-0.3
Depth (mbgs)	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	0.8-0.9	1.7-2.0	3.3-3.6	0.8-1.0	0.1-0.3
Material Type							Fill	Fill	Weathered Shale	Fill	Fill
Date Sampled	(SIL_2)	(SIL_4)					13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
As	400	500	20	10	0.5	500	5	3	3	2	5
Be	80	100	3	2	0.1	100	<1	1	<1	<1	1
Cd	80	100	NA	NA	0.1	100	<1	<1	<1	<1	<1
Cr	NA	NA	NA	NA	NA	NA	11	4	4	6	9
Cr VI	400	500	400	10	0.5	1900	----	----	----	----	----
Cu	4000	5000	100	NA	NA	NA	20	35	27	21	24
Mn	6000	7500	NA	NA	NA	NA	75	708	32	159	526
Ni	2400	3000	60	4	0.2	1050	2	15	3	4	14
Pb	1200	1500	600	10	0.5	1500	11	15	13	13	29
Zn	28000	35000	200	NA	NA	NA	28	75	34	29	81
Hg	60	75	1	0.4	0.02	50	<0.1	<0.1	0.1	<0.1	<0.1
Cyanide	2000	2500	-	32	1.6	5900	----	----	----	----	----

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

BH##_##Lab = interlaboratory split sample analysed by secondary laboratory

Labmark

Table 1 - Soil Sample Analytical Results (Metals and Cyanide)

Precinct	NSW EPA Guidlelines						Site 3				
Sample ID							BH20_0.1-0.3	BH21_0-0.2	BH22_0-0.2	BH23_0.03-0.2	BH23_1.8-2.0
Depth (mbgs)	Resid. with gardens & access. soil	Commercial / Industrial	PBIL	CT1 - Inert Waste	TCLP1 - Inert Waste	SCC1 - Inert Waste	0.1-0.3	0-0.2	0-0.2	0.03-0.2	1.8-2.0
Material Type							Fill	Fill	Fill	Fill	Clay
Date Sampled							13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(SIL_2) (mg/kg)	(SIL_4) (mg/kg)	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
As	400	500	20	10	0.5	500	----	6	3	1	----
Be	80	100	3	2	0.1	100	----	<1	<1	<1	----
Cd	80	100	NA	NA	0.1	100	----	<1	<1	<1	----
Cr	NA	NA	NA	NA	NA	NA	----	12	4	5	----
Cr VI	400	500	400	10	0.5	1900	----	----	----	----	----
Cu	4000	5000	100	NA	NA	NA	----	29	20	14	----
Mn	6000	7500	NA	NA	NA	NA	----	311	76	51	----
Ni	2400	3000	60	4	0.2	1050	<0.1	7	4	5	----
Pb	1200	1500	600	10	0.5	1500	----	30	13	10	----
Zn	28000	35000	200	NA	NA	NA	----	54	27	17	----
Hg	60	75	1	0.4	0.02	50	----	<0.1	<0.1	<0.1	----
Cyanide	2000	2500	-	32	1.6	5900	----	----	----	----	<1

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

"--" denotes analysis not conducted

(mbgs) denotes metres below ground surface

Guidelines are health-based soil investigation levels (SIL2 & PBIL) (EPA, 1998)

NA = No criteria defined by NSW EPA

CT1 = maximum values of total concentration for inert waste classification without determining total leachable concentrations

SCC1 = maximum values of total concentrations for inert waste classification used in conjunction with total leachable concentration (TCLP)

Shading denotes detected concentrations exceed NSW PBILs

Boxing denotes detected concentrations exceed NSW EPA CT1

##Lab = Interlaboratory split sample analysed by sec[illegible]oratory

Table 2 - Soil Sample Analytical Results (TPH and BTEX)

	Precinct	NSW EPA Guidelines			Site 3				
	Sample ID	Threshold concentrations for sensitive landuse	Classification for Inert Waste		BH01_0.9-1.0	DUP01	BH03_1.8-2.0	BH10_1.8-2.0	BH14_0-0.2
	Depth (mbgs)				0.9-1.0	BH01_0.9-1.0	1.8-2.0	1.8-2.0	0-0.2
	Material Type		CT1	SCC1	Fill	Fill	Fill	Sand	Fill
	Date Sampled				13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
	Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
TPH	C_6 - C_9 Fraction	65	NA	650	<2	<2	<2	<2	<2
TPH	C_{10} - C_{14} Fraction	1000	NA	5000	<50	<50	<50	<50	<50
TPH	C_{15} - C_{28} Fraction				<100	<100	<100	<100	<100
TPH	C_{29} - C_{36} Fraction				<100	<100	<100	<100	<100
BTEX	Benzene	1	1	500*	<0.2	<0.2	<0.2	<0.2	<0.2
BTEX	Toluene	1.4	28.8	518*	<0.2	<0.2	<0.2	<0.2	<0.2
BTEX	Ethylbenzene	3.1	60.0	1080*	<0.2	<0.2	<0.2	<0.2	<0.2
BTEX	meta- & para-Xylene	NA	NA	NA	<0.2	<0.2	<0.2	<0.2	<0.2
BTEX	ortho-Xylene	NA	NA	NA	<0.2	<0.2	<0.2	<0.2	<0.2
BTEX	Total Xylenes	14	100	1800*	<0.4	<0.4	<0.4	<0.4	<0.4

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

(mbgs) denotes metres below ground surface

* = only to be used in conjunction with TCLP values.

Table 2 - Soil Sample Analytical Results (TPH and BTEX)

	Precinct	NSW EPA Guidelines			Site 3	
	Sample ID	Threshold concentrations for sensitive landuse	Classification for Inert Waste		BH23_0.03-0.2	BH23_1.8-2.0
	Depth (mbgs)		CT1	SCC1	0.03-0.2	1.8-2.0
	Material Type				Fill	Clay
	Date Sampled				13/05/02	13/05/02
	Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
TPH	C_6 - C_9 Fraction	65	NA	650	<2	<2
TPH	C_{10} - C_{14} Fraction	1000	NA	5000	<50	<50
TPH	C_{15} - C_{28} Fraction	1000	NA	5000	122	<100
TPH	C_{29} - C_{36} Fraction	1000	NA	5000	474	<100
BTEX	Benzene	1	1	500*	<0.2	<0.2
BTEX	Toluene	1.4	28.8	518*	<0.2	<0.2
BTEX	Ethylbenzene	3.1	60.0	1080*	<0.2	<0.2
BTEX	meta- & para-Xylene	NA	NA	NA	<0.2	<0.2
BTEX	ortho-Xylene	NA	NA	NA	<0.2	<0.2
BTEX	Total Xylenes	14	100	1800*	<0.4	<0.4

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected above indicated laboratory practical quantitation limit.

(mbgs) denotes metres below ground surface

* = only to be used in conjunction with TCLP values.

Table 3 - Soil Sample Analytical Results (PAHs and Phenols)

Precinct						Site 3				
Sample ID	NSW EPA Guidelines					BH05_0.4-0.5	BH08_0.9-1.0	BH11_3.8-4.0	BH15_1.8-2.0	BH23_0.03-0.2
Depth (mbgs)	Residential with minimal soil access	Commercial / Industrial	Classification Inert Waste			0.4-0.5	0.9-1.0	3.8-4.0	1.8-2.0	0.03-0.2
Material Type						Fill	Fill	Fill	Fill	Fill
Date Sampled	(SIL_2)	(SIL_4)	CT1	TCLP1	SCC1	13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Naphthalene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	-	-				0.8	<0.5	<0.5	<0.5	<0.5
Pyrene	-	-				0.9	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	-	-				0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	4	5	0.08	0.004	1	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	-	-				<0.5	<0.5	<0.5	<0.5	<0.5
Total PAHs	80	100	NA	NA	200	2.2	nc	nc	nc	nc
Total Phenols	28000	35000	28.8	1.44	518	<2	<2	<2	<2	<2

Notes:

mg/kg = milligrams per kilogram

< denotes analyte not detected above indicated laboratory practical quantitation limits

- denotes no guideline value established

(mbgs) denotes metres below ground surface

Guidelines are NSW EPA (1998) health based soil investigation levels (SILs)

CT1 = maximum values of total concentration for inert waste classification without determining TCLP

SCC1 = maximum values for leachable concentration and total concentration when used together, except total PAHs which is assessed only by total concentration

Total PAH concentration calculated from sum of individual compounds quantified (n/c denotes sum incalculable due to non-detection)

Table 4 - Soil Sample Analytical Results (Organochlorine Pesticides and Polychlorinated Biphenyls)

Precinct	NSW EPA Guidelines - Residential with minimal soil access	NSW EPA Guidelines - Commercial / Industrial	Site 3					
Sample ID			BH01_0.9-1.0	DUP01	BH05_0.4-0.5	BH14_0-0.2	BH17_0.8-0.9	BH23_0.03-0.2
Depth (mbgs)			0.9-1.0	BH01_0.9-1.0	0.4-0.5	0-0.2	0.8-0.9	0.03-0.2
Material Type			Fill	Fill	Fill			
Date Sampled	(SIL_2)	(SIL_4)	13/05/02	13/05/02	13/05/02	13/05/02	13/05/02	13/05/02
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
alpha-BHC	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
HCB	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC & gamma-BHC	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	40*	50*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	40	50	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlordane - trans	200**	250**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan 1	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlordane - cis	200	250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	40*	50*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DDE	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan 2	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DDD	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DDT	800***	1000***	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PCB	40	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:
mg/kg = milligrams per kilogram
< = analyte not detected at or above indicated laboratory practical quantitation limit
* denotes guideline for total aldrin + dieldrin concentration
(mbgs) denotes metres below ground surface
** denotes combined chlordane criteria
*** denotes DDD = DDT = DDE

Table 5 - Soil Sample Analytical Results (Volatile Organic Compounds)

Sample Location	BH10	BH19
Sample ID	1.8-2.0	0.8-1.0
Material Type	Fill	Fill
Date Sampled	13/05/02	13/05/02
Units	mg/kg	mg/kg
Monocyclic Aromatic Hydrocarbons		
Benzene	<0.5	<0.5
Toluene	<0.5	<0.5
Ethylbenzene	<0.5	<0.5
meta & para Xylene	<0.5	<0.5
Styrene	<0.5	<0.5
ortho-Xylene	<0.5	<0.5
Isopropylbenzene	<0.5	<0.5
n-Propylbenzene	<0.5	<0.5
1.3.5 - Trimethylbenzene	<0.5	<0.5
sec-Butylbenzene	<0.5	<0.5
1.2.4-Trimethylbenzene	<0.5	<0.5
tert-Butylbenzene	<0.5	<0.5
p-Isopropyltoluene	<0.5	<0.5
n-Butylbenzene	<0.5	<0.5
Oxyenated Hydrocarbons		
Vinyl Acetate	<5	<5
2-Butanone	<5	<5
4-Methyl-2-pentanone	<5	<5
2-Hexanone	<5	<5
Sulfonated Compounds		
Carbon disulfide	<0.5	<0.5
Fumigants		
2.2-Dichloropropane	<0.5	<0.5
1.2-Dichlorpropane	<0.5	<0.5
cis-1.3 Dichloropropylene	<1	<1
trans-1.3-Dichlorpropylene	<1	<1
1.2-Dibromoethane	<0.5	<0.5
Halogenated Aliphatic Hydrocarbons		
Dichlorodifluoromethane	<5	<5
Chloromethane	<5	<5
Vinyl chloride	<5	<5
Bromomethane	<5	<5
Chloroethane	<5	<5
Trichlorofluoromethane	<5	<5
1.1-Dichloroethne	<0.5	<0.5
Iodemethane	<0.5	<0.5
trans-1.2-Dichloroethane	<0.5	<0.5
1.1-Dichloroethene	<0.5	<0.5
1.1.1-Trichloroethane	<0.5	<0.5
1.1-Dichloropropylene	<0.5	<0.5
Carbon Tetrachloride	<0.5	<0.5
1.2-Dichloroethane	<0.5	<0.5
Trichloroethene	<0.5	<0.5
Dibromomethane	<0.5	<0.5

Table 5 - Soil Sample Analytical Results (Volatile Organic Compounds)

Sample Location	BH10	BH19
Sample ID	1.8-2.0	0.8-1.0
Material Type	Fill	Fill
Date Sampled	13/05/02	13/05/02
Units	mg/kg	mg/kg
1.1.2-Trichloroethane	<0.5	<0.5
1.3-Dichloropropane	<0.5	<0.5
Tetrachlorethene	<0.5	<0.5
1.1.1.2-Tetrachloroethane	<0.5	<0.5
trans-1.4-Dichloro-2-butene	<0.5	<0.5
cis-1.4-Dichloro-2-butene	<0.5	<0.5
1.1.2.2-Tetrachloroethane	<0.5	<0.5
1.2.3-Trichloropropane	<0.5	<0.5
Pentachloroethane	<0.5	<0.5
1.2-Dibromo-3-chloropropane	<0.5	<0.5
Hexachlorobutadiene	<0.5	<0.5
Halogenated Aromatic Hydrocarbons		
Clorobenzene	<0.5	<0.5
Bromobenzene	<0.5	<0.5
2-Chlorotoluene	<0.5	<0.5
4-Chlorotoluene	<0.5	<0.5
1.3-Dichlorobenzene	<0.5	<0.5
1.4-Dichlorobenzene	<0.5	<0.5
1.2.4-Trichlorobenzene	<0.5	<0.5
1.2.3-Trichlorobenzene	<0.5	<0.5
Trihalomethanes		
Chloroform	<0.5	<0.5
Bromodichloromethane	<0.5	<0.5
Dibromodichloromethane	<0.5	<0.5
Bromoform	<0.5	<0.5
Napthalene		
Napthalene	<5	<5

Notes:
mg/kg = milligrams per kilogram
< denotes analyte not detected at or above indicated laboratory practical quantitation limit (PQL)

Table 6 - QA/QC Soil Sample Analytical Results (Metals and Cyanide)

Sample Location	BH01	BH01	*RPD*	BH05	BH05	*RPD*	BH06	BH06	*RPD*
Sample ID and Depth	BH01_0.9-1.0	DUP01		BH05_0.4-0.5	DUP02		BH06_0-0.3	BH06_0-0.3 Lab	
QAQC Type	Original	Field Duplicate		Original	Field Duplicate		Original	Field Duplicate	
Date Sampled	13/05/02	13/05/02		13/05/02	13/05/02		13/05/02	13/05/02	
Units	(mg/kg)	(mg/kg)	*(%)*	(mg/kg)	(mg/kg)	*(%)*	(mg/kg)	(mg/kg)	*(%)*
As	3	2	***40***	4	4	*0*	7	3.5	***67***
Be	<1	<1	*NA*	<1	<1	*NA*	<1	----	*NA*
Cd	<1	<1	*NA*	<1	<1	*NA*	<1	<0.5	*NA*
Cr	137	164	*18*	8	9	*12*	14	11	*24*
Cu	49	47	*4*	40	35	*13*	40	26	*42*
Mn	851	945	*10*	287	401	*33*	386	----	*NA*
Ni	124	130	*5*	26	37	*35*	21	16	*27*
Pb	5	4	*22*	13	18	*32*	33	19	***54***
Zn	62	56	*10*	44	61	*32*	54	47	*14*
Hg	<0.1	<0.1	*NA*	<0.1	<0.1	*NA*	<0.1	0.09	*NA*
Cyanide	<1	<1	*NA*	----	----	*NA*	----	----	*NA*

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected at or above indicated laboratory practical quantitation limit (PQL).

RPD = relative percentage difference.

NA = RPD not calculable

Bolding indicates RPD outside acceptable limits.

Table 7 - QA/QC Soil Sample Analytical Results (TPH and BTEX)

	Sample Location	BH01	BH01	*RPD*
	Sample ID and Depth	BH01_0.9-1.0	DUP01	
	QAQC Type	Original	Field Duplicate	
	Date Sampled	13/05/02	13/05/02	
	Units	mg/kg	mg/kg	*(%)*
TPH	C6 - C9 Fraction	<2	<2	*NA*
TPH	C10 - C14 Fraction	<50	<50	*NA*
TPH	C15 - C28 Fraction	<100	<100	*NA*
TPH	C29 - C36 Fraction	<100	<100	*NA*
BTEX	Benzene	<0.2	<0.2	*NA*
BTEX	Toluene	<0.2	<0.2	*NA*
BTEX	Ethylbenzene	<0.2	<0.2	*NA*
BTEX	meta- & para-Xylene	<0.2	<0.2	*NA*
BTEX	ortho-Xylene	<0.2	<0.2	*NA*
BTEX	Total Xylenes	<0.4	<0.4	*NA*

Notes:

mg/kg = milligrams per kilogram.

< denotes analyte not detected at or above indicated laboratory practical quantitation limit (PQL)

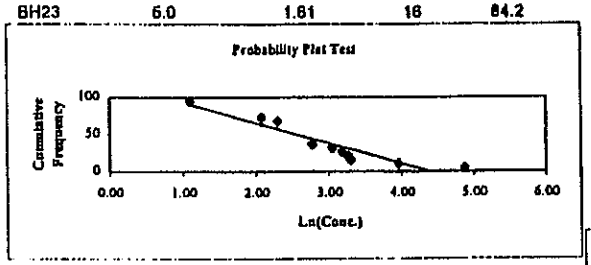
RPD = relative percentage difference.

NA = RPD not calculable

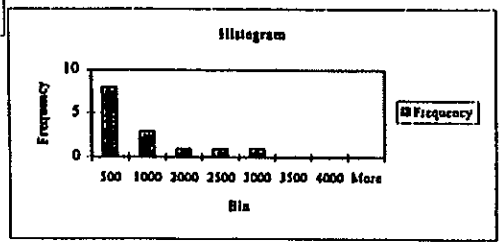
Bolding indicates RPD outside acceptable limits.

Table 9 - 95% UCL Calculation for Nickel in Fill

Sample	Conc.	Ln Conc.	Rank	Cum.Freq
BH01/DUP01	130.0	4.87	1	5.3
BH02	52.0	3.95	2	10.5
BH03	16.0	2.77	7	36.8
BH05	26.0	3.26	4	21.1
BH06	21.0	3.04	6	31.6
BH07	3.0	1.10	18	94.7
BH08	10.0	2.30	13	68.4
BH12	24.0	3.18	5	26.3
BH14	27.0	3.30	3	15.8
BH15	8.0	2.08	14	73.7
BH16	13.0	2.56	10	52.6
BH17	11.0	2.40	12	63.2
BH18	15.0	2.71	8	42.1
BH19	13.0	2.56	10	52.6
BH20	14.0	2.64	9	47.4
BH21	7.0	1.95	15	78.9
BH22	4.0	1.39	17	89.5
BH23	6.0	1.81	16	84.2



H Value Interpolation Table	
INPUTS (Nickel)	
Standard Deviation (data)	0.906092
Low S_y (Table E)	1.5
High S_y (Table E)	1.75
Count (data)	18
Low count (Table E)	12
High count (Table E)	15
Low SDEV - Low Count (Table E)	3.696
High SDEV - Low Count (Table E)	4.422
Low SDEV - High Count (Table E)	3.612
High SDEV - High Count (Table E)	4.081
SD DIFF	3.376
CT DIFF	-1.080
H_1 DIFF	2.648
H_2 DIFF	2.498
H	2.349



	Procedure D Normal Dist	*Procedure G* Log Normal Dist
CV		1.32
Ave	22.17	2.85
St. Dev	29.29	0.91
Var	858	0.82
n	18	18
h	n/a	2.349
t	1.74	n/a
95% ucl	34	38

Result:

Although the coefficient of variation is 1.2, the logarithmically transformed data is normally distributed (refer probability plot and histogram), NSW EPA (1995) Procedure G is applicable. There is a 95% probability that the arithmetic average concentration of nickel will not exceed 38 mg/kg.*

** NSW EPA (1995) Sampling Design Guidelines*

HLA

4

APPENDIX A

CALIBRATION LOG

PID: Mini Rae

Date	Job No	Staff	Calibration	Comments
25/9/01	J1725/7	GM	Reading 102	
26/9/01	J1725/7	GM	103	
27/9/01	J1725/7	GM	103	
28/9/01	J1725/7	GM	102	
1/10/01	J1725/7	GM	102	
3/10/01	J1698	GM	103	
9/11/01	J1817	GM	102	OK
12/11/01	J1834	AD	102	OK
21/8/01	J1720	RC	101.1	MMO low.
31/12/01	J1847	AD	103	OK
28/10/01	J1827	AD	102.6	OK
16/01/02	J1877	AD	102.9	OK
21/01/02	J1877	AD	102.6	OK
25/01/02	J1883	AD	103.5	OK
13/02/02	J1888	AD	104	Photovac P:1 OK
26/02/02	J1882	RAC	102.2	OK.
18/03/02	J1792	RAC	102.4	OK.
19/03/02	J1792	RAC	103.4	Mini Rae.
25/3/02	D0250	WW	103.1	WW.
8/4/02	J1923	AD	104	
24/4/02	J1896	AD	107	
1/05/02	D0253	WW	103.2	OK.
1/05/02	J1924	AD	103	OK.
2/05/02	J1951	AD	102.8	OK.
13/5/2	J1938	RAC	102.1	OK
14/5/2	J1938	RAC	103.4	OK
15/5/2	J1938	RAC	103.3	OK
21/5/02	J1928	AD	103.5	OK Calibrated Minirae
22/5/02	J1880	AD		
23/5/2	J1951	RAC	102.8	OK.
[redacted]				
31/05/02	J1737	AD	102.7	OK (Minirae)
[redacted]				
3/6/02	J1973	AD	103	OK (Minirae)

PHOTOVAC

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH01

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Direct-Push / Solid Stem Auger
SAMPLING METHOD Push Tube / Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH01_0.1-0.2				SAND with minor gravel (FILL), brown, loose to medium density, slightly moist to dry	0.40
							Gravelly CLAY with sand (FILL), brown, stiff, low to zero plasticity, slightly moist to dry	0.75
							Gravelly SAND (FILL), brown, dense, slightly moist to dry	0.90
ND			BH01_0.9-1.0 DUP01	*	1		Sandy silty GRAVEL and clay (FILL), blue/grey, dense, slightly moist	1.35
ND			BH01_1.4-1.5				Silty CLAY with minor shale (CL), red/orange, very stiff, low plasticity, slightly moist	2.10
					2		Weathered SHALE (BEDROCK), brown, slightly moist, low to high strength	2.30
ND			BH01_2.2-2.3				Auger refusal on shale Total Depth: 2.30 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH02

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH02_ 0.0-0.2	*			SAND with gravel (FILL), brown, loose, slightly moist to dry	0.60
ND			BH02_ 0.8-1.0		1		Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist	
ND			BH02_ 1.8-2.0		2			2.00
ND			BH02_ 2.2-2.4				Weathered SHALE (BEDROCK), brown, slightly moist, high strength	2.40
							Terminated on shale Total Depth: 2.40 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/06/02

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH03

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH03_ 0.0-0.2				SAND with gravel (FILL), brown, loose to medium density, slightly moist to dry	
ND			BH03_ 0.4-0.5		1			
ND			BH03_ 1.8-2.0	*	2			2.00
							Sandy SILT with minor gravel and clay (FILL), brown, soft/medium density, slightly moist to dry	
ND			BH03_ 3.8-4.0		4			
ND			BH03_ 4.8-5.0		5			
								5.20
							Weathered SHALE (BEDROCK), brown, slightly moist, high strength	5.40
							Auger refusal on shale Total Depth: 5.40 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH04

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH04_ 0.0-0.2				Silty SAND (FILL), brown, loose, slightly moist to dry	0.20
							Silty CLAY (CL), red/brown, very stiff, low to zero plasticity, slightly moist to dry	
ND			BH04_ 0.4-0.5	*				0.50
							Borehole terminated in clay Total Depth: 0.50 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH05

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is bitumen (10mm)

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH05 0.0-0.3				Bitumen	0.01
							Silty SAND with gravel (FILL), brown, loose, slightly moist	
ND			BH05 0.4-0.5 DUP02	*				
					1			
								1.60
							Gravelly CLAY (FILL), red/grey/brown, stiff, low plasticity, slightly moist	
ND			BH05 1.8-2.0					
					2			2.20
							Silty SAND with gravel (FILL), brown, medium density, slightly moist to dry	
ND			BH05 2.4-2.5					2.60
							Weathered SHALE (BEDROCK), brown, slightly moist to dry, high strength	
ND			BH05 2.8-3.0					
					3			3.00
							Auger refusal on shale	
							Total Depth: 3.00 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH06

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is bitumen (30mm)

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH06_ 0.0-0.3	*			Bitumen	0.03
							Silty SAND (FILL), brown, loose, slightly moist to dry	0.30
ND			BH06_ 0.4-0.5				Silty SAND with gravel (FILL), brown, nedium density, slightly moist to dry, timber fragments	
ND					1			
								1.40
							Gravelly CLAY (FILL), red/brown, stiff, low plasticity, slightly moist	
ND					2			
ND			BH06_ 2.8-3.0					3.00
ND			BH06_ 3.0-3.1		3		SHALE, brown, slightly moist, high strength	3.10
							Auger refusal on shale Total Depth: 3.10 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/06/02

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH07

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is bitumen (30mm)

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH07 0.0-0.3 DUP03				Bitumen	0.03
							Silty SAND with minor gravel (FILL), brown, loose, slightly moist to dry	
ND			BH07 0.9-1.0	*	1		CLAY with gravel (FILL), brown/white/red, stiff, low to zero plasticity, slightly moist	0.90
ND					2			
								2.70
							Silty CLAY (CL), orange/brown, stiff, low plasticity, slightly moist to dry	2.90
ND			BH07 2.9-3.0		3		Weathered SHALE (BEDROCK), brown, slightly moist, high strength	3.00
							Auger refusal on shale Total Depth: 3.00 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/06/02

HLA-Enviroscience Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH08

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH08 0.0-0.3				Silty SAND (FILL), brown, loose, slightly moist to dry	0.40
							Sandy SILT with gravel (FILL), dark brown, soft, moist	
ND			BH08 0.8-0.9	*	1			1.20
							Silty CLAY (CL), red/grey, stiff, low plasticity, slightly moist to dry	1.70
ND			BH08 1.7-1.9				Weathered SHALE (BEDROCK), brown, slightly moist, high strength	1.90
							Auger refusal on shale Total Depth: 1.90 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH09

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH09 0-0.3				Silty SAND (FILL), brown, loose, slightly moist to dry	0.50
							Sandy SILT with gravel (FILL), dark brown, soft, moist	
ND			BH09 0.8-1.0		1			
ND					2			2.60
							Silty CLAY (CL), brown, stiff, low plasticity, slightly moist to dry	
ND			BH09 2.8-3.0	*	3			3.00
							Borehole terminated in clay Total Depth: 3.00 m	

BORING_STRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/05/02

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH10

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH10_0.0-0.3				Silty SAND (FILL), brown, loose, slightly moist to dry	0.50
							Gravelly CLAY (FILL), brown, firm, low plasticity, slightly moist	
ND			BH10_0.8-1.0		1			
								1.60
							Clayey SAND (SP), grey, loose, very moist to saturated ▽	
ND			BH10_1.8-2.0	*	2			2.20
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH10_2.7-2.9					2.90
							Borehole terminated in clay Total Depth: 2.90 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH11

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH11_ 0.0-0.3 DUP04				Silty SAND (FILL), brown, loose, slightly moist to dry	0.40
							Silty CLAY with gravel (FILL), brown, stiff, moist	
ND			BH11_ 0.8-1.0		1			
ND			BH11_ 1.8-2.0		2			2.00
							Silty CLAY with gravel (FILL), dark brown, moist, soft	2.60
							Sandy SILT with gravel (FILL), dark brown, soft, saturated	3.10
ND			BH11_ 2.8-3.0		3			
							SAND with gravel (SP), grey, medium density, saturated to slightly moist, poorly graded sand	
ND			BH11_ 3.8-4.0	*	4			4.00
							Borehole terminated in sand Total Depth: 4.00 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 06/08/02

HLA-Enviroscience Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH12

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH12_ 0.0-0.2	*			Silty sandy GRAVEL (FILL), brown, loose, slightly moist to dry	
								0.40
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH12_ 0.8-1.0		1			
								1.60
							Weathered SHALE (BEDROCK), dark grey, slightly moist, high strength	
ND			BH12_ 1.8-2.0		2			2.00
							Borehole terminated on shale Total Depth: 2.00 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH13

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH13_0.0-0.2				Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	
								0.40
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH13_0.8-1.0	*	1			
							Borehole terminated in clay Total Depth: 1.00 m	1.00

BORING ,TRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/05/02

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH14

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH14_ 0.0-0.2	*			Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	0.40
							Silty CLAY with minor shale (CL), red/grey, stiff, low plasticity, slightly moist to dry	
ND			BH14_ 0.8-1.0		1			
								1.60
							Weathered SHALE (BEDROCK), grey/brown, slightly moist, high strength	
ND			BH14_ 1.8-2.0					2.00
					2		Borehole terminated in weathered shale Total Depth: 2.00 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH15

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH15_ 0.0-0.2 DUP05				Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	0.80
ND			BH15_ 0.8-1.0		1		Sandy silty CLAY with gravel (FILL) dark brown, stiff, slightly moist to dry	1.50
							Sandy SILT with gravel (FILL), dark brown, soft, slightly moist, with minor slag	
ND			BH15_ 1.8-2.0	*	2			2.10
							Silty CLAY (CL), light brown/grey, stiff, low plasticity, moist	
ND			BH15_ 2.5-2.7					2.70
							Borehole terminated in clay Total Depth: 2.70 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/06/02

HLA-Enviroscience Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH16

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH16_ 0.0-0.2				Silty SAND with gravel and clay (FILL), brown, loose, slightly moist to dry	
ND			BH16_ 0.8-1.0	*	1			
								1.50
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH16_ 1.8-2.0					
					2			2.00
							Borehole terminated in clay Total Depth: 2.00 m	

BORING / WELL CONSTRUCTION LOG J1938.GPJ HLA_SYD.GDT 04/06/02

HLA-Enviroscences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH17

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH17_ 0.0-0.2				Silty SAND (FILL), brown, loose, slightly moist to dry	0.70
ND			BH17_ 0.8-0.9	*	1		Sandy silty CLAY (FILL) brown, stiff, slightly moist to dry	
ND			BH17_ 1.8-2.0		2			2.10
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH17_ 2.4-2.5					2.50
							Borehole terminated in clay Total Depth: 2.50 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH18

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH18_ 0.0-0.3				Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	
ND			BH18_ 0.8-1.0		1			1.00
							Silty SAND with gravel (FILL), brown/grey, loose, slightly moist to dry	
ND			BH18_ 1.7-2.0	*	2			
ND			BH18_ 2.8-3.0		3			
								3.30
ND			BH18_ 3.3-3.6	*			Weathered SHALE (BEDROCK), brown, slightly moist, high strength	
								3.60
							Auger refusal on shale Total Depth: 3.60 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH19

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH19 0.0-0.2				Silty CLAY with gravel (FILL), red/brown, stiff, slightly moist	
ND			BH19 0.8-1.0	*	1			
								1.40
							Silty CLAY (CL), red/brown, stiff, low plasticity, slightly moist to dry	
ND			BH19 1.7-1.8					1.80
							Weathered SHALE (BEDROCK), brown, slightly moist, high strength	1.90
							Auger refusal on shale Total Depth: 1.90 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH20

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH20_0.1-0.3	*			Silty SAND with gravel and clay (FILL), brown, loose, slightly moist to dry	
ND			BH20_0.8-1.0		1			1.50
							Silty CLAY (CL), grey/brown, stiff, low plasticity, slightly moist to dry	2.00
ND			BH20_2.0-2.2		2		Weathered SHALE (BEDROCK), brown, slightly moist, high strength	2.20
							Auger refusal on shale Total Depth: 2.20 m	

HLA-Enviroscience Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG

BH21

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is grass

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH21_ 0.0-0.2	*			Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	0.50
							Silty CLAY (CL), light brown/grey, stiff, low plasticity, slightly moist to dry	
ND			BH21_ 0.7-0.8					0.90
							Weathered SHALE (BEDROCK), brown, slightly moist, high strength	1.00
					1		Borehole terminated in shale Total Depth: 1.00 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG
BH22

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is gravel

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH22_ 0.0-0.2	*			Silty SAND with gravel (FILL), brown, loose, slightly moist to dry	0.40
							Weathered SHALE (BEDROCK), grey/brown, slightly moist, low to high strength	
ND			BH22_ 0.8-1.0		1			1.00
							Borehole terminated in weathered shale Total Depth: 1.00 m	

HLA-Envirosciences Pty Limited
55-65 Grandview Street
Pymble NSW 2073
Telephone: (02) 9988 4422
Fax: (02) 9988 4441

BORING / WELL CONSTRUCTION LOG
BH23

PROJECT NUMBER J1938
PROJECT NAME SOPA
LOCATION Homebush
DRILLING METHOD Solid-Stem Auger
SAMPLING METHOD Grab
SURFACE ELEVATION
WELL HEAD/TOC
LOGGED BY R. Casson
COMMENTS Surface cover is bitumen (30mm)

DATE 13/05/2002
BLANK
SCREEN
GRAVEL PACK
SANITARY SEAL/BENTONITE
STABILISED WATER LEVEL
GROUND WATER ELEVATION

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
ND			BH23_ 0.03-0.2	*			Bitumen	0.03
							SAND (crushed sandstone) with gravel (FILL), white/black/brown, loose, slightly moist	0.30
							Silty CLAY with gravel (FILL), brown, soft, low plasticity, moist	
ND			BH23_ 0.8-1.0		1			
								1.50
							Silty CLAY (CL), yellow/brown, stiff, low plasticity, slightly moist	
ND			BH23_ 1.8-2.0		2			
								2.20
							Weathered SHALE (BEDROCK), grey/brown, slightly moist, low to high strength	
ND			BH23_ 2.5-2.7					2.70
							Borehole terminated in weathered shale Total Depth: 2.70 m	

APPENDIX B

The following sections describe components of the Quality Assurance and Control Plan for the Site Contamination Assessment, which complement the measures described in the report. An evaluation of the conformance of the results of the investigation against predetermined data quality objectives (DQOs) is also included.

B1.1 Laboratory Data Quality Objectives

Listed below are the predetermined DQOs defined for the assessment of the laboratory analytical data:

- All sample analyses to be conducted using National Association of Testing Authorities (NATA) registered methods in accordance with ANZECC (1996) and NEPM (1999) guidelines;
- Maximum acceptable sample holding time is 14 days for organic analyses and 6 months for metal analyses. Mercury (Hg) to be analysed within 28 days of sample collection;
- Samples were appropriately preserved and handled;
- Laboratory method blank analyses required to be below the limits of reporting (PQLs);
- Surrogate compound concentrations required to be spiked at similar concentration to sample results;
- All PQLs must be less than the assessment criteria;
- The relative percent difference of replicates will be determined and compared to the following criteria for acceptability. The acceptance criteria are based on both HLA's experience and the criteria listed in AS 4482.1 of 1997:
  - Less than 30 percent for field duplicates and laboratory split samples;
  - Less than 30 percent for laboratory duplicates where the detection is less than 10 times the LOR; and
  - Less than 20 percent for laboratory duplicates where the detection is greater than 10 times the PQL.
- RPDs for Control Spike Duplicates were compared to an acceptable limit of 20%.
- RPDs for Matrix Spike Duplicates were compared to an acceptable limit of 20%.
- Percent recoveries of control spikes and matrix spikes were compared to an acceptable range of 70–130 %. Where this range was exceeded, reference to the laboratories internal DQO limits was made. In addition, percentage recoveries of surrogates were also compared to the USEPA surrogate recovery limits.

In HLA's experience, since samples to be analysed for volatiles cannot be homogenised, the RPD results obtained for duplicate and triplicate samples and repeat analyses will typically not provide an assessment of laboratory precision, but rather an indication of homogeneity of the distribution of the analyte within the sample. Any exceedences of the above acceptable limits were professionally assessed to determine the affect, if any on the overall usability or validity of the field sample data.

B1.2 Chemical Analysis

The primary laboratory used for sample analysis was Australian Laboratory Services (ALS) and the secondary laboratory used to analyse triplicate samples was Labmark Laboratory Services (Labmark). Both laboratories are NATA accredited for all analyses conducted. The following table presents a summary of the analytical methods used by the primary laboratory (only) and endorsed by ANZECC (1996):

Primary Laboratory Methods

	ALS			
Analyte	**Matrix**	**Lab Method**	**Reference Method**	**Detection Limit (mg/kg)**
Metals	Soil	EG-005T	USEPA SW846, 6010	1 – 5
TPH/BTEX	Soil	EP-071-SS EP-080-SS	USEPA 5030, 8260, 8015	TPH 2 – 100 BTEX 0.2 – 0.4
PAH (including BaP)	Soil	EP-076A-SS	USEPA 8270	0.5 – 1
OCPs	Soil	EP-075	USEPA 8270	0.05 – 0.2
Chromium VI	Soil	EG-050	USEPA 8151	1
PCBs	Soil	EP-075	USEPA 8270	0.1
Cyanide	Soil	EK-026	4500 CN-C&N	1

Laboratory Blanks

Laboratory or control blanks consist of reagents specific to each individual analytical method and are prepared and analysed by laboratories in the same manner as regular samples. The preparation and analysis of laboratory blanks enables the measurement of contamination within the laboratory.

Ideally, no contamination should be present in blanks. However, in the event that contamination is detected, the following actions are taken:

- The organic test results are not to be corrected by subtracting any blank value;
- If an analyte is found in a blank but not a sample, no action is taken;
- No absolute results are reported unless the analyte concentration within a sample exceeds 10 times the amount in any blank for common contaminants (dichloromethane, acetone, phthalates, and 2-butanone), or five times the amount for any other analyte; and
- Professional judgment is used where little or no contamination is present in the associated blanks, but contamination is suspected in actual samples.

Laboratory blanks are typically analysed at a frequency of 1 in 20, with a minimum of one analysed per batch.

Laboratory Duplicates

Laboratory duplicate samples are prepared in the laboratory by splitting a field sample and analysing it as two independent samples. The analysis of laboratory duplicate samples provides an indication of analytical precision and may be influenced by sample heterogeneity. The laboratory duplicate RPDs are used to assess laboratory precision.

Laboratory duplicates are typically analysed at a frequency of 1 in 20, with a minimum of one analysed per batch.

Laboratory Control Samples

Laboratory control samples (LCS) or Quality Control check samples are prepared within the laboratory by spiking an aliquot of an appropriate clean matrix reagent with known concentrations of specific analytes. The check sample is then analysed and the results are used to assess the laboratory performance on sample preparation and analysis procedure. Certified reference material may also be used to assess analytical accuracy independent of the investigations.

Accuracy is assessed by calculation of percent recovery (PR):

$$PR = X / T \times 100\%$$

Where: X is the measured analyte concentration
T is the "true" value

To evaluate percent recovery, the quality control limits that the laboratories have calculated are assessed following the procedures required by the US EPA. Ideally, all calculated recovery values should be within acceptance limits, which for the case of metals consists of historical analyte recoveries as experienced by the laboratory. However, in the event that control limit outliers are reported, professional judgement is used to assess the extent to which such results may affect the overall useability of the data. LCSs are typically analysed at a frequency of 1 in 20, with a minimum of one analysed per analytical batch.

Matrix Spikes

Matrix spikes are samples prepared within the laboratory by dividing a field sample into two aliquots, then spiking each with identical concentrations of the analytes. The matrix spike, and matrix spike duplicate, are then analysed separately and the results compared to determine the effects of the sample matrix on the accuracy and precision of the analytes. Accuracy is assessed by the calculation of the percent recovery (PR) for matrix spikes:

$$PR = \frac{(SSR - SR)}{SA} \times 100\%$$

Where: SSR is the spiked sample result
SR is the sample result
SA is the spike added

Note that when the sample concentration is less than the instrument detection level, then a value of SR = 0 is recommended.

Surrogates

Surrogates are compounds which are similar to the organic analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in field samples. Surrogates are generally spiked into all sample aliquots prior to preparation and analysis. Percent recoveries are calculated for each surrogate, providing an indication of analytical accuracy. US EPA methodology (SW – 846) requires that surrogate testing be performed whenever analysing by Gas Chromatography or HPLC.

In order to compare analytical accuracy, it is usually necessary to spike a range of surrogate compounds of different chemical properties into each sample aliquot.

USEPA Method 8000 (7) provides that the laboratory may calculate its own surrogate recovery limit should the EPA not specify a limit. In the absence of specified PR criteria for individual surrogates or laboratory calculated control limit, the general acceptance criteria for quality control measurements employed were taken from USEPA guidelines (5) which are summarised below:

< 10%	Unacceptable low recovery which may result in negative detections.
10% to 25%	Recoveries are sufficiently low that results provide only an estimate of analyte concentration.
25% to 130%	Acceptable recovery.
> 130%	Unacceptable high recovery which may result in false high detections.

Ideally, all calculated surrogate recovery values should be within acceptable limits. In the event that some recoveries lie outside the control limits, the USEPA guidance documents provide criteria for surrogate recovery results to assign a level of confidence in the results of actual sample analyses. USEPA protocols identify the need to test a minimum of three surrogates for each analytical group.

C2.0 DATA VALIDATION

The overall assessment of the quality of the data obtained during the investigation is discussed below in terms of the following data quality indicators.

B2.1 Precision

Precision – or variability of the data was assessed by determining RPDs between the original and duplicated analyses. Two field duplicate soil samples (DUP01 and DUP02) were sent to the primary laboratory (ALS) and were variably analysed for heavy metals, cyanide, TPH, BTEX, OCPs and PCBs. One field duplicate sample (BH06_0-0.3Lab) was sent to the secondary laboratory (Labmark) and was analysed for metals (only).

RPDs were calculated for all analytes for all original and duplicate samples, the results of which are included in the analytical summary Tables 6 to 8.

The RPDs for TPH, BTEX, OCPs and PCBs were unable to be calculated as results were below laboratory practical quantitation Limits (PQLs) and as such the precision of the laboratory results is considered adequate. The following details instances where the RPD values exceed the predetermined DQOs.

RPDS – Metals (Soils) – Table 6

RPDs for metals in soils generally adhere to the DQOs outlined above, except for the following instances:

- ***BH01_0.9-1.0, DUP01***: calculated RPDs for arsenic exceed 30%. The apparent discrepancies are ascribed to low detected analyte concentrations and inherent difficulty in accurately splitting the heterogenous fill material. The concentrations for arsenic were well below adopted site investigation criteria and in the same magnitude of order.
- ***BH06_0-0.3 and BH06_0-0.3Lab***: Lead and Arsenic RPDs exceed the adopted project DQOs. The high RPDs are attributable to the same reasons as given above.

The laboratory precision is considered adequate as all concentrations reported are below pertinent soil evaluation criteria and all RPDs for laboratory duplicate analyses were less than the DQOs. .

B2.2 Accuracy

The laboratory QA/QC results indicated:

- All method blank samples were reported at less than laboratory PQLs.
- Laboratory PQLs were less than the assessment criteria, except for BaP for Inert Waste Classification.
- Samples were extracted and analysed within acceptable holding times.
- Surrogate compound concentrations were similar to sample result concentrations.

All matrix spike recoveries and surrogate spike recoveries were within acceptable DQO range of 70% to 130%.

Laboratory QA/QC results were included with the laboratory certificates. The laboratory QA/QC assessment results are provided below:

The accuracy of the data obtained from both laboratories is considered to be sufficient for the purposes of the investigation.

B2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of parameter variations at sampling points or environmental conditions. Sample representativeness is controlled through selecting sampling locations that exemplify site conditions and obtaining suitable samples from these sites. Sampling rationale is discussed in the body of the report.

Sample selection and analysis was conducted in order to meet the specific objectives of the particular phase of work, specifically assess any imported fill material. Analysis for the contaminants of concern was selectively conducted on soil as indicated in analytical summary tables. Based on the sampling and analytical regime undertaken, the results obtained are considered to be sufficiently representative of the subsurface conditions at the site.

B2.4 Comparability

Comparability expresses the confidence with which one data set can be compared with another. In order to assess comparability, field sampling procedures, laboratory sample preparation procedures, analytical procedures, and reporting units must be known and similar to established protocols, as was the case during this investigation. Qualitatively, data subjected to strict QA/QC procedures will be deemed more reliable, and therefore more comparable, than other data. This investigation involved only one day of soil subsurface field investigation as such the data collected is intrinsically comparable. Furthermore all of the field investigation was undertaken by the same Environmental Scientist and all of the laboratory analysis was conducted by the same laboratories, confirming good comparability of subsurface investigation.

B2.5 Completeness

The completeness of data is defined as the percentage of analytical results that are considered valid. Valid chemical data are values that have been identified as acceptable or acceptable as qualified during the data validation process. The completeness is a comparison of the total number of samples accepted against the total number of samples, calculated as a percentage. The project goal for completeness is 90%. Completeness also includes checking that all entries in the database are correct, properly entered, and that any typographical errors in the database are corrected and the data are re-entered properly. Completeness is defined as:

$$\text{Completeness} = \frac{\textit{number of acceptable items}}{\textit{total number of items}} \times 100\%$$

All samples collected and analysed complied with the predetermined DQOs as such the data obtained is considered to be 100% quantitative and complete.

B2.6 Overall Assessment

Based on an assessment of field and laboratory QA/QC data, the reported analytical results are considered to be valid and representative of concentrations of the analysed compounds at the sample locations tested.

APPENDIX C

ATT: Rachael Lasson

SAMPLE RECEIPT ADVICE INFORMATION

(This form is to be used conjunction with Costing Worksheet SYFM 57)

ES33505

Due Date: 21/5/02

Australian Laboratory Services has received samples pertaining to your **Reference Number** (see over page):

- [✓] All samples and paper work were received in **good order.**
- [ ] Paperwork **not received** yet. Please advise us of your requirements.
- [ ] Paperwork **incomplete and ambiguous.** Please contact us to provide further details
- [ ] Samples were **damaged** during transit. Please contact us.
- [✓] Samples have been received within **recommended holding times.**
- [ ] **Breaches** in recommended extraction/analysis holding times may occur. See comments section for details.
- [ ] Please **contact** us.
- [ ] Samples received **do not match** samples detailed on your submission sheet. See below for details.
- [✓] Samples **chilled** when received.
- [ ] Samples at **ambient** temperature when received.
- [✓] Samples received in **appropriately** pre-treated and preserved containers.
- [ ] Sample containers **do not comply** to pre-treatment/preservation standards (AS,APHA,USEPA)
- [ ] Samples requiring volatile organic compound analysis received in **airtight** containers (ZHE)
- [ ] Volatile organic compound analysis may be compromised as sample **vials contained headspace.**
- [ ] Please direct any turnaround/technical **queries** to (MM) INSERT LAB MANAGERS NAME. Any queries relating to sample condition/numbering/breakage should be directed to WS
- [ ] Recommended holding times **exceeded** during transit. Please contact us.
- [ ] Analytical work for this batch will be conducted at **ALS Brisbane.**
- [✓] Analytical work for this batch will be conducted at **ALS Sydney.**
- [ ] Analytical work for this batch will be conducted at **ALS Melbourne.**
- [ ] Analytical work for this batch will be **subcontracted** to _____.
- [✓] All aqueous samples are **stored** for 2 weeks and solid samples for three months from the date of completion of the batch, unless specific arrangements are made otherwise.
- [ ] **COMMENTS**

Completed by _____ Date _____

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MS RACHAEL CASSON	BATCH:	ES33505
CLIENT:	HLA-ENVIROSCIENCES PTY LTD	SUB BATCH:	0
ADDRESS:		LABORATORY:	SYDNEY
	P O BOX 726	DATE RECEIVED:	14/05/2002
	PYMBLE NSW 2073	DATE COMPLETED:	23/05/2002
ORDER No.:	119255	SAMPLE TYPE:	SOIL
PROJECT:	J1938/1-HOMEBUSH	No. of SAMPLES:	27

COMMENTS

Samples as received digested by USEPA method 200.2 (mod) prior to the determination of metals. Results reported on a dry weight basis. Manganese spike recovery for samples BH01 and BH20 not determined due to background levels of this analyte. LOR's raised for sample BH02_0-0.2 due to high moisture content (>50%). All analysis and Laboratory QC conducted in accordance with Schedule B(3) NEPM Guideline on Laboratory Analysis of Potentially Contaminated Soil (December 1999). This report supersedes any previous preliminary reports of the same batch number.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: SYDNEY

Address
277-289 Woodpark Road
SMITHFIELD NSW 2164

Phone: 61-2-8784 8555
Fax: 61-2-8784 8500
Email: michael.heery@alsenviro.com

Signatory

Sub Batch: 0

Date of: 23/05/2002

Client: HLA-ENVIROSCIENCES PTY LTD

Client Reference: J1938/1-HOMEBUSH

CERTIFICATE OF ANALYSIS

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION									
	Laboratory I.D.			1	2	3	4	5	6	7	8	9	10
	Date Sampled			13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002
				BH01_	BH02_	BH03_	BH04_	BH05_	BH06_	BH07_	BH08_	BH09_	BH10_
				0.9-1.0	0-0.2	1.8-2.0	0.4-0.5	0.4-0.5	0-0.3	0.9-1.0	0.9-1.0	2.8-3.0	1.8-2.0
EA-055	Moisture Content (dried @ 103°C)	%	0.1	6.9	52.0	31.1	27.4	7.2	10.4	12.3	16.4	25.4	13.9
EG-005T	Arsenic - Total	mg/kg	1	3	11	6	13	4	7	8	14	10	4
EG-005T	Beryllium - Total	mg/kg	1	<1	<2	1	<1	<1	<1	<1	<1	<1	<1
EG-005T	Cadmium - Total	mg/kg	1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1
EG-005T	Chromium - Total	mg/kg	1	137	23	10	17	8	14	7	31	20	7
EG-005T	Copper - Total	mg/kg	1	49	76	33	19	40	40	23	14	18	14
EG-005T	Manganese - Total	mg/kg	1	851	1160	769	6	287	386	161	301	11	294
EG-005T	Nickel - Total	mg/kg	1	124	52	16	<1	26	21	3	10	2	9
EG-005T	Lead - Total	mg/kg	1	5	64	35	16	13	33	12	35	20	15
EG-005T	Zinc - Total	mg/kg	1	62	123	79	7	44	54	29	23	8	45
EG-035T	Mercury - Total	mg/kg	0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EK-031A	Total Cyanide	mg/kg	1	<1	----	----	----	----	----	<1	----	----	----
EP-035	Phenols	mg/kg	2	----	----	----	----	<2	----	----	<2	----	----

Batch: ES33505
Sub Batch: 0
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

CERTIFICATE OF ANALYSIS

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002
				BH11_ 3.8-4.0	BH12_ 0-0.2	BH13_ 0.8-1.0	BH14_ 0-0.2	BH15_ 1.8-2.0	BH16_ 0.8-1.0	BH17_ 0.8-0.9	BH18_ 1.7-2.0	BH18_ 3.3-3.6	BH19_ 0.8-1.0
EA-055	Moisture Content (dried @ 103°C)	%	0.1	18.5	5.3	18.2	4.8	14.9	11.6	11.1	10.1	8.6	16.1
EG-005T	Arsenic - Total	mg/kg	1	3	4	4	3	59	5	5	3	3	2
EG-005T	Beryllium - Total	mg/kg	1	1	2	<1	<1	<1	<1	<1	1	<1	<1
EG-005T	Cadmium - Total	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EG-005T	Chromium - Total	mg/kg	1	4	4	7	7	17	15	11	4	4	6
EG-005T	Copper - Total	mg/kg	1	29	22	12	70	64	63	20	35	27	21
EG-005T	Manganese - Total	mg/kg	1	58	918	21	321	252	333	75	708	32	159
EG-005T	Nickel - Total	mg/kg	1	6	24	<1	27	8	13	2	15	3	4
EG-005T	Lead - Total	mg/kg	1	59	13	18	13	39	30	11	15	13	13
EG-005T	Zinc - Total	mg/kg	1	48	100	3	36	41	61	28	75	34	29
EG-035T	Mercury - Total	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.1	<0.1
ER-031A	Total Cyanide	mg/kg	1	----	----	----	----	<1	----	----	----	----	----
EP-035	Phenols	mg/kg	2	<2	----	----	----	<2	----	----	----	----	----

Batch: [illegible]
Sub Batch: 0
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

CERTIFICATE OF ANALYSIS

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION								
Laboratory I.D.				21	22	23	24	25	26	27		
Date Sampled				13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002		
				BH20_ 0.1-0.3	BH21_ 0-0.2	BH22_ 0-0.2	BH23_ 0.03-0.2	BH23_ 1.8-2.0	DUP01	DUP02		
EA-055	Moisture Content (dried @ 103°C)	%	0.1	12.6	15.1	14.7	6.8	20.4	5.7	7.7		
EG-005T	Arsenic - Total	mg/kg	1	5	6	3	1	----	2	4		
EG-005T	Beryllium - Total	mg/kg	1	1	<1	<1	<1	----	<1	<1		
EG-005T	Cadmium - Total	mg/kg	1	<1	<1	<1	<1	----	<1	<1		
EG-005T	Chromium - Total	mg/kg	1	9	12	4	5	----	164	9		
EG-005T	Copper - Total	mg/kg	1	24	29	20	14	----	47	35		
EG-005T	Manganese - Total	mg/kg	1	526	311	76	51	----	945	401		
EG-005T	Nickel - Total	mg/kg	1	14	7	4	5	----	130	37		
EG-005T	Lead - Total	mg/kg	1	29	30	13	10	----	4	18		
EG-005T	Zinc - Total	mg/kg	1	81	54	27	17	----	56	61		
EG-035T	Mercury - Total	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	----	<0.1	<0.1		
EK-031A	Total Cyanide	mg/kg	1	----	----	----	----	<1	<1	----		
EP-035	Phenols	mg/kg	2	----	----	----	<2	----	----	----		

Batch: ES33505
Sub Batch: 0
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

QUALITY CONTROL REPORT

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION									
				Laboratory I.D.	1	1	11	11	21	21	200	201	202	205
				Date Sampled	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	14/05/2002	14/05/2002	14/05/2002	14/05/2002
					BH01_0.9-1.0_MS	BH01_0.9-1.0_CHK	BH11_3.8-4.0_MS	BH11_3.8-4.0_CHK	BH20_0.1-0.3_MS	BH20_0.1-0.3_CHK	METHOD BLANK1	LCS1	MS1	METHOD BLANK2
					CHECKS AND SPIKES									
EA-055	Moisture Content (dried @ 103°C)	%	0.1	----	17.4	----	18.7	----	13.5	----	----	----	----	
EG-005T	Arsenic - Total	mg/kg	1	94.0%	16	90.0%	3	75.0%	5	<1	96.0%	90.0%	<1	
EG-005T	Beryllium - Total	mg/kg	1	91.0%	<1	92.0%	1	84.0%	1	<1	----	92.0%	<1	
EG-005T	Cadmium - Total	mg/kg	1	84.0%	<1	94.0%	<1	84.0%	<1	<1	98.0%	94.0%	<1	
EG-005T	Chromium - Total	mg/kg	1	82.0%	156	93.0%	4	85.0%	11	<1	105%	93.0%	<1	
EG-005T	Copper - Total	mg/kg	1	88.0%	55	97.0%	32	82.0%	25	<1	110%	97.0%	<1	
EG-005T	Manganese - Total	mg/kg	1	Not Det'd	977	107%	58	Not Det'd	411	<1	----	107%	<1	
EG-005T	Nickel - Total	mg/kg	1	77.0%	149	91.0%	5	74.0%	10	<1	107%	91.0%	<1	
EG-005T	Lead - Total	mg/kg	1	86.0%	7	86.0%	44	70.0%	27	<1	106%	86.0%	<1	
EG-005T	Zinc - Total	mg/kg	1	71.0%	78	82.0%	44	88.0%	62	<1	111%	82.0%	<1	
EG-035T	Mercury - Total	mg/kg	0.1	124%	<0.1	109%	<0.1	115%	<0.1	<0.1	99.0%	----	<0.1	
EK-031A	Total Cyanide	mg/kg	1	----	----	----	----	----	----	<1	100%	109%	----	
EP-035	Phenols	mg/kg	2	----	----	----	----	----	----	<2	91.0%	90.0%	<2	

Batch: ES33505
Sub Batch: 0
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

QUALITY CONTROL REPORT

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION
		Laboratory I.D.		206
		Date Sampled		14/05/2002
				LCS2
				CHECKS AND SPIKES
EA-055	Moisture Content (dried @ 103°C)	%	0.1	----
EG-005T	Arsenic - Total	mg/kg	1	96.0%
EG-005T	Beryllium - Total	mg/kg	1	----
EG-005T	Cadmium - Total	mg/kg	1	99.0%
EG-005T	Chromium - Total	mg/kg	1	101%
EG-005T	Copper - Total	mg/kg	1	106%
EG-005T	Manganese - Total	mg/kg	1	----
EG-005T	Nickel - Total	mg/kg	1	101%
EG-005T	Lead - Total	mg/kg	1	99.0%
EG-005T	Zinc - Total	mg/kg	1	104%
EG-035T	Mercury - Total	mg/kg	0.1	94.0%
EK-031A	Total Cyanide	mg/kg	1	----
EP-035	Phenols	mg/kg	2	----

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MS RACHAEL CASSON	BATCH:	ES33505
CLIENT:	HLA-ENVIROSCIENCES PTY LTD	SUB BATCH:	1
ADDRESS:		LABORATORY:	SYDNEY
	P O BOX 726	DATE RECEIVED:	14/05/2002
	PYMBLE NSW 2073	DATE COMPLETED:	23/05/2002
		SAMPLE TYPE:	SOIL
ORDER No.:	119255	No. of SAMPLES:	6
PROJECT:	J1938/1-HOMEBUSH		

COMMENTS

Samples analysed on an as received basis. Results reported on a dry weight basis. All analysis and Laboratory QC conducted in accordance with Schedule B(3) NEPM Guideline on Laboratory Analysis of Potentially Contaminated Soil (December 1999).

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: SYDNEY

Address
277-289 Woodpark Road
SMITHFIELD NSW 2164

Phone: 61-2-8784 8555
Fax: 61-2-8784 8500
Email: michael.heery@alsenviro.com

Signatory

Batch: ES33505
Sub Batch: 1
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	5	14	17	24	26				
		Date Sampled		13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002	13/05/2002				
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	BH01_ 0.9-1.0	BH05_ 0.4-0.5	BH14_ 0-0.2	BH17_ 0.8-0.9	BH23_ 0.03-0.2	DUP01				
EA-055	Moisture Content (dried @ 103'C)	%	0.1	6.9	7.2	4.8	11.1	6.8	5.7				
EP-066 SS	Total Polychlorinated biphenyls	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
EP-066S-SS	**POLYCHLORINATED BIPHENYL SURROGATE**												
EP-066S-SS	Decachlorobiphenyl	%	1	81	89	81	73	77	79				

Batch: ES33505
Sub: 1
Date of Issue: 23/05/2002
Client: HLA-ENVIROSCIENCES PTY LTD
Client Reference: J1938/1-HOMEBUSH

QUALITY CONTROL REPORT

METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION									
	Laboratory I.D.			100	101	102	103	104					
	Date Sampled			14/05/2002	14/05/2002	14/05/2002	14/05/2002	14/05/2002					
				METHOD BLANK	NPCBS482 SCS	NPCBS482 DCS	NPCBS482 MS	NPCBS482 MSD					
				CHECKS AND SPIKES									
EA-055	Moisture Content (dried @ 103'C)	%	0.1	---	---	---	---	---					
EP-066-SS	Total Polychlorinated biphenyls	mg/kg	0.1	<0.1	81.0%	80.0%	80.0%	73.0%					
EP-066S-SS	POLYCHLORINATED BIPHENYL SURROGATE												
EP-066S-SS	Decachlorobiphenyl	%	1	100	98	100	106	99					