Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

PRELIMINARY SITE INVESTIGATION

1-5 Chester Street, Annandale NSW

Prepared for

Coach Painting Pty Ltd

7th June 2017
ES6874

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ABBREVIATIONS

ADWG	Australian Drinking Water Guidelines
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground Storage Tank
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
COC	Contaminants of Concern
DLWC	Department of Land & Water Conservation
DNR	Department of Natural Resources
DQOs	Data Quality Objectives
POEO	Protection of the Environment Operations
DSI	Detailed Site Investigation
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance / Quality Control
RAC	Remediation Acceptance Criteria
RAP	Site Remediation Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SCID	Stored Chemical Information Database
SEPP	State Environment Planning Policy
SMP	Site Management Plan
SVC	Site Validation Criteria
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VHC	Volatile Halogenated Compounds

EXECUTIVE SUMMARY

Aargus Pty Ltd ('Aargus') was appointed by Coach Painting Pty Ltd (the 'client') to undertake a Preliminary Site Investigation (DSI) within the property located at 1-5 Chester Street, Annandale NSW (the 'site'). The preliminary investigation was undertaken for due diligence purposes to determine the presence and extent of soil and ground water contamination within the site, in order to determine the suitability of the site for its continued use and for any future prospective development applications.

At the time of the inspection (13th May 2017), the site was predominantly being utilised for a car spray painting workshop. The site was completely sealed with concrete.

Land title information provided suggested that the site was owned by various individuals and companies from 1916 to 1977 and that the current owner acquired the site in 1977. No records were identified for the site on the EPA database. The land is not affected by one of the matters prescribed by Section 59 (2) of the *Contaminated Land Management Act 1997*.

The desktop study identified some areas of potential environmental concern, in relation to imported fill of unknown origin, pesticide use, leaks of storage tanks, motor vehicles, chemical storage in workshop, metal degradation, and potential presence of hazardous materials in current or past building structures, which may pose risks to human and environmental receptors.

The findings of the assessment indicated the following areas of environmental concern:

Soils:

- Chrysotile Asbestos (0.001%w/w FA) was detected in sample BH2 (0.2-0.3m)

Groundwater:

- Copper, Nickel and Zinc were detected in sample GW1 at concentrations above the freshwater criteria.
- F1 (C_6-C_{10}) was detected in GW1 at concentrations of 3,380mg/L, which was above LOR but below assessment criteria.

- F2 (C_{10}-C_{15}) was detected in GW1 at concentrations of 310mg/L, which was above LOR but below assessment criteria.

The following data gaps were identified with respect to the pollution linkages:

- The lateral and/or vertical extent of BH2 is currently unknown and an appropriate remediation strategy should be devised as part of the remediation works to be carried out in the future for any proposed development.
- The contamination status below the USTs and associated infrastructure.

Based on the results of this investigation it is considered that the risks to human health and the environment associated with soil contamination at the site are low to moderate within the context of the current commercial land use.

However if the site is proposed to be re-developed in the future, the following requirements need to be considered in relation to making the site suitable for its intended land use:

- Re-assessment of investigative results under the proposed future land use 'HIL' guidelines.
- An appropriate remedial / management strategy is developed, culminating in preparation of a Remedial Action Plan (RAP) in accordance with EPA guidelines, in regards to the abovementioned soil exceedance locations BH2 as well as the USTs, and associated infrastructure.
- Another round of groundwater testing following remediation.
- Any soils requiring removal from the site, as part of future site works, should be classified in accordance with the "Waste Classification Guidelines, Part 1: Classifying Waste" NSW EPA (2014).

1 INTRODUCTION

1.1 Background

Aargus Pty Ltd ('Aargus') was appointed by Coach Painting Pty Ltd (the 'client') to undertake a Preliminary Site Investigation (DSI) within the property located at 1-5 Chester Street, Annandale NSW (the 'site'). The location of the property is presented in Figure 1 of Appendix A.

The preliminary investigation was undertaken for due diligence purposes to determine the presence and extent of soil and ground water contamination within the site, in order to determine the suitability of the site for its continued use and for any future prospective development applications.

1.2 Objective

The primary objectives of this DSI are as follows:

- Identify potential areas where contamination may have occurred from current and historical activities;
- Identify potential contaminants associated with potentially contaminating activities;
- Assess the potential for soils and groundwater to have been impacted by current and historical activities; and
- Assess the suitability of the site for redevelopment into a mixed use development based on its current condition and the findings of this investigation.

1.3 Scope of Works

The scope of works for this DSI includes:

- Review of the physical site setting and site conditions based on a site inspection, including research of the location of sewers, drains, holding tanks and pits, spills, patches of discoloured vegetation, etc. (where applicable);
- Research and review of the information available, including previous environmental investigations, current and historical titles information, review of aerial photographs, groundwater bore searches, EPA notices, anecdotal evidence, site survey and site records on waste management practices;
- Development of a refined Conceptual Site Model (CSM) to demonstrate the interactions between potential sources of contamination, exposure pathways and human/ecological receptors identified;
- A targeted soil boring/sampling investigative study – formulating and conducting a sampling plan and borehole investigation;
- A targeted groundwater monitoring well installation/sampling investigative study – formulating and conducting a sampling plan and groundwater investigation;
- Laboratory analysis and results from sample analysis – findings and comparison to regulatory guidelines;
- Field and laboratory Quality Assurance/Quality Control (QA/QC); and
- Recommendations for additional investigations should any data gaps be identified or possible strategies for the management of the site, where relevant.

This report was prepared with reference to the NSW Environment Protection Authority (EPA) "*Guidelines for Consultants Reporting on Contaminated Sites*" (2011).

2 SITE IDENTIFICATION AND DESCRIPTION

2.1 Site Identification

Site identification information and land use is summarised in the table below.

Table 1: Site Identification

Lot and DP Number (Address)	Lots 11 in DP499846 (1-5 Chester Street, Annandale NSW)
Coordinates *	NW: Latitude: -33.88477, Longitude: 151.173911 NE: Latitude: -33.884687, Longitude: 151.174059 SW: Latitude: -33.885173, Longitude: 151.173919 SE: Latitude: -33.884979, Longitude: 151.174225
Approx. Total Site Area	1,359m^2
Local Government Area	Inner West City Council
Parish	Petersham
County	Cumberland
Current Land Zoning**	IN2 – Light Industrial
Site End Users	Workers and Visitors

Notes: * refer to http://maps.six.nsw.gov.au/

** refer to Zoning Map published in http://www.legislation.nsw.gov.au/maps/d14d3295-d134-4310-84e7-a117f35297e2/4800_COM_LZN_009_005_20161220.pdf

The site boundary and Lot and DP numbers are presented in Figure 2 of Appendix A.

2.2 Site Inspection

A site visit was carried out on Wednesday 13th May 2017 by an Aargus field engineer to inspect the site for any potential sources of contamination and document any observations made regarding the current site conditions.

At the time of the site inspection, the following observations were made:

- The site was approximately triangular in shape.
- The site was used as a car spray painting workshop.

- The site was occupied by a warehouse constructed of brick with metal roof and sealed concrete floor in the south eastern section of the site, a workshop area with metal awning in the south west and western section of the site and a small brick building used as office with a shed next to it in the north section of the site.
- The main access to the site was along eastern boundary from Chester Street.
- Site was completely sealed with concrete.
- Cracks and oil staining observed within the entire site.
- Cars were parked under the awning and in the north portion of the site.
- The site boundaries were defined by Johnston Creek along western and northern boundary, a commercial building along southern boundary and Chester Street along the eastern boundary.
- Vegetation (grass) was observed in the western and northern boundaries of the site. No stress to vegetation was observed.
- No surface standing water was noticed at the site.

The site features are presented in Figure 3. Site photographs are included in Appendix C.

2.3 Topography and Surface Water Drainage

The following observations were made during the site inspection carried out on the 13th May 2017:

- The site is generally flat with a slight slope to the north at the northeast corner towards Johnsons Creek
- Stormwater runoff from the site is expected to flow in a north direction along Chester Road.

2.4 Surrounding Land Uses

The surrounding land uses identified are described in the table below:

Table 2: Surrounding Land Uses

Orientation	Description
North	Douglas Grant Park and Johnstons Creek
East	Chester Street then commercial building(Kennards Self Storage Camperdown, The Informed Tourist)
South	Commercial building
West	Johnstons Creek then medium residential

3 SITE HISTORY

3.1 Land Titles

A review of historical documents held at the NSW Department of Lands offices was undertaken to identify the current and previous land owners, and potential land uses. The results of the title search are summarised in the following table.

Table 3: Land Title Information

Year	Lot 11 in DP499846 (1-5 Chester Street, Annandale NSW)
1988-Current	Peter John Fitzhenry
	Prior: Vol. 13815,Fol. 125
1979-1988	Peter John Fitzhenry
	Prior: Vol. 12207,Fol. 69
1977-1979	Peter John Fitzhenry
1973-1977	Peter John Fitzhenry/ Clifton George Vincent
1973-1973	Wadame Magda
	Prior: Vol. 4954,Fol. 225
1970-1973	Wadame Magda
1968-1970	Roberta Jefferon
1943-1968	Electric Control Ltd/ Engineering Limited
1938-1943	Grace Bros Pty Ltd
	Prior: Vol. 1318, Fol. 25
1923-1938	Philip Ignatino Delponte
1920-1923	Grace Bros Pty Ltd
1916-1920	William Edwin

In summary, the land title information provided indicated that the company owned by different companies between 1920 to 1968 with the exception of 1923 to 1938. The site was owned by private individuals at least from 1916 to the current date. In 1977 the site transferred to the current site owner Peter John Fitzhenry.

3.2 EPA Records

3.2.1 CLM Act 1997

The NSW EPA publishes records of contaminated sites under Section 58 of the Contaminated Land Management (CLM) Act 1997. The notices relate to investigation and/or remediation of site contamination considered to pose a significant risk of harm under the definition in the CLM Act. However, it should be noted that the EPA record of Notices for Contaminated Land does not provide a record of all contaminated land in NSW.

A search of the EPA database revealed that the subject site is not on the list of NSW contaminated sites notified to EPA.

There is one (1) site listed in the suburb of Camperdown that being O'Dea Reserve. The O'Dea Reserve is located 850m to the south from the site and it includes one (1) former notice. The one (1) former notices pertaining to the site is related to the voluntary remediation proposal.

Copies of the EPA records are included in Appendix D.

3.2.2 POEO Register

A search of the POEO Register revealed that the site was not listed. A copy of the POEO register search is included in Appendix D.

3.3 Industrial Processes and Products Manufactured

A review of industrial processes and/or products manufactured at the site was conducted, and based on the site inspection and historical study, product manufacturing on site is unlikely to have occurred.

3.4 Former Chemical Storage and Transfer Areas

There is one UST kept on site. The non-destructive investigation indicates there was one separate area with a possible UST present. A small amount of chemicals were kept within the workshop and spray painting booths. It is unlikely that there were any bulk chemical storage and transfer areas and/or products manufactured at the site.

3.5 Product Spill & Loss History

It was indicated by the site owner, that to their knowledge no serious land or water contamination had occurred.

3.6 Discharges to Land, Water and Air

No discharge to the land, water and air were observed.

3.7 Complaint History

As indicated by the site owner, there was no complaints lodged against the site.

3.8 Historical Use of Adjacent Land

It was indicated by the client that to their knowledge, the adjacent lands to the site have been used primarily for residential / commercial developments.

3.9 Discussion and Summary of Site History

Based on available information, the site historical usage is summarised as follows:

- Land title information provided suggested that the site was owned by various individuals and companies from 1916 to 1977 and that the current owner acquired the site in 1977.
- No records were identified for the site on the EPA database.
- The land is not affected by one of the matters prescribed by Section 59 (2) of the *Contaminated Land Management Act 1997*.

4 ENVIRONMENTAL SETTING

4.1 Sensitive Environmental Receptors

The nearest environmental receptors in the site vicinity include:

- The Johnstons Creek is located approx. 6m to the west.
- The Douglas Grant Park is located approx. 20m to the north.
- Annandale Public School is located approx. 316m to the west.
- Camperdown Park is located approx. 348m to the south.

4.2 Geology

The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Wianamatta Group Ashfield Shale consisting of black to dark grey shale and laminite.

4.3 Acid Sulfate Soils

To determine whether there is a potential for acid sulphate soils to be present at the site, reference was made to the NSW Department of Land & Water Conservation (DLWC) *Acid Sulphate Soil Risk Maps* (Edition Two, December 1997, Scale 1:250,000), specifically Map No. 93 – "Botany Bay". A review of the map indicated that the subject site is located in the Disturbed Terrain area that may include filled areas, and often occur during reclamation of low lying swamps for urban developments.

Other disturbed terrain includes areas which have been mined or dredged, or have undergone heavy ground disturbance through general urban development or construction of dams or levees.

A search of the NSW Government Planning & Environment shows that the site is located within Class 3 of Acid Sulphate Soil Risk area (https://www.planningportal.nsw.gov.au/find-a-property/property/1918569_1-5_Chester_Street_11_Annandale_DP499846/1-5_chester_street,_annandale,_2038).

4.4 Hydrogeology

Based on available information, our desktop study indicates that groundwater from site is likely to be flowing towards the Johnstone Creek, approximately 60m west.

A search of the Department of Natural Resources (DNR) borehole database information revealed no groundwater bores within a 500m radius of the site.

4.5 Summary of Local Meteorology

The monthly rainfall of the local area can be represented by the data collected by Bureau of Meteorology (BOM) from the rainfall gauge located in Sydney Olympic Park, which is located approximately 40km west of the site. Records indicate that the mean annual rainfall for the since 1995 is 911.8 mm.

Reference can be made to Appendix G – Local Meteorology.

5 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

Based on the site inspection, site history, previous reports and review of available information from the desktop study, the potential Areas of Environmental Concern (AEC) and their associated Contaminants of Concern (CoC) for the site were identified. These are summarised in the following table.

Table 4: Summary of Potential Areas and Contaminants of Concern

Potential AEC	Potentially contaminating activity	Potential CoCs	Potentially Impacted Medium	Likelihood of Site Impact	Justification
Entire site	Importation of fill material from unknown origin	Metals, TPH, BTEX, PAH, OCP, PCB, Asbestos	Soil	Low	Based on the site observations and site topography, the presence of imported fill material is likely to be minimal.
	Potential for pesticides to have been sprayed or injected on or underneath concrete slabs	OCP	Soil	Low	The site is not known for having been used for agricultural purposes from the 1950s when OCPs were first introduced into Australia. If use of OCPs has occurred, the impact is likely to have been localised and limited to the topsoil layer.
UST, Chemical storage in workshops	Potential for leaks from storage tanks	Metals, TPH, BTEX, PAH	Soil and groundwater	Low to moderate	Tank integrity test indicates the tank were not leaking. The workshop area was sealed with concrete.
Car Parking Areas	Potential for leaks from parked vehicles	Metals, TPH, BTEX, PAH	Soil	Low	The concrete surfaces were in good conditions; however, minor oil staining was noted across the site.
Metals Features	Degradation of metal features	Metals	Soil	Low	If this has occurred, it would likely be restricted to the surface soils.
Building Structures	Potential Asbestos/Fibro Features	Asbestos	Soil	Low	If present, these will be removed by licensed contractors.

6 DATA QUALITY OBJECTIVES

6.1 Step 1 – State the Problem

6.1.1 Problem Statement

The investigation is for due diligent purposes to determine the presence and extent of any possible contaminants onsite. This site investigation report is be prepared by a consultant to assess whether the site is suitable for the continued use for commercial land use.

However, the desktop study identified some areas of potential environmental concern, in relation to imported fill of unknown origin, pesticide use, leaks of storage tanks, motor vehicles, chemical storage in workshop, metal degradation, and potential presence of hazardous materials in current or past building structures, which may pose risks to human and environmental receptors.

6.1.2 Objectives

The objectives of the PSI are:

- To assess the potential for the soils and groundwater to have been impacted by current and historically contaminating activities; and
- To assess the suitability of the site for future development.

6.1.3 Project Team

The nominated core project team and their responsibilities are listed in the table below.

Table 5: Project Team and Responsibilities

Project Team Member	Responsibilities
Mark Kelly – Environmental Manager	Project Director & Technical Review
Con Kariotoglou – Senior Project Manager	Project Manager & Report Author
Ningye Zhang – Environmental Engineer	Field Representative

6.2 Step 2 - Identify the Decisions of the Study

The decisions required to address the contamination problem are as follows:

- Is soil and groundwater contamination present within the areas of potential environmental concern identified?
- Is soil and groundwater contamination likely to present an unacceptable risk of harm to humans or the environment?
- Is the site currently suitable for the proposed land use being residential with minimal access to soil and groundwater?
- Is there a potential for onsite/offsite migration issues?
- If not, does the site require further investigation and/or remediation works?

6.3 Step 3 - Identify Information Inputs

The following information is required for input into the decisions identified in Step 2:

- Identification of potential areas and contaminants of concern as detailed in Section 5 of this report;
- Selection of soil and groundwater assessment criteria from appropriate guidelines as detailed in Section 8 of this report;
- Collection of soil and groundwater samples from site;
- Headspace analysis for screening of VOCs present within soils using a PID; and
- Comparison and interpretation of results again the adopted soil and groundwater assessment criteria.

6.4 Step 4 – Define the Study Boundaries

The spatial and temporal aspects of the investigation area that the data must represent to support the decisions identified in Step 2 are as follows:

- The lateral extent of the study boundary is defined by the site boundaries as shown in the Site Location Plans (refer to Figure 1).
- The vertical extent of the study boundary is defined by the depth of the natural soil and groundwater in borehole BH1/GW1 to a depth of approximately 7.98 metres below the ground surface.

6.5 Step 5 – Develop the Analytical Approach

The acceptable limits for laboratory QA/QC parameters are shown in the table below and are based upon the laboratory reported acceptable limits and those stated within the NEPM 2013 Guidelines.

Table 6: Acceptable Limits for QC Samples

Type of QC Sample	Control Limit
FIELD	
Rinsate Blanks	Analytes <LOR
Intra-Laboratory Duplicates	RPD's <50%
Inter-Laboratory Duplicates	RPD's <50%
Trip Blanks	Volatiles <LOR
Trip Spike Recovery	>70%
LABORATORY	
Method Blanks	< Laboratory LOR
Matrix Spike	Recovery targets: • Metals: 70% to 130% • Organics: 60% to 140%
Laboratory Duplicate	RPD's <30%
Laboratory Control Samples	Recovery targets: 60% to 140%
Surrogate Spike	Recovery targets: 60% to 140%

The following conditions should be adopted:

- If the control limits are exceeded, then an assessment of the significance of the results should be carried out;
- If the results of the DQI assessment indicate that the data set is reliable, then the data set will be deemed to be acceptable for the purposes of the investigation; and
- If the measured concentrations of soil and groundwater samples analysed meet their respective validation criteria, then no additional assessment is required is required.

6.6 Step 6 - Specify Limits on Decision Errors

There are two types of decision errors:

- **Sampling errors**, which occur when the samples collected are not representative of the conditions within the investigation area; and
- **Measurement errors**, which occur during sample collection, handling, preparation, analysis and data reduction.

These errors may lead to following (null hypothesis):

- Deciding that the site is not suitable for the proposed development when it actually is (Type I error);
- Deciding that the site is suitable for the proposed development when it is actually not (Type II error);
- Deciding that the risks to human health from soil vapour concentrations are high and require further management or remediation, when the risks are actually low (Type I error); and
- Deciding that the risks to human health from soil vapour concentrations are low and requires no further management, when the risks are actually high (Type II error).

A 5% significance level has been selected for Type I errors on the basis that 95% of the data set will satisfy the DQIs. Therefore, the acceptable limit of the decision errors is based on a 5% probability of the hypothesis being incorrect.

An assessment will be made as to the likelihood of a decision error being made based on:

- The acceptable limits for inter/intra laboratory duplicate sample comparisons as specified in Step 5 of the DQOs; and
- The acceptable limits for laboratory QA/QC parameters are based upon the laboratory reported acceptable limits and those stated within the NEPM Guidelines.

If the concentration of a particular contaminant of concern exceeds its assessment criteria, then a further assessment is required to address the significance of the result. Statistical analysis based on 95% UCL may be used to assess the significance of the data provided the following conditions are met:

- the arithmetic mean of the data set must be less than its respective threshold level; that is, it is acceptable for individual results to exceed its respective threshold level, but the cumulative mean of the data set of soil and groundwater sample results must not exceed the threshold level;
- the standard deviation of the data set is less than 50% of the relevant threshold level; and
- no individual sample result should be greater than 250% of the relevant threshold level.

Ecological data is not included in this assessment process as ecological results cannot be statistically interpreted.

6.7 Step 7 - Optimise the Design for Obtaining Data

The optimum design for obtaining data in order to achieve the Data Quality Objectives is as follows:

- Only NATA-accredited environmental testing laboratories will be commissioned to analyse soil samples and will implement a quality control plan conforming to the NEPM (Assessment of Site Contamination) Measure Schedule B(3) Guidelines for Analysis of Potentially Contaminated Soils;
- An assessment of the Data Quality Indicators to determine if the field procedures and laboratory analytical results are reliable;
- The investigation will be carried out by an experienced and qualified Environmental Scientist, who is trained in sampling at contaminated sites in accordance with Aargus protocols based on best practice industry standards;
- Collection of QA/QC samples at frequencies prescribed in the NEPM Guidelines; and
- In accordance with the NSW EPA "Sampling Design Guidelines" (September 1995) a minimum of seven (7) sampling points for a site area of 1,631m^2 will be adopted to provide general site coverage.

7 DATA QUALITY INDICATORS

7.1 General

The five Data Quality Indicators (DQIs) comprising completeness; comparability; representativeness; precision and accuracy provide an assessment of the reliability of field procedures and laboratory analytical results in accordance with the 'Guidelines for the NSW Site Auditor Scheme (2nd Edition), 2006. These are addressed in the following sub-sections.

7.2 Completeness

Data Completeness is a measure of the amount of useable data (expressed as %) from a data collection activity. The completeness is equal to the percentage of valid quality assurance and quality control results.

The assessment should address the following:

Table 7: Data Completeness

Field	Laboratory
• All critical locations are sampled; • All samples collected from critical grids and depths; • Consistency in the use of standard operating procedures, equipment, sampler; • Completion and correctness of field documentation.	• All critical samples and analytes are analysed in accordance with the DQOs; • Appropriateness of laboratory methods and PQLs.

The minimum target frequency for each type of QA/QC sample should be carried out in accordance with the following tables:

Table 8: QA/QC Requirements

Field QA/QC Sample	Frequency
Intra-Laboratory Duplicate	1 in 20 samples
Inter-Laboratory Duplicate	1 in 20 samples
Field Blanks	1 per day (rinsate)
Trip Blank	1 per sample batch
Trip Spike	1 per sample batch

Where any of the above objectives are not achieved for particular samples, steps will be taken to rectify the non-conformance, if possible. Alternatively, data qualifiers detailing the nature of the quality problem will be documented in the report and attached to relevant data in the result summary tables.

The target for overall completeness for each data set is a minimum of 95%. A data completeness of less than 95% may be accepted where it can be justified that the non-conformance does not have a significant effect on the outcome of the results.

7.3 Comparability

Data Comparability is the confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.

The qualitative assessment should address the following:

Table 9: Data Comparability

Field	Laboratory
• Consistency in the use of standard operating procedures, equipment, sampler • Consistency in the method of sample collection for each media • Quantification of influence by climatic conditions	• Consistency of analytical methods and limits of reporting (LOR) for each analyte • Whether laboratory limits of reporting are set at < 20% of the adopted site criteria value for each analyte • Consistent use of one primary and one secondary laboratory

7.4 Representativeness

Data Representativeness is the confidence (expressed qualitatively) that data are representative of each media present on the site.

The qualitative assessment should address the following:

Table 10: Data Representativeness

Field	Laboratory
• Samples are collected in accordance with the proposal • Receipt of samples within holding times • Receipt of intact samples • Receipt of adequately preserved samples	• All samples are extracted and analysed within their respective holding times

7.5 Precision

Data Precision is a quantitative measure of the variability (or reproducibility) of data.

Intra-laboratory or Inter-laboratory Duplicate Samples (B) results are compared with Primary Sample (A) results using Relative Percentage Differences (RPDs) according to the following formula:

$$\%RPD = \left|\frac{A - B}{A + B}\right| \times 200$$

Duplicate sampling rates for this assessment (**for each separate sample batch**) are to be tested for all the same analytes as the primary sample:

Table 11: Data Precision

Type of QC Sample	Control Limit
Field Intra-Laboratory Duplicate (Blind)	RPD < +/- 50%
Field Inter-Laboratory Duplicate (Split)	RPD < +/- 50%

Where the laboratory has reported results for a particular analyte below the limit of reporting for either the primary sample or a duplicate sample, the RPD is reported as 'Not Calculable' or NC. A discussion should be made as to which sample should be adopted and compared against the relevant assessment criteria. However, no discussion is required where both the primary sample and the duplicate sample for a particular analyte are below the limit of reporting.

7.6 Accuracy

Data Accuracy is a quantitative measure of the closeness of reported data to the true value. Laboratory measured recovery of analytes in lab control samples with known concentrations. Laboratory QA/QC testing is to include:

Table 12: Data Accuracy

Laboratory QA/QC Sample	Frequency
Method Blank	1 per 20 samples
Matrix Spike	1 per 20 samples
Laboratory Duplicate	Laboratory defined
Laboratory Control	Laboratory defined
Surrogate Spike	All organic samples

8 SITE INVESTIGATION AND SCREENING LEVELS

8.1 General

The selection of appropriate human health, ecological and groundwater site assessment criteria were based on the following guiding documents:

- "Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000" (ANZECC);
- "Australian Water Quality Guidelines 2000" (AWQG);
- "Australian Drinking Water Guidelines 2011" (ADWG);
- "Guidelines for Managing Risk to Recreational Waters 2008 (GMRRW); and
- "National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)", NEPC (2013).

Full details of the site investigation and screening levels for each potential contaminant of concern in soils and groundwater identified in Section 5 are presented in Appendix H.

8.2 Soils Investigation and Screening Levels

8.2.1 Health Investigation Levels (HILs)

The NEPM presents Tier 1 Health Investigation Levels (HILs) for a broad range of chemicals such as metals, inorganics, PAHs, phenols, pesticides and other organics. The HILs are applicable to generic land uses such as residential, commercial/industrial or public open space and all soil types, generally within the first 3 metres of soil below ground level. The HILs have been applied to assess human health risks via all relevant pathways of exposure.

Based on the proposed development, soil investigation results within the site will be assessed against the **HIL 'D'** – *Commercial/industrial, includes premises such as shops, offices, factories and industrial sites*

8.2.2 Health Screening Levels (HSLs)

The NEPM presents Tier 1 Health Screening Levels (HSLs) for the following petroleum compounds and fractions:

- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Naphthalene; and
- TPH C6-C10 and TPH >C10-C16 fractions

The HSLs are applicable to generic land uses such as residential, commercial/industrial or recreational/public open space and different soil types between the ground surface and soils >4 metres below ground level. The HILs have been applied to assess human health risks via the inhalation and direct contact pathways of exposure.

Point 1 of Table 1A (4), which indicates that HSL D can be used in lieu of HSL B for buildings that comprise car parks or commercial properties on the ground floor.

8.2.3 Ecological Screening Levels (ESLs)

Table 1B (6) of the NEPM presents Ecological Screening Levels (ESLs) for TPH C6-C40 fractions, BTEX and benzo(a)pyrene.

The ESLs are applicable to generic land uses such as areas of ecological significance, urban residential areas and public open space, and commercial/industrial land uses. The ESLs have been applied to assess risks to terrestrial ecosystems, generally, within the top 2 metres of coarse or fine soil at the final surface/ground level.

8.2.4 Petroleum Hydrocarbon Management Limits

Table 1B (7) of the NEPM presents petroleum hydrocarbon management limits for application to TPH fractions C_6-C_{10}, >C_{10}-C_{16}, >C_{16}-C_{34} and >C_{34}-C_{40}. The management limits are applicable for coarse or fine soils in residential, parkland, public open space or commercial/industrial land uses following consideration of relevant ESLs and HSLs.

8.2.5 Asbestos

Health screening for asbestos in soil, which are based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and are referred in Table 7 in Schedule B1.

Table 13 Health screening levels for asbestos contamination in soil

	Health Screening Level (w/w)			
Form of asbestos	**Residential A[1]**	**Residential B[2]**	**Recreational C[3]**	**Commercial/ Industrial D[4]**
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[5] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
2. Residential B with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
3. Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
4. Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
5. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer Section 4.10). This screening level is not applicable to free fibres.

8.3 Groundwater Investigation and Screening Levels

8.3.1 Potential Beneficial Uses

Groundwater investigation and screening levels were established by identifying the potential beneficial uses of groundwater down-gradient from the site based on the Six Environmental Values presented in the table below.

Table 14: Potential Beneficial Uses of Groundwater

Environmental Value	Applicability
Freshwater aquatic ecosystem	✓
Marine aquatic ecosystem	×
Agricultural use - irrigation	×
Agricultural use – stock watering	×
Recreational use	✓
Raw drinking water	×

The applicable Environmental Values were selected on the basis of the following down-gradient receptors as identified in Section 4.1 of this report:

- The fresh water aquatic ecosystem, recreational users and aesthetics at Johnstone Creek located approximately 60m west of the site:

No abstraction wells for agricultural use were identified within 500m of the site.

For each relevant Environmental Value identified above, the groundwater investigation and screening levels adopted are discussed in the following sub-sections. Full details of the investigation and screening levels for potential contaminants of concern in groundwater are presented in Appendix H.

If the screening or investigation levels are exceeded, then further consideration will be given to processes such natural attenuation, advection, adsorption and contaminant flux to assess potential risks to down-gradient aquatic ecosystems or drinking water sources.

8.3.2 Protection of Aquatic Ecosystems

Table 1C of the NEPM presents Groundwater Investigation Levels (GILs) for the protection of fresh water and marine water in slightly to moderately disturbed ecosystems. However, where the closest sensitive receptor is high value or highly disturbed, Section 3.1 of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) provides a range of water quality guidelines values based upon three levels of ecosystem conditions as shown in the table below.

Table 15: Aquatic Ecosystem Values

Ecosystem Value	Protection Level	Brief Definition	Applicability
High value ecosystems (HVE)	99%	Effectively unmodified, with ecological integrity regarded as intact.	×
Slightly to moderately disturbed ecosystems (SMDE)	95%	Small impacts to aquatic biological diversity within moderately cleared catchments with reasonably intact riparian vegetation.	✓
Highly disturbed ecosystems (HDE)	90%	Measurably degraded ecosystems typically associated with shipping ports or urban catchments.	×

Based on observations made during the site walkover, the aquatic ecosystem value of the Johnstone Creek area was considered to be slightly to moderately disturbed and that the NEPM GILs are applicable.

However, where contaminants are potentially bio-accumulative, trigger values for the protection of 99% of species were used. Low reliability trigger values presented in Table 3.4.1 of the ANZECC 2000 guidelines were also adopted in the absence of high or moderate reliability trigger values.

8.3.3 Recreational Water Use and Aesthetics

The GMRRW guidelines (as referenced in NEPM) recommend adopting a multiplication factor of 10 to 20 to the ADWG for the assessment of recreational water quality. This is based on the rationale that the ADWG guideline values are based on a daily consumption of 2L, which is considered to be very conservative for application to recreational water exposure. On this basis, a multiplication factor of '10' (i.e. recreational consumption of 200mL per day) will be applied to the ADWG health guidelines to establish screening criteria.

8.4 Export of Waste

To assess the waste classification of materials to be disposed of off-site, the NSW EPA refers to the NSW EPA (2014) "*Waste Classification Guidelines, Part 1: Classifying Waste*".

9 SOIL INVESTIGATION

9.1 General Methodology

The soil investigation was carried out on the 13th May 2017 and was designed to meet the Data Quality Objectives. The fieldwork procedures adopted were carried out in general accordance with the Aargus fieldwork protocols, which are based on industry standard practice as prescribed in the NEPM.

Each borehole was drilled by a drilling rig using solid flight augers. The boreholes were backfilled with clean spoil or clean sand/gravel.

A description of sub-surface conditions observed during drilling are presented in borehole logs included in Appendix G.

9.2 Sampling Design Rationale

Seven boreholes (BH1 to BH7) were drilled by adopting a targeted sampling pattern across the site to provide general site coverage with consideration given to accessibility, site features and the proposed development zones.

It is considered that the number of sampling points adopted meets the minimum requirements of the NSW EPA "Sampling Design Guidelines" (1995) for a site area of 1,631m^2 and to detect a hotspot diameter of 19.9m. The borehole locations are shown in Figure 4 of Appendix A.

9.3 Sampling Density and Sampling Depth

Boreholes were advanced through fill material and terminated at least 0.5m into natural soils to allow for the collection of at least one soil sample from fill material and one from natural soils.

9.4 Sampling Methodology

Soil sampling was carried out in general accordance with Aargus Fieldwork Protocols. In summary:

- Soil samples were collected using a solid flight auger from each soil type or change in lithology.
- Samples were transferred into clean laboratory supplied containers using a hand trowel.
- In general, each soil sample was divided into two sub-samples. One of the sub-samples was placed into a laboratory-supplied container and a second sub-sample was placed in a separate zip-lock bag for field headspace screening using a PID.

Sampling of asbestos was undertaken as follows:

- One wetted 500ml sample from each sampling location was submitted for laboratory analysis for AF.

9.5 Field Tests

A calibrated Photo-ionisation Detector (PID) meter was used to obtain the following field measurements:

- Background concentrations of ionisable volatile organic compounds (VOCs) in the ambient air taken approximately 5 to 10 metres upwind of the general work area; and
- Headspace analysis of bagged soil samples collected to detect the presence of ionisable VOCs.

The PID readings were observed before and after each measurement of a sample to ensure that the PID was operating correctly. The procedures followed in performing field headspace on soil samples can be found in the Aargus Field Protocols.

Readings of PID maximums, fluctuations and general comments of observation were recorded in Aargus field record forms included in Appendix H. The PID calibration certificate can be found in Appendix H.

9.6 Soil Laboratory Analysis

Soil samples were submitted to their respective laboratories as specified in Section 11.2. The schedules of analysis for each sampling batch are presented in Appendix I.

10 GROUNDWATER INVESTIGATION

10.1 General Methodology

The groundwater sampling was carried out on the 18th May 2017. Groundwater gauging, purging and sampling methodology adopted was carried out in accordance with Aargus fieldwork protocols.

Groundwater-related field record forms included in Appendix J.

10.2 Sampling Design Rationale

One (1) of the boreholes drilled was converted into a groundwater monitoring well on the 13th May 2017 and were designated as GW1 (BH1). The location of the monitoring wells are shown on Figure 4 of Appendix A and were selected on the basis of accessibility and to provide an assessment of groundwater conditions beneath the site.

A list of the groundwater monitoring wells and their function in the monitoring network are presented in the table below.

Table 16: Groundwater Network

Well ID	Site	Status	Function
GW1	Annandale	Installed on the 13th May 2017	Considered down-gradient well based on terrain map, check the extent of the on-site migration and general monitoring

10.3 Well Installation

Groundwater monitoring well was constructed on 13th May 2017 by adopting the following methodology:

- 50mm diameter, Class 18uPVC threaded and flush joined casing and 0.45 machine-slotted screens were used;

- The screen extended 1m above and 2m below the standing water table measured after drilling;
- Coarse, washed sand and gravel was placed in the annulus surrounding the piping to a height of 0.2m above the screen;
- Bentonite pellets were placed in the annulus above the sand to form an impermeable plug of a thickness of 1.0m and near the top of the well to prevent surface runoff from entering directly into the well;
- A PVC cap was placed on the casing; and
- 140mm diameter stainless steel flushed covers were used for groundwater well GW1, finishes and concreted onto the ground surface.

A summary of the groundwater monitoring well construction details installed are listed in the table below and are also presented in full detail within their respective borehole logs included in Appendix H.

Table 17: Summary of Well Construction Details

Well ID	Total Depth (m BGL)	Screening Zone (m BGL)	Lithological Description
GW1	7.98	4.68-7.98	Natural

The wells were developed by completely removing existing water column in the well after the construction.

10.4 Groundwater Gauging

Prior to purging and sampling of groundwater at each monitoring well, groundwater levels were measured and the presence of phase-separated hydrocarbons (PSH) was checked using an oil-water interface probe.

Measurements of groundwater well depths were also obtained to assess whether siltation of the well had occurred following well development. Where a significant difference was noted, the well was redeveloped. In this investigation, no significant difference was observed in the measurement of groundwater well depths.

Groundwater levels were measured within a single time interval at all locations prior to the commencement of purging and sampling.

10.5 Groundwater Purging and Sampling

Prior monitoring, wells were purged and sampled using low flow techniques with a micropurge pump and maintaining a flow rate of between 100ml/min and 500 ml/min to reduce potential loss of VOCs.

Purging of groundwater was carried out until three consecutive readings from a calibrated Water Quality Meter were measured within the stabilisation criteria specified for each physico-chemical parameters listed in the table below.

Table 18: Groundwater Quality Stabilisation Criteria

Parameter	Measurement Unit	Stabilisation Variance
Temperature	°C	± 0.2
pH	pH units	± 0.1
Oxidation Reduction Potential (ORP)	mV	± 10 mV
Dissolved Oxygen (DO)	mg/L	± 0.2 or 10%
Electrical Conductivity	mS/cm	± 5%

Groundwater samples were collected only after stabilised groundwater quality readings were achieved to ensure representative sampling and then transferred into laboratory-supplied sample containers appropriate for laboratory analyses. A copy of the calibration certificate can be found in Appendix J.

10.6 Laboratory Analyses

Groundwater samples were submitted to their respective laboratories as specified in Section 11.2. The schedules of analysis for each sampling batch are presented in Appendix I.

11 QUALITY ASSURANCE / QUALITY CONTROL

11.1 Field QA/QC

11.1.1 General

The frequency required for each field quality assurance / quality control (QA/QC) sample is presented in the table below.

Table 19: QA/QC Sampling Frequency

	Intra-Lab Duplicates	Inter-Lab Duplicates	Rinsates	Trip Blanks	Trip Spikes
Sampling Frequency	1 in 20 primary samples	1 in 20 primary samples	1 / Day	1 / Day	1 / Day

11.1.2 Field Duplicates

Duplicates of primary samples were collected to enable the assessment of variability in analyte concentrations between samples collected from the same sampling point. The tables below list the duplicate soil, groundwater and soil vapour samples collected with their corresponding primary samples.

Table 20: Soil Field Duplicate Samples

Primary Sample ID	Sample Depth (m bgl)	Blind Duplicate ID	Split Duplicate ID	Date Sampled
BH1	0.2 – 0.4	D1	SS1	13.05.2017

11.1.3 Rinsates

Rinsate samples recovered for each day in which sampling took place to identify possible cross contamination between the sampling locations are listed in the table below.

Table 21: Rinsate Samples

Sample ID	Equipment Type	Sample Media	Date Collected
R1	Hand Trowel	Soil	13.05.2017

11.1.4 Trip Blanks / Spikes

Trip spike and trip blank samples were collected to assess the effect of sample handling on volatile concentrations in the samples collected and are listed in the table below.

Table 22: Trip Blank/Trip Spikes

Sample ID	QC Sample Type	Media	Date Collected
TB1	Trip Blank	Soil	13.05.2017
TS1	Trip Spike	Soil	13.05.2017

11.1.5 Sample Handling, Storage and Transport

The following sampling handling, storage and transport procedures were adopted to ensure sample integrity:

- Samples were collected in laboratory supplied containers. A list of sample preservation methods and the types of sample containers used are attached in Appendix J.
- Soil and groundwater sample containers were placed immediately into a chilled cooler box and dispatched to their respective analytical laboratories on the same day. If this was not possible, samples were temporarily held overnight in the Aargus office refrigerator at a temperature of no greater than 4 °C and dispatched the following day.
- A Chain of Custody form (COC) was completed for all samples collected and included with the samples for transport to their respective laboratories for chemical analysis. Copies of COCs are included in Appendix K.
- All glass bottles were individually bubble wrapped for protection and insulated containers/coolers were used for sample shipment.
- Disposable nitrile gloves were used for OH&S purposes and were changed between every sample location.

11.1.6 Decontamination Procedures

The decontamination of non-dedicated sampling equipment was achieved by washing with phosphate-free detergent and tap water, followed by a final rinse with distilled water. Decontamination was conducted after the collection of samples at each sample location. A clean pair of disposable gloves was used when handling each sample.

The augers were decontaminated between sampling locations by physically removing soil material between boreholes, washing the augers with Decon 90 and rinsing them with water.

We highlight that separate bailer chord and disposable bailers were used for each monitoring well during development, and separate disposable tubing used when sampling. These equipment items were not subject to decontamination procedures.

11.1.7 Calibration of Equipment

The 10.6eV lamp of the PID was calibrated with isobutylene gas at 100ppm prior to commencement of fieldwork and prior to commencement of each day's fieldwork. The battery in the PID unit was recharged after every day's use in the field.

Copies of calibration records for each relevant item of equipment used can be found in Appendix H.

11.2 Laboratory QA/QC

11.2.1 Laboratories Used

The following NATA-accredited laboratories were commissioned to carry out laboratory analysis of soil and groundwater samples collected:

- Primary Laboratory for soil and groundwater samples – ALS Environmental (Sydney)
- Secondary Laboratory for soil samples – ALS Environmental (Melbourne)
- ASET was selected to conduct asbestos analysis on all primary soil samples

These laboratories also operate Quality Systems that are designed to comply with ISO/IEC 17025. All primary samples, blind duplicates, rinsate samples, trip blank/spikes were dispatched to the primary laboratory. All split samples were dispatched to the secondary laboratory. Laboratory Certificates of Analysis are included in Appendix K.

11.2.2 Holding Times

The holding times for chemicals analysed are presented in Appendix M and were based on USEPA methods, Standard Methods for the Examination of Water and Wastewater (APHA).

11.2.3 Test Methods and Practical Quantitation Limits

The test methods adopted by ALS Environmental – Sydney & Melbourne are listed in Appendix P and Practical Quantitation Limits (PQLs) adopted are specified within the Laboratory Certificates of Analysis included in Appendix M.

The methods used by the laboratories generally comply with those listed in the NEPM and the Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*". Alternate methods used by the laboratories (i.e. not identified in the NEPM and ANZECC guidelines) have been validated by the laboratories, as recommended in the NEPM and ANZECC guidelines, and endorsed by NATA.

11.3 QA/QC Data Evaluation

A full evaluation of the Data Quality Indicators (DQIs) for both fieldwork and laboratory procedures is presented in Appendix Q. These were assessed with reference to Appendix V of the NEPM and Guidelines for the NSW Site Auditor Scheme (2nd ed.), 2006. In summary, the findings of the QA/QC evaluation indicated the following:

- Data Completeness – The data set is considered to be adequately complete.
- Data Comparability – The data set is considered to be adequately comparable.
- Data Representativeness – The data set is considered to be adequately representative.
- Data Precision – The data set is considered to be adequately precise. However, the following minor non-conformances were identified:
    - The calculated RPDs for Copper, Nickel and B(a)P based on sample results SS1 exceeded the control limits. However, this was likely due to variations in the groundwater quality during sampling and the use of preservatives ion the sampling bottles. Given that the majority of RPDs were within the criteria, the data set was considered to be adequately precise and was not considered to affect the outcome of the assessment.
- Data Accuracy – The data set is considered to be adequately accurate.

The sampling methods (including sample preservation, transport and decontamination procedures) and laboratory methods followed during this investigation works were consistent with Aargus protocols and were found to meet the DQOs for this project.

It is therefore considered that the data is sufficiently reliable and that the results can be used for the purpose of this project.

12 FIELD OBSERVATIONS

12.1 Geology

Based on surface and sub-surface conditions observed during the intrusive investigation, the surface and sub-surface profile across the site is summarised in the table below.

Table 23: Summary of Geological Observations

Geological Unit	Lithological Description
Fill / Topsoil	Clayey Sand, Silty Sand and Gravelly Sand
Natural Soils (Residual)	Silty CLAY and Sandy CLAY
Bedrock	Sandstone

The following additional observations were made:

- Some Hydrocarbon staining was observed on concrete surfaces across the site.
- No Hydrocarbon odours were noted within any of the borehole locations.
- No fibre-containing fragments or sheeting were observed in any of the borehole samples.

We recommend that this section be read in conjunction with Figure 4 (Sample Location Plan) in Appendix A, the Daily Work Sheets in Appendix H and the borehole logs in Appendix G.

12.2 Field Headspace Results

Ionisable VOC detections in PID readings taken from soil samples subjected to field headspace analysis are listed in the following table.

Table 24: Summary of PID Results

Sample ID	Depth Range (m bgl)	PID Readings	Stratum
BH1	0.2-0.4	0.6 ppm	Fill
BH2	0.2-0.3	0.2 ppm	Fill
BH3	0.2-0.3	0.1 ppm	Fill
BH4	0.2-0.3	0.5 ppm	Fill
BH5	0.2-0.3	0.6 ppm	Fill
BH6	0.2-0.3	0.2 ppm	Fill
BH7	0.2-0.3	0.4 ppm	Fill

The PID field record forms can be found in Appendix H.

12.3 Groundwater Observations during Drilling

Groundwater observations made during drilling are summarised in the table below.

Table 25: Groundwater Observations during Drilling

Borehole ID	Initial Depth (m BGL)	Flow Type	Standing Water Level (m BGL)	PSH (mm)	Lithology (Initial Depth)
GW1/BH1	7.98	Seepage	4.68	None	Natural – Weathered Shale

These results indicated the following:

- No PSH were observed in the groundwater monitoring wells during drilling.

12.4 Groundwater Monitoring Results

12.4.1 Groundwater Measurements

Groundwater levels measured and observations made during the monitoring event carried out on the 18th May 2017 are summarised in the table below.

Table 26: Groundwater Elevations and Observations

Well ID	Well Depth (m BGL)	Groundwater Depth Measured (m BGL)	Groundwater Depth Measured (m RL AHD)	PSH Depth (m BGL) / Thickness (mm)
GW1	7.98	4.68	-	None

Note: No information regarding R.L.s were available from the client

Based on the general topography of the site vicinity the general groundwater flow from site is inferred to be in a westerly direction towards Johnstone Creek as shown in Figure 4 in Appendix A.

12.4.2 Physio-Chemical Parameters

The stabilised measurements taken for each groundwater physico-chemical parameter are summarised in the table below. Copies of detailed field measurement records for each monitoring well location are presented in Appendix H.

Table 27: Physico-Chemical Parameters

Well ID	Temperature (°C)	pH	EC (mS/cm)	Redox (mV)	DO (ppm)
GW1	18.6	6.50	7.99	282.3	2.94

The results of the field parameters measured are summarised as follows:

- pH readings ranged from 6.45to 6.50 indicating the groundwater is slightly alkaline;
- EC readings ranged from 7.83 mS/cm to 7.99 mS/cm, indicating that the groundwater on site is slightly brackish. This is considered due to salinity presented within the clay-shale strata and alkaline groundwater.
- Redox potential readings ranged from 282.3 mV to 321.1 mV, indicating an environment between the suboxic (ferric iron reduction) and aerobic zones; and
- DO readings ranged from 2.94 mg/L to 6.66 mg/L, indicating low levels to support fish & insects.

13 LABORATORY RESULTS

13.1 General

A comparison of soil and groundwater laboratory results against their respective assessment criteria (as specified in Section 8) are presented in the summary tables in Appendix I. Certificates of laboratory analysis are attached in Appendix K. A discussion of the results is presented in the following sub-sections.

13.2 Soil Results

13.2.1 Heavy Metals

13.2.1.1 Health Investigation Levels (HILs)

As indicated in Table A1, the concentrations of the discrete heavy metals were below the Health Investigation Level (HIL) for a commercial land use, that being the HIL 'D'.

13.2.2 TRH, BTEX, NAPHTHALENE &/OR BENZO(a)PYRENE

13.2.2.1 Health Screening Levels (HSLs)

As indicated in Table B1, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), benzene, toluene, ethyl benzene, xylenes and naphthalene concentrations were below the HSL 'D' for a sand soil profile with a source depth of "0m to <1m".

13.2.2.2 Ecological Screening Levels (ESLs)

As indicated in Table B3, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), F3 (C_{16}-C_{34}), F4 (C_{34}-C_{40}), benzene, toluene, ethyl benzene, xylenes and benzo(a)pyrene concentrations were below the ESL for a coarse grained soil texture in an "commercial and industrial" environment.

13.2.2.3 Management Limits

As indicated in Table B5, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), F3 (C_{16}-C_{34}) and F4 (C_{34}-C_{40}), concentrations were below the Management Limits for a coarse grained soil texture in an "commercial and industrial" environment.

13.2.3 PAH, OCP & PCB

13.2.3.1 Health Investigation Levels (HILs)

As indicated in Table C, the concentrations of the benzo(a)pyrene (as TEQ), Total PAH, OCP & PCB were below the Health Investigation Level (HIL) for commercial and industrial, that being the HIL 'D'.

13.2.3.2 Ecological Investigation Levels (EILs)

As indicated in Table C, the concentrations of naphthalene and DDT/DDE/DDD were below the Ecological Investigation Level (EIL) for commercial and industrial.

13.2.3.3 Ecological Screening Levels (ESLs)

As indicated in Table C, the benzo(a)pyrene concentrations were below the ESL for a coarse grained soil texture in an "commercial and industrial" environment.

13.2.4 Asbestos

As indicated in Table D, no asbestos was detected in any of the samples analysed, and no ACM was observed during the sampling, with the exception of:

- Sample BH2 (0.2-0.3m) 0.001%w.w FA

13.3 Groundwater Results

13.3.1 Heavy Metals

As indicated in Table A in Appendix I, the heavy metal concentrations were below the assessment criteria with exception of the following:

- Copper was detected in sample GW1 at a concentration of 836 µg/L, which was above the freshwater criteria of 1.4 µg/L.
- Nickel was detected in sample GW1 at a concentration of 18 µg/L, which was above the freshwater criteria of 11 µg/L.
- Zinc was detected in sample GW1 at a concentration of 577 µg/L, which was above the freshwater criteria of 8 µg/L.

13.3.2 TRH, BTEX & PAH

13.3.2.1 Fresh Water

As indicated in Table B, the BTEX concentrations were either less than the laboratory limit of reporting (LOR) and below the fresh water or water for recreational purpose assessment criteria.

13.3.2.2 Health Screening Levels (HSLs)

As indicated in Table C, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), benzene, toluene, ethyl benzene, xylenes and naphthalene concentrations were below the HSL 'A' & HSL 'B' for a clay soil profile with a source depth of "2m to <4m" and"4m to <8m", with the exception of:

- F1 (C_6-C_{10}) was detected in GW1 at concentrations of 3,380mg/L, which was above LOR but below assessment criteria.
- F2 (C_{10}-C_{15}) was detected in GW1 at concentrations of 310mg/L, which was above LOR but below assessment criteria.

13.3.3 PAH

As indicated in Table D, the PAH concentrations were below the assessment criteria.

14 DISCUSSION OF RESULTS

A summary of the soil results for this assessment are provided below:

14.1 Soil

- All of heavy metals concentrations from the primary soil samples analysed met their respective assessment criteria under the HIL 'D' land use scenario.
- All of the TRH, BTEX and naphthalene concentrations from primary soil samples analysed met their respective HSLs, ESLs and/or Management Limits.
- The PAHs (including benzo(a)pyrene (TEQ)), OCP & PCB concentrations from primary samples analysed met their HILs 'D', & ESLs criteria.
- Chrysotile Asbestos (0.001%w/w FA) was detected in sample BH2 (0.2-0.3m)

14.2 Groundwater

- All of heavy metals concentrations from the primary soil samples analysed met their respective assessment criteria under the HIL 'B' land use scenario, with the exception of the following:
    - Copper, Nickel and Zinc were detected in sample GW1 at concentrations above the freshwater criteria.
- All of the TRH, BTEX and PAH concentrations from primary groundwater samples analysed met their respective criteria, with the exception of the following:
    - F1 (C_6-C_{10}) was detected in GW1 at concentrations of 3,380mg/L, which was above LOR but below assessment criteria.
    - F2 (C_{10}-C_{15}) was detected in GW1 at concentrations of 310mg/L, which was above LOR but below assessment criteria.

Reference should be made to Figure 4 in Appendix A for a copy of the soil and groundwater exceedance location plan.

15 SITE MODEL

15.1 Conceptual Site Model

The refined Conceptual Site Model (CSM) presented in the table below provides a representation of the potential risks associated with the linkages between the following elements:

- Potential contamination sources and their associated contaminants of concern identified in Section 5. Only potential areas of concern with a significance rating of low to high were included;
- Potential human receptors that may be impacted by site contamination are current and future end-users, construction workers and the general public within the immediate vicinity;
- Potential environmental receptors identified in Section 4;
- Potential exposure pathways; and
- Whether each source-pathway-receptor pollution linkage are complete, limited or not present, based on current and future site conditions.

Table 28: Conceptual Site Model

Potential Sources	Potential Receptor	Potential Exposure Pathways	Complete Linkages	Risk	Justification
Chrysotile Asbestos in BH2 (0.2-0.3) UST and associated infrastructure Nickel Copper & Zinc in GW1 F1, F2 detections in GW1	Site users or the general public	Dermal contact, inhalation or ingestion of exposed impacted soils	Limited (Current)	Low	Impacted soils are below the existing concrete slabs.
			No (Future)	Negligible	If present, contaminated soils are likely to be remediated.
		Inhalation or ingestion of exposed impacted soils	Limited	Low	Impacted soils are below the existing concrete slabs.
			No (Future)	Negligible	If present, contaminated soils are likely to be remediated.
	The aquatic ecosystems at Brickmakers Creek	Migration of impacted groundwater and surface water run-off	Yes (Current)	Low	No obvious sources of contamination were observed on site that could migrate off site with surface water run-off.
			No (Future)	Negligible	If present, contaminated groundwater is likely to be remediated and any remaining residual contamination would likely be at negligible concentrations.
	Underlying Aquifer	Leaching and migration of contaminants through groundwater infiltration	Limited (Current)	Low	Groundwater infiltration is likely to be higher within sandy or weathered bedrock zones. However, this would be limited within higher strength bedrock at further depths where groundwater would be present within water bearing zones such as fractures and joints.
			No (Future)	Negligible	If present, contaminated soils are likely to be remediated and removed with the remaining soils from the basement excavation level for off-site disposal.
Asbestos in buildings	Site users or the general public	Inhalation or ingestion of airborne fibres	Limited (Current)	Low	Asbestos may exist in the main building, considering its age.
			No (Future)	Negligible	Contaminated soils are likely to be remediated and removed for off-site disposal.

16 CONCLUSION AND RECOMMENDATIONS

The findings of the assessment indicated the following areas of environmental concern:

SOILS:

- Chrysotile Asbestos (0.001%w/w FA) was detected in sample BH2 (0.2-0.3m)

GROUNDWATER:

- Copper, Nickel and Zinc were detected in sample GW1 at concentrations above the freshwater criteria.
- F1 (C_6-C_{10}) was detected in GW1 at concentrations of 3,380mg/L, which was above LOR but below assessment criteria.
- F2 (C_{10}-C_{15}) was detected in GW1 at concentrations of 310mg/L, which was above LOR but below assessment criteria.

The following data gaps were identified with respect to the pollution linkages:

- The lateral and/or vertical extent of BH2 is currently unknown and an appropriate remediation strategy should be devised as part of the remediation works to be carried out in the future for any proposed development.
- The contamination status below the USTs and associated infrastructure.

Based on the results of this investigation it is considered that the risks to human health and the environment associated with soil contamination at the site are low to moderate within the context of the current commercial land use.

However if the site is proposed to be re-developed in the future, the following requirements need to be considered in relation to making the site suitable for its intended land use:

- Re-assessment of investigative results under the proposed future land use 'HIL' guidelines.
- An appropriate remedial / management strategy is developed, culminating in preparation of a Remedial Action Plan (RAP) in accordance with EPA guidelines, in regards to the abovementioned soil exceedance locations BH2 as well as the USTs, and associated infrastructure.
- Another round of groundwater testing following remediation.
- Any soils requiring removal from the site, as part of future site works, should be classified in accordance with the "Waste Classification Guidelines, Part 1: Classifying Waste" NSW EPA (2014).

Thank you for the opportunity to undertake this work. We would be pleased to provide further information on any aspects of this report.

For and on behalf of
Aargus Pty Ltd

Written By:

Con Kariotoglou
Project Manager / WHS Consultant

Reviewed By:

Mark Kelly
Environmental Manager

LIMITATIONS

The Aargus assessment is based on the result of limited site investigations and sample testing. Neither Aargus, nor any other reputable consultant, can provide unqualified warranties nor does Aargus assume any liability for site conditions not observed or accessible during the time of the investigations.

Despite all reasonable care and diligence, the materials encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site. In addition, site characteristics may change at any time in response to variations in natural conditions, chemical reactions, truck movement or contractor movement of soils and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to Aargus investigations and assessment.

This report and associated documentation and the information herein have been prepared solely for the use of the client at the time or writing the report and is valid (for the purposes of management or transport of material) for a period of one month only from the date of issue. Any other reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Aargus.

Whilst this report provides a review of site conditions encountered at sampling locations within the investigation, it should be noted that if materials are proposed to moved from site - Part 5.6, Section 143 of the Protection of the Environment Operations (POEO) Act 1997 states that is an offence for waste to be transported to a place that cannot lawfully be used as a facility to accept that waste. It is the duty of the owner and transporter of the waste to ensure that all material removed from a site must be accompanied by an appropriate waste classification report and materials are disposed of appropriately. An environmental or validation report does not constitute a waste classification report and results are treated

differently. Aargus accepts no liability for the unlawful disposal of waste materials from any site. Aargus does not accept any responsibility for the material tracking, loading, management, transport or disposal of waste from the site. If material is to be removed from a site, before disposal of any material to a licensed landfill is undertaken, the site owner must ensure an appropriate waste classification exists for all materials on the site planning to be removed, the waste producer will need to obtain prior consent from the licensed landfill/recycler. The receiving site should check to ensure that the material received matches the description provided in the report.

Opinions are judgements, which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

Appendix O – Important information about your environmental site report should also be read in conjunction with this report.

REFERENCES

This report was prepared with reference to the following guiding documents:

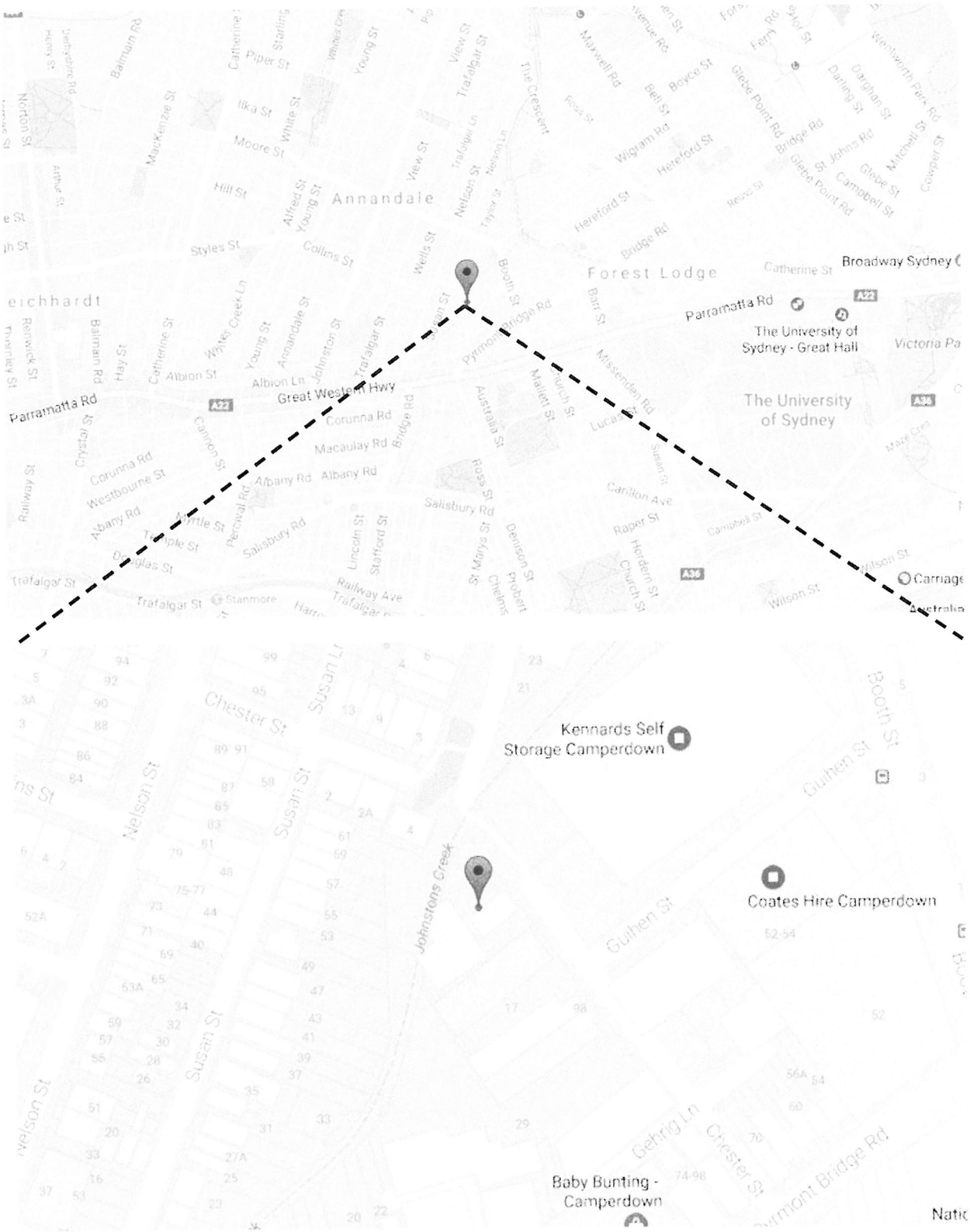
- ANZECC/NHMRC (1992) – "Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites". Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council, Canberra.
- Department of Urban Affairs and Planning – EPA (1998) "Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land".
- National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1).
- NSW DEC "Guidelines for the NSW Site Auditor Scheme" (2006, 2nd edition). NSW Environment Protection Authority, Sydney.
- NSW EPA (2014) – "Waste Classification Guidelines, Part 1: Classifying Waste";
- NSW EPA "Guidelines for Consultants Reporting on Contaminated Sites" (2011). NSW Environment Protection Authority, Sydney.
- NSW EPA "Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997" (2009). NSW Environment Protection Authority, Sydney;
- NSW EPA "Sampling Design Guidelines" (1995). NSW Environment Protection Authority, Sydney.

APPENDIX A

SITE PLANS

Aargus

SITE LOCALITY MAP



PROJECT DETAILS	
Project Title	Preliminary Site Investigation
Project No.	ES6874
Client	Coach Painting Pty Ltd
Site Address	1-5 Chester Street, Annandale NSW

Aargus

DRAWING DETAILS			
Figure No.	1	**Rev No.**	0
Scale	As above	**Size**	A4
Drawn by	SP	**Date**	01.06.2017
Approved by	MK	**Date**	01.06.2017

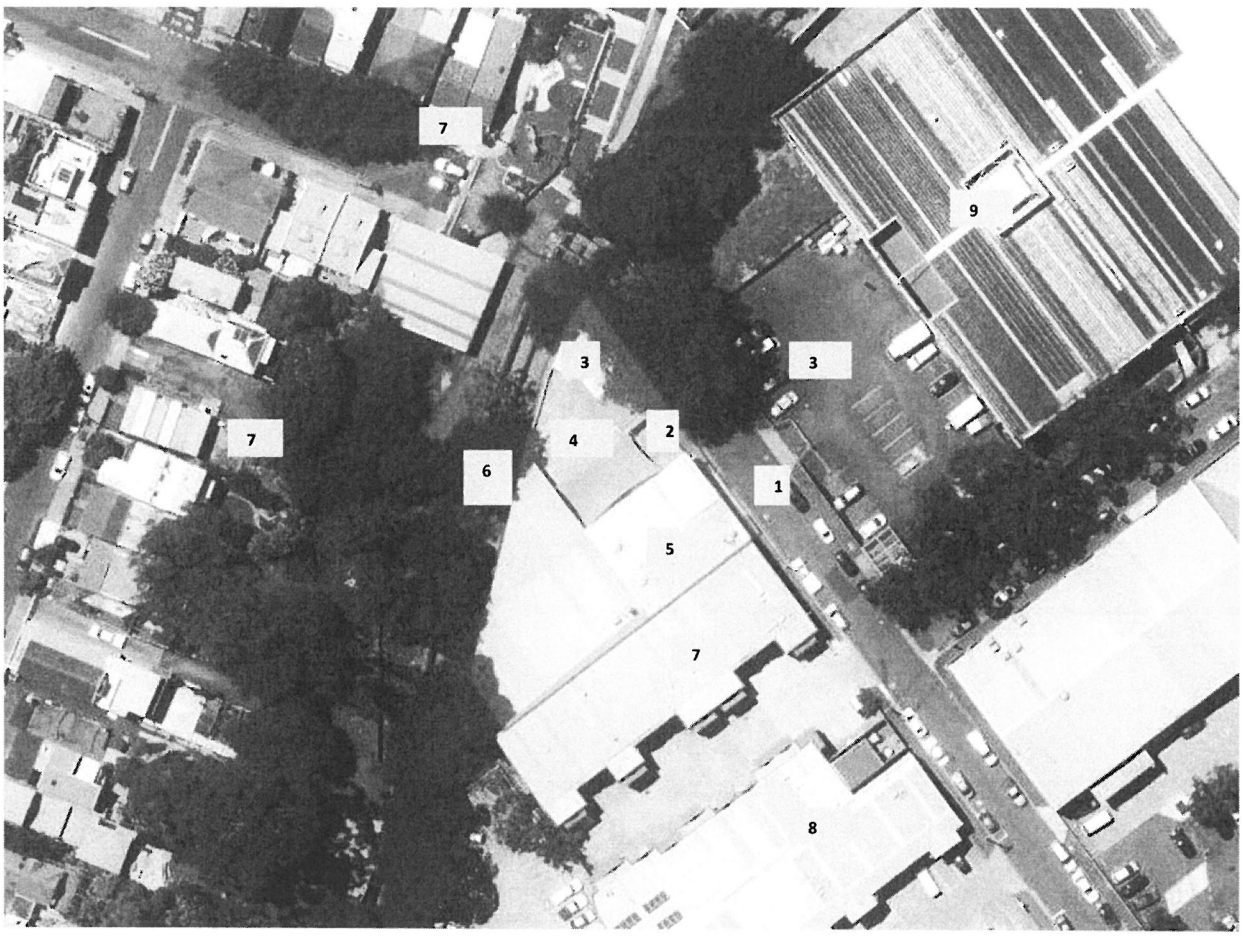
LOT & DEPOSITED PLAN

PROJECT DETAILS	
Project Title	Preliminary Site Investigation
Project No.	ES6874
Client	Coach Painting Pty Ltd
Site Address	1-5 Chester Street, Annandale NSW

Aargus

DRAWING DETAILS			
Figure No.	2	**Rev No.**	0
Scale	As above	**Size**	A4
Drawn by	SP	**Date**	01.06.2017
Approved by	MK	**Date**	01.06.2017

SITE FEATURES



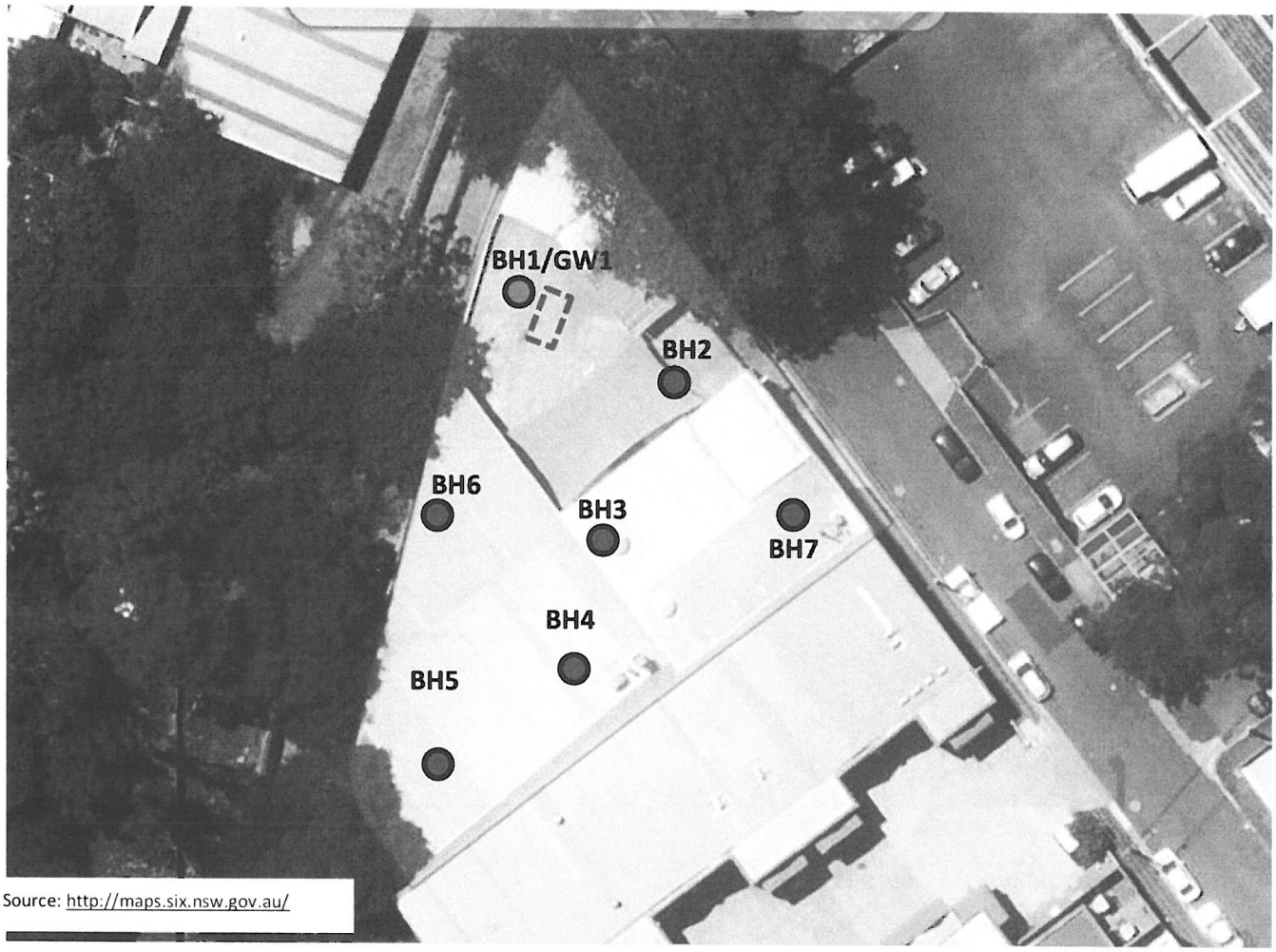
SITE FEATURES - LEGEND

1. Chester Street
2. Driveway sealed with asphalt
3. Car wash bay
4. Open car park
5. Spray Booth inside
6. Johnstons Creek
7. Neighbouring Low to medium Residential properties
8. Neighbouring Commercial warehouses and offices
9. Neighbouring Kennards Self Storage

PROJECT DETAILS		DRAWING DETAILS			
Project Title	Preliminary Site Investigation	**Figure No.**	3	**Rev No.**	0
Project No.	ES6874	**Scale**	As above	**Size**	A4
Client	Coach Painting Pty Ltd	**Drawn by**	LC	**Date**	05.06.2017
Site Address	1-5 Chester Street, Annandale NSW	**Approved by**	MK	**Date**	05.06.2017

Aargus

SAMPLING LOCATIONS



Source: http://maps.six.nsw.gov.au/

LEGEND	
	Site Boundary
	Borehole Sampling Locations
	Groundwater Sampling Locations
	USTs

PROJECT DETAILS	
Project Title	Preliminary Site Investigation
Project No.	ES6874
Client	Coach Painting Pty Ltd
Site Address	1-5 Chester Street, Annandale NSW

Aargus

DRAWING DETAILS			
Figure No.	4	**Rev No.**	0
Scale	As above	**Size**	A4
Drawn by	LC	**Date**	05.06.2017
Approved by	MK	**Date**	05.06.2017

APPENDIX B

SITE PHOTOGRAPHS

Aargus

SITE PHOTOGRAPHS

Client:	Coach Painting Pty Ltd
Project:	Preliminary Site Investigation
Site Location:	1-5 Chester St, Annandale NSW
Job No.:	ES6874
Photos Taken By:	NZ

Aargus

Photograph N° 7

View of 1-5 Chester St, Annandale.
Showing **Borehole Location BH3**
Looking southwest. Inspected on 13.05.2017

Photograph N° 8

View of 1-5 Chester St, Annandale.
Showing **Borehole Location BH4**
Looking southwest. Inspected on 13.05.2017

Photograph N° 9

View of 1-5 Chester St, Annandale.
Showing **Borehole Location BH5**
Looking south. Inspected on 13.05.2017

Photograph N° 10

View of 1-5 Chester St, Annandale.
Showing **Borehole Location BH6**
Looking west. Inspected on 13.05.2017

Photograph N° 11

View of 1-5 Chester St, Annandale.
Showing **Borehole Location BH7**
Looking east. Inspected on 13.05.2017

Photograph N° 12

View of 1-5 Chester St, Annandale.
Showing **UST location.**
Looking south. Inspected on 13.05.2017

APPENDIX C

LAND TITLES

Aargus

[redacted]FICATE OF TITLE

13815125

NEW SOUTH WALES [redacted]AL PROPERTY ACT, 1900

Vol. 13815 Fol. 125

Appln. No.3149

Prior Title Vol.12207 Fol.69

EDITION ISSUED

5 3 1979

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

[redacted]

Registrar General

SEE AUTO FOLIO

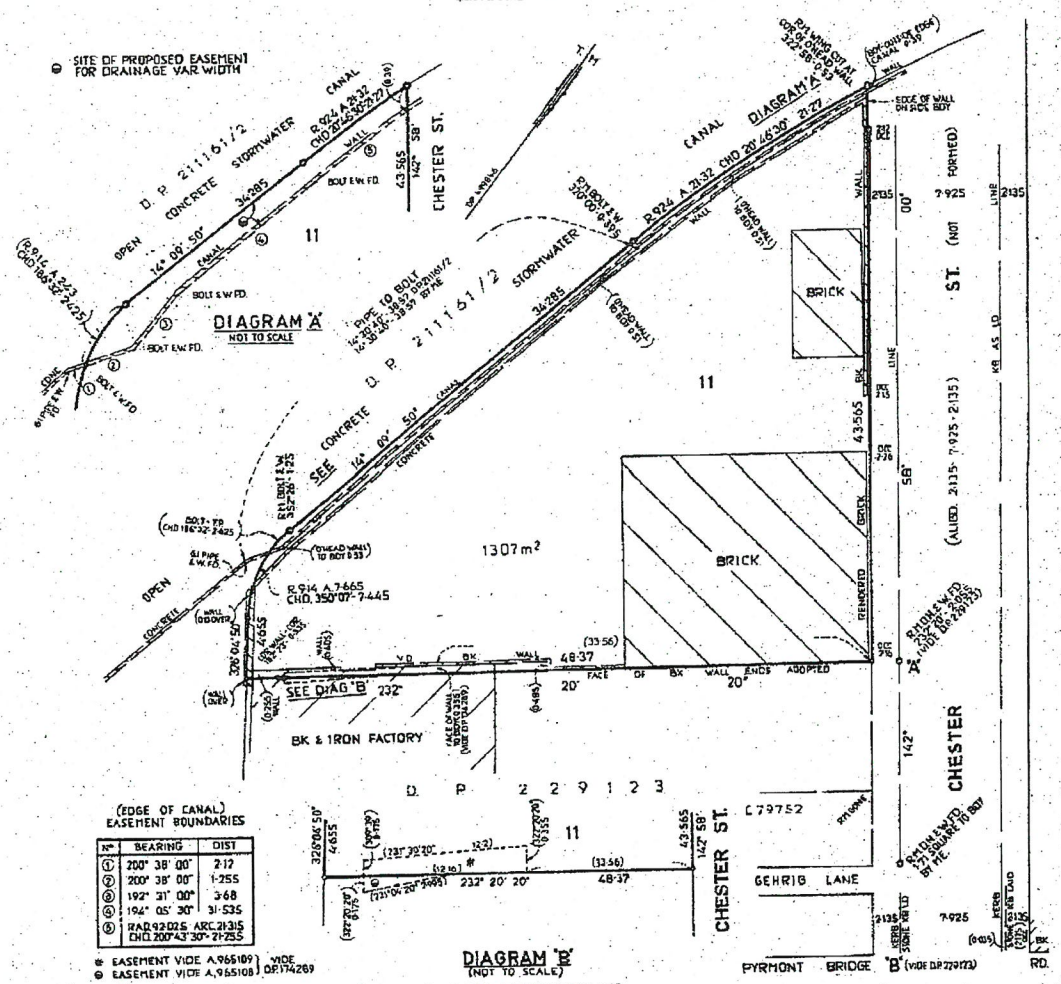
(Page 1) Vol. 13815 Fol. 125

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE REGISTRAR GENERAL'S OFFICE.

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES



No	BEARING	DIST
C	200° 38' 00"	2·12
D	200° 38' 00"	1·255
E	192° 31' 00"	3·68
F	194° 05' 30"	31·535
G	RAD 92·026 ARC 21·315 CHD 200°43'30" 21·255	

R53868 S

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 11 in Deposited Plan 499846 at Camperdown in the Municipality of Leichhardt Parish of Petersham and County of Cumberland being part of 97.13 hectares granted to William Bligh on 10-8-1806.

FIRST SCHEDULE

PETER JOHN FITZHENRY of Camperdown, Company Director.

GRY

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
EA 2. A965109 Easement appurtenant to the land above described affecting the land shown so burdened in the plan hereon.
EA 3. A965109 Easement affecting the part of the land above described shown so burdened in the plan hereon.
4. ~~Q112175 Mortgage to The Commercial Bank of Australia Limited.~~ V912295 Discharged S63712
5. ~~Q631859 Mortgage to A.C.C. (Advances) Limited.~~

RG 2/62

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Vol. 13815 Fol. 125

CT 27.8.80.
S63712 D/m
Q112175 Mtge 4.7.83
T652375 M
G PM
V16339 T/A
V16340 N/D
V912295 D/M.
G D/m

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	Signature of Registrar General
CANCELLED				
SEE AUTO FOLIO				

SECOND SCHEDULE (continued)

INSTRUMENT NATURE / NUMBER	PARTICULARS	REGISTERED	Signature of Registrar General	CANCELLATION	
T652375	~~Mortgage to Doris Ellen Lambert, Neville Reginald Wills, David Bernard Whitehouse, Susan Ellen Rocchi, Greig Melville Baldwin, Phylis Doreen Baldwin and Wolfgang Gerhard Liers for tenancy see dealing. Registered 25-8-1983~~		[signature]	Discharged	V912296
T652376	~~Postponement of Mortgage. Priority T652375, Q112175. Registered 25-8-1983~~				
Q112175	~~Mortgage. Mortgagee now Westpac Banking Corporation. See T652376 and T282693. Registered 26-8-1983.~~		[signature]	Cancelled	V912295
T652376	~~Postponement of Mortgage. Priority now T652375, Q112175. Registered 26-8-1983.~~		[signature]	Cancelled	V912296
T652375	~~Mortgage. Mortgagees: Davydde Geoffrey Owens, Neville Reginald Wills, David Bernard Whitehouse, Susan Ellen Rocchi, Greig Melville Baldwin, Phylis Doreen Baldwin, Wolfgang Gerhard Liers for tenancy see dealing, by Transmission V16339 and Notice of Death V16340. Registered 15-3-1984~~		[signature]	Cancelled	V912296

REG. GEN. 26.8.1983

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

CERTIFICATE OF TITLE

[redacted] PROPERTY ACT, 1900

12207069

NEW SOUTH WALES

Appln. No.3149

Prior Title Vol.4954 Fol.225

Vol. 12207 Fol. 69

Edition issued 5-9-1973.

N338644

CANCELLED

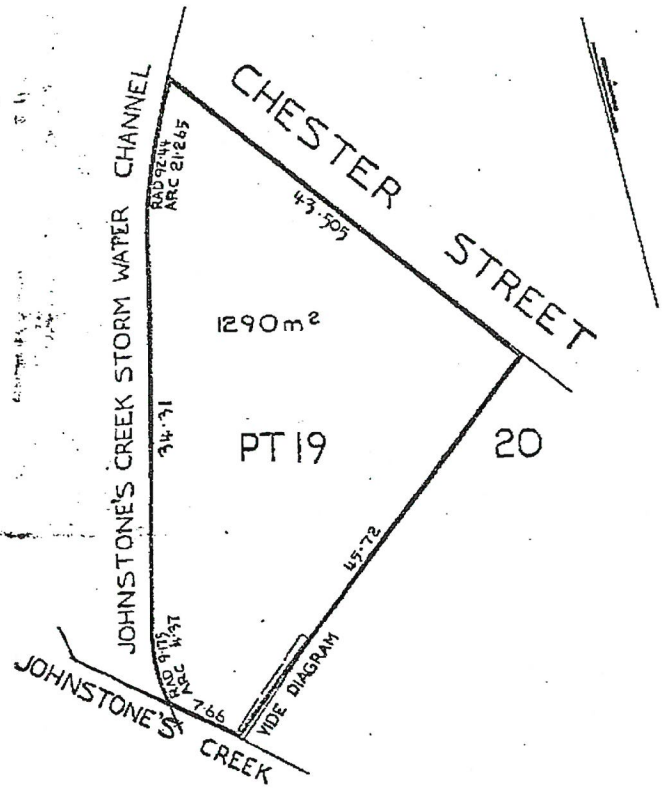
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

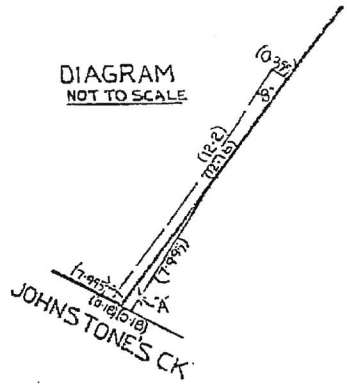
Registrar General.

(Page 1) Vol. 12207 Fol. 69

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES





N338644

REDUCTION RATIO 1:500

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in the part of Lot 19 in Deposited Plan 231 in the Municipality of Leichhardt Parish of Petersham County of Cumberland being also part of 97.13 hectares granted to William Bligh on 10-8-1806.

FIRST SCHEDULE

~~MILDALE MAGDA KORNER of Woollahra, Beautician.~~

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easement created by Transfer No.A965108 appurtenant to the land above described affecting the piece of land designated A in the plan hereon.
3. Easement created by Transfer No.A965109 affecting the part of the land above described shown designated B in the plan hereon.

Registrar General.

Vol. 12207 Fol 69

V. C. N. BLIGHT, GOVERNMENT PRINTER

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General
~~Peter John Fitzhenry of Camperdown, Company Director and Clifton George Vincent of Point Piper~~ ~~Company Director as tenants in common~~	Transfer	N338645	21-6-1973	27-9-1973	
Peter John Fitzhenry of Camperdown, Company Director	Transfer	Q112174	———	14-3-1977	

This Deed is cancelled and Certificate of Title issued
Vol. 13815 Fol 125 this 5/3/1979
Vide: R53868

Registrar General

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
~~Mortgage~~	~~N338646~~	~~21-6-1973~~	~~to The Commercial Bank of Australia Limited~~	~~27-9-1973~~		Discharged	Q112173	
Mortgage	Q112175	———	to The Commercial Bank of Australia Limited	14-3-1977				
Mortgage	Q631859	———	to A.G.C. (Advances) Limited.	6-4-1978				

(Page 2 of 2 pages)

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

RG 2/60A

N338645 Tr. N338646 Mtge.
Q 112173 P/m
— 74T
R — 75m
CT 20/3/78.
Q631859 M/R
78M 251 AMENDMENT SURVEY
CT 24/7/78
CT 19/12/78
R53868 Surrender

NSW GOVERNMENT | Land & Property Information

TITLE SEARCH

Computer Folio Certificate issued under
Section 96D of the Real Property Act 1900

COMPUTER FOLIO REFERENCE	
11/499846	
EDITION No. & DATE OF CURRENT CERTIFICATE OF TITLE	
2	12/1/2004

No. 91

Search certified to:
17/5/2017 10:09 AM

LAND

LOT 11 IN DEPOSITED PLAN 499846
AT CAMPERDOWN
LOCAL GOVERNMENT AREA INNER WEST
PARISH OF PETERSHAM COUNTY OF CUMBERLAND
TITLE DIAGRAM DP499846

FIRST SCHEDULE

PETER JOHN FITZHENRY

SECOND SCHEDULE (3 NOTIFICATIONS)
---
1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 A965109 EASEMENT APPURTENANT TO THE LAND ABOVE DESCRIBED AFFECTING THE LAND SHOWN SO BURDENED IN DP174289
3 A965109 EASEMENT AFFECTING THE PART OF THE LAND ABOVE DESCRIBED SHOWN SO BURDENED IN DP174289

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

NSW GOVERNMENT | Land & Property Information

HISTORICAL TITLE SEARCH

Certificate issued under Section 96G
of the Real Property Act 1900

No. 92

Search certified to: 17/5/2017 10:09AM

Computer Folio Reference: 11/499846

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 13815 FOL 125

Recorded	Number	Type of Instrument	C.T. Issue
21/8/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
6/12/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
29/5/1997	3103533	MORTGAGE	EDITION 1
12/1/2004	AA315578	DISCHARGE OF MORTGAGE	EDITION 2
21/3/2004	AA501351	DEPARTMENTAL DEALING	
15/5/2014	AI580195	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

APPENDIX D

NSW EPA RECORDS

Aargus

NSW EPA

Healthy Environment, Healthy Community, Healthy Business

Home Contaminated land Record of notices

Search results

Your search for:Suburb: CAMPERDOWN

Matched 1 notice relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
CAMPERDOWN	Salisbury LANE	O'Dea Reserve	1 former

Page 1 of 1

1 June 2017

NSW EPA

Healthy Environment, Healthy Community, Healthy Business

Home Contaminated land Record of notices

Site and notice details

Your search for: Suburb: CAMPERDOWN 1 notice on 1 site were matched.
Return to list of search results Search Again Refine Search

Area No: 3342

The information below was correct at the time the notices were issued.

Site: O'Dea Reserve
Address: Salisbury LANE, CAMPERDOWN
LGA: Marrickville Council

Owner: Marrickville Council
Lot 1-4 DP 600644

Notices relating to this site (0 current and 1 former)

(Map) where available, maps show the part of the site affected by the notice
* notice matched search criteria

Notice recipient	Notice type & number	Status	Date
Marrickville Council	Agreed Voluntary Remediation Proposal * 26029	Former	Issued 20 Dec 2002 Completed 07 Oct 2005

1 June 2017

Connect

Feedba

Web su
Public c

NSW EPA

Healthy Environment, Healthy Community, Healthy Business

Search results

Your search for: **General Search** with the following criteria

Suburb - CAMPERDOWN

returned 4 results

Export to excel

1 of 1 Pages

Search Again

Number	Name	Location	Type	Status	Issued date
289	SYDNEY SOUTH WEST AREA HEALTH SERVICE	MISSENDEN ROAD, CAMPERDOWN, NSW 2050	POEO licence	No longer in force	14 Aug 2000
1044227	SYDNEY SOUTH WEST AREA HEALTH SERVICE	MISSENDEN ROAD, CAMPERDOWN, NSW 2050	s.58 Licence Variation	Issued	08 Feb 2005
6068	THE PRETERM FOUNDATION	300 BRIDGE ROAD, CAMPERDOWN, NSW 2050	POEO licence	Surrendered	09 May 2000
1018967	THE PRETERM FOUNDATION	300 BRIDGE ROAD, CAMPERDOWN, NSW 2050	s.58 Licence Variation	Issued	22 Oct 2002

01 June 2017

Connect

Feedba

Web su
Public c

APPENDIX E

LOCAL METEOROLOGY

Aargus

Australian Government
Bureau of Meteorology

Climate statistics for Australian locations

Monthly climate statistics

All years of record

Site information

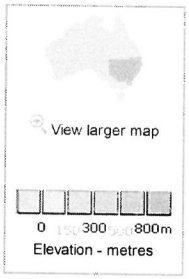
Site name: SYDNEY OLYMPIC PARK (SYDNEY OLYMPIC PK (
Site number: 066195
Latitude: 33.85 °S **Longitude:** 151.06 °E
Elevation: 28 m
Commenced: 1995 **Status:** Open
Latest available data: 30 Aug 2011

Additional information

Additional site information

Nearest alternative sites

1. 066046 PARRAMATTA (7.1km)
2. 066194 CANTERBURY RACECOURSE AWS (7.4km)
3. 066124 PARRAMATTA NORTH (MASONS DRIVE) (7.9km)



View: Main statistics All available | Period: 30 year period not available | Text size: Normal Large

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	28.4	28.1	26.6	23.9	20.8	18.3	17.6	19.5	22.5	24.3	25.3	27.4	23.6	16	1996 2011
Mean minimum temperature (°C)	19.3	19.4	17.8	14.3	11.2	8.9	7.8	8.7	11.6	13.7	15.8	17.9	13.9	16	1996 2011
Rainfall															
Mean rainfall (mm)	84.4	109.8	66.0	89.2	88.2	75.8	63.5	56.7	52.7	64.9	76.2	58.0	911.8	14	1995 2011
Decile 5 (median) rainfall (mm)	65.2	109.4	52.4	65.6	54.8	59.1	53.9	30.4	48.0	47.0	68.4	54.4	899.5	16	1995 2011
Mean number of days of rain ≥ 1 mm	7.6	7.7	7.6	6.9	7.7	6.9	6.3	4.4	5.5	7.1	7.8	6.8	82.3	15	1995 2011
Other daily elements															
Mean daily sunshine (hours)															
Mean number of clear days															
Mean number of cloudy days															
9 am conditions															
Mean 9am temperature (°C)	22.3	21.9	20.3	18.0	14.6	12.0	11.2	12.9	16.4	18.7	19.6	21.5	17.4	15	1996 2010
Mean 9am relative humidity (%)	67	72	72	68	70	71	68	61	57	56	64	64	66	15	1996 2010
Mean 9am wind speed (km/h)	9.6	9.3	8.4	9.5	10.5	10.9	11.0	11.6	11.9	11.1	11.4	10.0	10.4	14	1996 2010
3 pm conditions															
Mean 3pm temperature (°C)	26.3	26.1	24.9	22.4	19.5	17.3	16.6	18.1	20.6	22.1	23.2	25.3	21.9	15	1996 2010
Mean 3pm relative humidity (%)	53	55	53	51	51	52	48	41	43	45	51	50	49	15	1996 2010
Mean 3pm wind speed (km/h)	19.0	17.3	16.0	14.2	12.6	12.5	13.5	15.8	17.6	18.6	19.3	19.4	16.3	14	1996 2010

red = highest value blue = lowest value

Product IDCJCM0028 Prepared at Thu 01 Jun 2017 02:24:43 AM EST

Monthly statistics are only included if there are more than 10 years of data. The number of years (provided in the 2nd last column of the table) may differ between elements if the observing program at the site changed. More detailed data for individual sites can be obtained by contacting the Bureau.

Related Links

- This page URL: http://www.bom.gov.au/climate/averages/tables/cw_066195.shtml
- About climate averages: http://www.bom.gov.au/climate/cdo/about/about-stats.shtml
- Bureau of Meteorology website: http://www.bom.gov.au

Page created: Thu 01 Jun 2017 02:24:43 AM EST

This page was created at **on**

APPENDIX F

REGULATORY CRITERIA

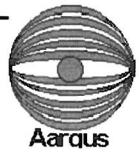


Table 1A(1) Health investigation levels for soil contaminants

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
Metals and Inorganics				
Arsenic[2]	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000
Copper	6000	30 000	17 000	240 000
Lead[3]	300	1200	600	1 500
Manganese	3800	14 000	19 000	60 000
Mercury (inorganic)[5]	40	120	80	730
Methyl mercury[4]	10	30	13	180
Nickel	400	1200	1200	6 000
Selenium	200	1400	700	10 000
Zinc	7400	60 000	30 000	400 000
Cyanide (free)	250	300	240	1 500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	3	4	3	40
Total PAHs[7]	300	400	300	4000
Phenols				
Phenol	3000	45 000	40 000	240 000
Pentachlorophenol	100	130	120	660
Cresols	400	4 700	4 000	25 000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160
Herbicides				
2,4,5-T	600	900	800	5000

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
2,4-D	900	1600	1300	9000
MCPA	600	900	800	5000
MCPB	600	900	800	5000
Mecoprop	600	900	800	5000
Picloram	4500	6600	5700	35000
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500
Other Organics				
PCBs[8]	1	1	1	7
PBDE Flame Retardants (Br1–Br9)	1	2	2	10

Notes:

(1) Generic land uses are described in detail in Schedule B7 Section 3

HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

HIL B – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present.

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

PAH species	TEF	PAH species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	1	Chrysene	0.01

Benzo(b+j)fluoranthene	0.1	Dibenz(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

Where the B(a)P occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk.

(7) Total PAHs: HIL is based on the sum of the 16 PAHs most commonly reported for contaminated sites (WHO 1998). The application of the total PAH HIL should consider the presence of carcinogenic PAHs and naphthalene (the most volatile PAH). Carcinogenic PAHs reported in the total PAHs should meet the B(a)P TEQ HIL. Naphthalene reported in the total PAHs should meet the relevant HSL.

(8) PCBs: HIL relates to non-dioxin-like PCBs only. Where a PCB source is known, or suspected, to be present at a site, a site-specific assessment of exposure to all PCBs (including dioxin-like PCBs) should be undertaken.

Table 1A(2) Interim soil vapour health investigation levels for volatile organic chlorinated compounds

Chemical	Interim soil vapour HIL (mg/m^3)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial / Industrial[1] D
TCE	0.02	0.02	0.4	0.08
1,1,1-TCA	60	60	1200	230
PCE	2	2	40	8
cis-1,2-dichloroethene	0.08	0.08	2	0.3
Vinyl chloride	0.03	0.03	0.5	0.1

Notes:

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7, though secondary school buildings should be assessed using residential 'A/B' for vapour intrusion purposes.
2. Interim HILs for VOCCs are conservative soil vapour concentrations that can be adopted for the purpose of screening sites where further investigation is required on a site-specific basis. They are based on the potential for vapour intrusion using an indoor air-to-soil vapour attenuation factor of 0.1 and an outdoor air-to-soil vapour attenuation factor of 0.05.
3. Application of the interim HILs is based on a measurement of shallow (to 1 m depth) soil vapour (or deeper where the values are to be applied to a future building with a basement) or sub-slab soil vapour.
4. The applicability of the interim HILs needs to be further considered when used for other building types such as homes with a crawl-space and no slab, which may require site-specific assessment.
5. Use of the interim HILs requires comparison with data that has been collected using appropriate methods and meets appropriate data quality requirements.
6. Oral and dermal exposure should be considered on a site-specific basis where direct contact exposure is likely to occur.

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
CHEMICAL	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	Soil saturation concentration (Csat)
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	64
Xylenes	40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3	360
F1[9]	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2[10]	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560
SILT													
Toluene	390	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	640

Aargus

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	69
Xylenes	95	210	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	4	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.6	0.7	1	2	NL	NL	NL	NL	4	4	6	10	440
F1[9]	40	65	100	190	NL	NL	NL	NL	250	360	590	NL	910
F2[10]	230	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	570
CLAY													
Toluene	480	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	630
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	68
Xylenes	110	310	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.7	1	2	3	NL	NL	NL	NL	4	6	9	20	430
F1[9]	50	90	150	290	NL	NL	NL	NL	310	480	NL	NL	850
F2[10]	280	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Notes:

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used.

(2) The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).

(3) Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) Soil HSLs for vapour inhalation incorporate an adjustment factor of 10 applied to the vapour phase partitioning to reflect the differences observed between theoretical estimates of soil vapour partitioning and field measurements. Refer Friebel & Nadebaum (2011a) for further information.

(5) The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(6) The HSLs for TPH C_6-C_{10} in sandy soil are based on a finite source that depletes in less than seven years, and therefore consideration has been given to use of sub-chronic toxicity values. The >C_8-C_{10} aliphatic toxicity has been adjusted to represent sub-chronic exposure, resulting in higher HSLs than if based on chronic toxicity. For further information refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

(7) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(8) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(9) To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

(10) To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1A(4) Groundwater HSLs for vapour intrusion (mg/L)

CHEMICAL	HSL A & HSL B Low – high density residential			HSL C recreational / open space			HSL D Commercial / industrial			Solubility limit
	2 m to <4 m	4 m to <8 m	8 m+	2 m to <4 m	4 m to <8 m	8 m+	2 m to <4 m	4 m to <8 m	8 m+	
SAND										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17
Benzene	0.8	0.8	0.9	NL	NL	NL	5	5	5	59
F1[7]	1	1	1	NL	NL	NL	6	6	7	9.0
F2[8]	1	1	1	NL	NL	NL	NL	NL	NL	3.0
SILT										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21

	HSL A & HSL B Low – high density residential			HSL C recreational / open space			HSL D Commercial / industrial			
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17
Benzene	4	5	5	NL	NL	NL	30	30	30	59
F1[7]	6	6	6	NL	NL	NL	NL	NL	NL	9.0
F2[8]	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.0
CLAY										
Toluene	NL	NL	NL	NL	NL	NL	NL	NL	NL	61
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.9
Xylenes	NL	NL	NL	NL	NL	NL	NL	NL	NL	21
Naphthalene	NL	NL	NL	NL	NL	NL	NL	NL	NL	0.17
Benzene	5	5	5	NL	NL	NL	30	30	35	59
F1[7]	NL	NL	NL	NL	NL	NL	NL	NL	NL	9.0
F2[8]	NL	NL	NL	NL	NL	NL	NL	NL	NL	3.0

Notes:

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used.

(2) The key limitations of the HSLs are presented in Friebel and Nadebaum (2011d) and should be referred to prior to application.

(3) Detailed assumptions in the derivation of the HSLs and information on the application of the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(5) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(6) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(7) To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

(8) To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1A(5) Soil vapour HSLs for vapour intrusion (mg/m³)

	HSL A & HSL B Low – high density residential					HSL C recreational / open space					HSL D Commercial / Industrial				
CHEMICAL	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m to <8 m	8 m+
SAND															
Toluene	1300	3800	7300	15 000	29 000	NL	NL	NL	NL	NL	4800	16 000	39 000	84 000	NL
Ethylbenzene	330	1100	2200	4300	8700	NL	NL	NL	NL	NL	1300	4600	11 000	25 000	53 000
Xylenes	220	750	1500	3000	6100	NL	NL	NL	NL	NL	840	3,200	8000	18 000	37 000
Naphthalene	0.8	3	6	10	25	410	NL	NL	NL	NL	3	15	35	75	150
Benzene	1	3	6	10	20	360	2400	4700	9500	19 000	4	10	30	65	130
F1[8]	180	640	1,300	2600	5300	86 000	NL	NL	NL	NL	680	2800	7000	15 000	32 000
F2[9]	130	560	1200	2400	4800	NL	NL	NL	NL	NL	500	2400	NL	NL	NL
SILT															
Toluene	1400	14 000	32 000	69 000	140 000	NL	NL	NL	NL	NL	5700	63 000	NL	NL	NL
Ethylbenzene	380	4200	9700	21 000	43 000	NL	NL	NL	NL	NL	1500	19 000	54 000	NL	NL
Xylenes	260	2900	6800	15 000	30 000	NL	NL	NL	NL	NL	1000	13 000	38 000	NL	NL
Naphthalene	0.9	10	25	60	120	NL	NL	NL	NL	NL	4	50	150	350	750
Benzene	1	10	25	55	110	1800	12 000	24 000	48 000	97 000	4	50	140	320	670

	HSL A & HSL B Low – high density residential					HSL C recreational / open space					HSL D Commercial / Industrial				
F1[8]	210	2600	6000	13 000	26 000	NL	NL	NL	NL	NL	850	11 000	33 000	77 000	160 000
F2[9]	160	2300	5400	NL	NL	NL	NL	NL	NL	NL	670	NL	NL	NL	NL
CLAY															
Toluene	1600	23 000	53 000	110 000	NL	NL	NL	NL	NL	NL	6500	100 000	NL	NL	NL
Ethylbenzene	420	6800	16 000	35 000	NL	NL	NL	NL	NL	NL	1800	31 000	NL	NL	NL
Xylenes	280	4800	11 000	24 000	50 000	NL	NL	NL	NL	NL	1200	21 000	NL	NL	NL
Naphthalene	1	20	45	95	200	NL	NL	NL	NL	NL	4	85	240	560	1200
Benzene	1	15	40	90	180	3000	20 000	40 000	81 000	160 000	5	80	230	530	1100
F1[8]	230	4200	9900	21 000	44 000	NL	NL	NL	NL	NL	1000	19 000	55 000	130 000	270 000
F2[9]	180	3,800	NL	NL	NL	NL	NL	NL	NL	NL	800	NL	NL	NL	NL

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used.
2. The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).
3. Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).
4. The maximum possible soil vapour concentrations have been calculated based on vapour pressures of the pure chemicals. Where soil vapour HSLs exceed these values a soil-specific source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.
5. Soil vapour HSLs should be compared with measurements taken as laterally close as possible to the soil or groundwater sources of vapour (i.e. within or above vapour sources). Consideration is required of where the sample is taken, the current condition of the site and the likely future condition of the site. Shallow gas measurements in open space (less than 1 m below ground surface) may be subject to influences of weather conditions and moisture.
6. The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

7. For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.
8. To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.
9. To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1B(5) Generic EILs for aged As, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties

	Ecological Investigation Levels (mg total contaminant/kg)		
CHEMICAL	Areas of ecological significance	Urban residential and public open space[1]	Commercial and industrial
Arsenic[2]	40	100	160
DDT[3]	3	180	640
Naphthalene[3]	10	170	370

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. Aged values are applicable to arsenic contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
3. Insufficient data was available to calculate aged values for DDT and naphthalene, consequently the values for fresh contamination should be used.
4. Insufficient data was available to calculate ACLs for As, DDT and naphthalene. The EIL should be taken directly from Table 1B(5).

Table 1B(6) ESLs for TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C_6-C_{10}	*Coarse/ Fine*	125*	180*	215*
F2 >C_{10}-C_{16}		25*	120*	170*
F3 >C_{16}-C_{34}	*Coarse*	-	300	1700
	Fine	-	1300	2500
F4 >C_{34}-C_{40}	*Coarse*	-	2800	3300
	Fine	-	5600	6600
Benzene	*Coarse*	8	50	75
	Fine	10	65	95
Toluene	*Coarse*	10	85	135
	Fine	65	105	135
Ethylbenzene	*Coarse*	1.5	70	165
	Fine	40	125	185
Xylenes	*Coarse*	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	*Coarse*	0.7	0.7	1.4
	Fine	0.7	0.7	1.4

Notes:

(1) ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

(2) '-' indicates that insufficient data was available to derive a value.

(3) To obtain F1, subtract the sum of BTEX concentrations from C_6-C_{10} fraction.

Table 1 B(7) Management Limits for TPH fractions F1–F4 in soil

TPH fraction	Soil texture	Management Limits[1] (mg/kg dry soil)	
		Residential, parkland and public open space	Commercial and industrial
F1[2] **C_6- C_{10}**	*Coarse*	700	700
	Fine	800	800
F2[2] **>C_{10}-C_{16}**	*Coarse*	1000	1000
	Fine	1000	1000
F3 >C_{16}-C_{34}	*Coarse*	2500	3500
	Fine	3500	5000
F4 >C_{34}-C_{40}	*Coarse*	10 000	10 000
	Fine	10 000	10 000

[1] Management limits are applied after consideration of relevant ESLs and HSLs

[2] Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

Table 4

SOIL HEALTH SCREENING LEVELS FOR DIRECT CONTACT (mg/kg)[a,b]

Chemical	HSL-A Residential (Low Density)	HSL-B Residential (High **Density**)	HSL-C Recreational Open Space	HSL-D Commercial / Industrial
Toluene	14,000	21,00	18,000	99,000
Ethylbenzene	4,500	5,900	5,300	27,000
Xylenes	12,000	17,000	15,000	81,000
Naphthalene	1,400	2,200	1,900	11,000
Benzene	100	140	120	430
C6-C10	4,400	5,600	5,100	26,000
>C10-C16	3,300	4,200	3,800	20,000
>C16-C34	4,500	5,800	5,300	27,000
>C34-C40	6,300	8,100	7,400	38,000

Note:

(a) Derived assumptions used in the derivation of the HSLs and information on how to apply the HSLs are presented in:

- Frebel E & Nadebaum P 2011. Health screening levels for petroleum hydrocarbons in soil and groundwater Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia
- Frebel E & Nadebaum P 2011. Health screening levels for petroleum hydrocarbons in soil and groundwater Part 2: Application document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia

(b) The key limitations in the development of the HSLs should be referred to prior to application. These are presented in the text of the summary document and the HSL application checklist in Appendix A of the Application Document (Frebel & Nadebaum 2011 - Part 2)

Table 7: Health screening levels for asbestos contamination in soil

Form of Asbestos	Health Screening Level (w/w)			
	Residential A[1]	Residential B[2]	**Recreational C[3]**	Commercial/ Industrial D[4]
Bonded ACM	0.01%	0.04%	**0.02%**	0.05%
FA & AF (friable asbestos & fines)	**0.001%**			
All forms of asbestos	**No visible asbestos for surface soil**			

Notes:

1. Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
2. Residential B with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
3. Residential C includes public open space such as parks, playgrounds, playing fields (e.g. Ovals), secondary schools and unpaved footpaths.
4. Commercial/Industrial D includes premises such as shops, offices, factories and industrial sites.

Table 1C Groundwater Investigation Levels (GILs)

Substance		Groundwater Investigation Levels		
		Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
		(µg/L)	(µg/L)	(mg/L)
Metals and Metalloids				
Aluminium, Al pH>6.5		55	-	-
Antimony		-	-	0.003
Arsenic		24 as As(III) 13 as As(V)	-	0.01
Barium		-	-	2
Beryllium		-	-	0.06
Boron		370[C]	-	4
Cadmium	H	0.2	0.7[D]	0.002
Chromium, Cr (III)	H	-	27	-
Chromium, Cr (VI)		1[C]	4.4	0.05
Cobalt		-	1	-
Copper	H	1.4	1.3	2
Iron, (Total)		-	-	-
Lead	H	3.4	4.4	0.01
Manganese		1900[C]	-	0.5
Mercury (Total)		0.06[D]	0.1[D]	0.001
Molybdenum		-	-	0.05
Nickel	H	11	7	0.02
Selenium (Total)		5[D]	-	0.01
Silver		0.05	1.4	0.1
Tributyl tin (as Sn)		-	0.006[C]	-
Tributyl tin oxide		-	-	0.001
Uranium		-	-	0.017
Vanadium		-	100	-
Zinc	H	8[C]	15[C]	-
Non-metallic Inorganics				
Ammonia[E] (as NH_3-N at pH 8)		900[C]	910	-
Bromate		-	-	0.02
Chloride		-	-	-
Cyanide (as un-ionised Cn)		7	4	0.08
Fluoride		-	-	1.5

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Hydrogen sulphide (un-ionised H_2S measured as S)	1	-	-
Iodide	-	-	0.5
Nitrate (as NO_3)	refer to guideline	refer to guideline	50
Nitrite (as NO_2)	refer to guideline	refer to guideline	3
Nitrogen	refer to guideline	refer to guideline	-
Phosphorus	refer to guideline	refer to guideline	-
Sulphate (as SO_4)	-	-	500
Organic alchohols/other organics			
Ethanol	1400	-	-
Ethylenediamine tetra-acetic acid (EDTA)	-	-	0.25
Formaldehyde	-	-	0.5
Nitrilotriacetic acid	-	-	0.2
Anilines			
Aniline	8	-	-
2,4-Dichloroaniline	7	-	-
3,4-Dichloroaniline	3	150	-
Chlorinated Alkanes			
Dichloromethane	-	-	0.004
Trihalomethanes (total)	-	-	0.25
Tetrachloromethane (carbon tetrachloride)	-	-	0.003
1,2-Dichloroethane	-	-	0.003
1,1,2-Trichloroethane	6500	1900	-
Hexachloroethane	290[D]	-	-
Chlorinated Alkenes			
Chloroethene (vinyl chloride)	-	-	0.0003
1,1-Dichloroethene	-	-	0.03
1,2-Dichoroethene	-	-	0.06
Tetrachloroethene (PCE) (Perchloroethene)	-	-	0.05

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Chlorinated Benzenes			
Chlorobenzene	-	-	0.3
1,2- Dichlorobenzene	160	-	1.5
1,3- Dichlorobenzene	260	-	-
1,4- Dichlorobenzene	60	-	0.04
1,2,3- Trichlorobenzene	3[D]	-	0.03 for individual or total trichlorobenzenes
1,2,4- Trichlorobenzene	85[D]	20[D]	
1,3,5-Trichlorobenzene	-	-	
Polychlorinated Biphenyls (PCBs)			
Aroclor 1242	0.3[D]	-	-
Aroclor 1254	0.01[D]	-	-
Other Chlorinated Compounds			
Epichlorohydrin	-	-	0.1
Hexachlorobutadiene	-	-	0.0007
Monochloramine	-	-	3
Monocyclic Aromatic Hydrocarbons			
Benzene	950	500[C]	0.001
Toluene	-	-	0.8
Ethylbenzene	-	-	0.3
Xylenes	350 (as o-xylene) 200 (as p-xylene)	-	0.6
Styrene (Vinyl benzene)	-	-	0.03
Polycyclic Aromatic Hydrocarbons (PAHs)			
Naphthalene	16	50[C]	-
Benzo[a]pyrene	-	-	0.00001
Phenols			
Phenol	320	400	-
2-Chlorophenol	340[C]	-	0.3
4-Chlorophenol	220	-	-
2,4-Dichlorophenol	120	-	0.2
2,4,6-Trichlorophenol	3[D]	-	0.02
2,3,4,6-Tetrachlorophenol	10[D]	-	-
Pentachlorophenol	3.6[D]	11[D]	0.01

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
2,4-Dinitrophenol	45	-	-
Phthalates			
Dimethylphthalate	3700	-	-
Diethylphthalate	1000	-	-
Dibutylphthalate	10[D]	-	-
Di(2-ethylhexyl) phthalate	-	-	0.01
Pesticides			
Acephate	-	-	0.008
Aldicarb	-	-	0.004
Aldrin plus Dieldrin	-	-	0.0003
Ametryn	-	-	0.07
Amitraz	-	-	0.009
Amitrole	-	-	0.0009
Asulam	-	-	0.07
Atrazine	13	-	0.02
Azinphos-methyl	-	-	0.03
Benomyl	-	-	0.09
Bentazone	-	-	0.4
Bioresmethrin	-	-	0.1
Bromacil	-	-	0.4
Bromoxynil	-	-	0.01
Captan	-	-	0.4
Carbaryl	-	-	0.03
Carbendazim (Thiophanate-methyl)	-	-	0.09
Carbofuran	0.06	-	0.01
Carboxin	-	-	0.3
Carfentrazone-ethyl	-	-	0.1
Chlorantraniliprole	-	-	6
Chlordane	0.03[D]	-	0.002
Chlorfenvinphos	-	-	0.002
Chlorothalonil	-	-	0.05
Chlorpyrifos	0.01[D]	0.009[D]	0.01
Chlorsulfuron	-	-	0.2
Clopyralid	-	-	2

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Cyfluthrin, Beta-cyfluthrin	-	-	0.05
Cypermethrin isomers	-	-	0.2
Cyprodinil	-	-	0.09
1,3-Dichloropropene	-	-	0.1
2,2-DPA	-	-	0.5
2,4-D [2,4-dichlorophenoxy acetic acid]	280	-	0.03
DDT	0.006[D]	-	0.009
Deltramethrin	-	-	0.04
Diazinon	0.01	-	0.004
Dicamba	-	-	0.1
Dichloroprop	-	-	0.1
Dichlorvos	-	-	0.005
Dicofol	-	-	0.004
Diclofop-methyl	-	-	0.005
Dieldrin plus Aldrin	-	-	0.0003
Diflubenzuron	-	-	0.07
Dimethoate	0.15	-	0.007
Diquat	1.4	-	0.007
Disulfoton	-	-	0.004
Diuron	-	-	0.02
Endosulfan	0.03[D]	0.005[D]	0.02
Endothal	-	-	0.1
Endrin	0.01[D]	0.004[D]	-
EPTC	-	-	0.3
Esfenvalerate	-	-	0.03
Ethion	-	-	0.004
Ethoprophos	-	-	0.001
Etridiazole	-	-	0.1
Fenamiphos	-	-	0.0005
Fenarimol	-	-	0.04
Fenitrothion	0.2	-	0.007
Fenthion	-	-	0.007
Fenvalerate	-	-	0.06
Fipronil	-	-	0.0007

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Flamprop-methyl	-	-	0.004
Fluometuron	-	-	0.07
Fluproponate	-	-	0.009
Glyphosate	370	-	1
Haloxyfop	-	-	0.001
Heptachlor	0.01[D]	-	-
Heptachlor epoxide	-	-	0.0003
Hexazinone	-	-	0.4
Imazapyr	-	-	9
Iprodione	-	-	0.1
Lindane (γ-HCH)	0.2	-	0.01
Malathion	0.05	-	0.07
Mancozeb (as ETU, ethylene thiourea)	-	-	0.009
MCPA	-	-	0.04
Metaldehyde	-	-	0.02
Metham (as methylisothiocyanate, MITC)	-	-	0.001
Methidathion	-	-	0.006
Methiocarb	-	-	0.007
Methomyl	3.5		0.02
Methyl bromide	-	-	0.001
Metiram (as ETU, ethylene thiourea)	-	-	0.009
Metolachlor/s–Metolachlor	-	-	0.30
Metribuzin	-	-	0.07
Metsulfuron-methyl	-	-	0.04
Mevinphos	-	-	0.006
Molinate	3.4	-	0.004
Napropamide	-	-	0.4
Nicarbazin	-	-	1
Norflurazon	-	-	0.05
Omethoate	-	-	0.001
Oryzalin	-	-	0.4
Oxamyl	-	-	0.007

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Paraquat	-	-	0.02
Parathion	0.004[C]	-	0.02
Parathion methyl	-	-	0.0007
Pebulate	-	-	0.03
Pendimethalin	-	-	0.4
Pentachlorophenol	-	-	0.01
Permethrin	-	-	0.2
Picloram	-	-	0.30
Piperonyl butoxide	-	-	0.6
Pirimicarb	-	-	0.007
Pirimiphos methyl	-	-	0.09
Polihexanide	-	-	0.7
Profenofos	-	-	0.0003
Propachlor	-	-	0.07
Propanil	-	-	0.7
Propargite	-	-	0.007
Proparzine	-	-	0.05
Propiconazole	-	-	0.1
Propyzamide	-	-	0.07
Pyrasulfatole	-	-	0.04
Pyrazophos	-	-	0.02
Pyroxsulam	-	-	4
Quintozene	-	-	0.03
Simazine	3.2	-	0.02
Spirotetramat	-	-	0.2
Sulprofos	-	-	0.01
2,4,5-T	36	-	0.1
Tebuthiuron	2.2	-	-
Temephos	-	0.05[D]	0.4
Terbacil	-	-	0.2
Terbufos	-	-	0.0009
Terbuthylazine	-	-	0.01
Terbutryn	-	-	0.4
Thiobencarb	2.8	-	0.04
Thiometon	-	-	0.004

Substance	Groundwater Investigation Levels		
	Fresh Waters[A]	Marine Waters[A]	Drinking Water[B]
	(µg/L)	(µg/L)	(mg/L)
Thiram	0.01	-	0.007
Toltrazuril	-	-	0.004
Toxafene	0.1[D]	-	-
Triadimefon	-	-	0.09
Trichlorfon	-	-	0.007
Triclopyr	-	-	0.02
Trifluralin	2.6[D]	-	0.09
Vernolate	-	-	0.04
Surfactants			
Linear alkylbenzene sulfonates (LAS)	280	-	-
Alcohol ethoxylated sulfate (AES)	650	-	-
Alcohol ethoxylated surfactants (AE)	140	-	-

A Investigation levels apply to typical slightly-moderately disturbed systems. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.

B Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).

C Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.

D Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.

E For changes in GIL with pH refer to ANZECC & ARMCANZ (2000) for further guidance.

H Values have been calculated using a hardness of 30 mg/L $CaCO_3$ refer to ANZECC & ARMCANZ (2000) for further guidance on recalculating for site-specific hardness.

APPENDIX G

BOREHOLE LOGS

Aargus

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

BOREHOLE NUMBER BH1

CLIENT Peter J Fitzhenry **PROJECT NAME** Detailed Site Investigation

PROJECT NUMBER ES6874 **PROJECT LOCATION** 1-5 Chester Street, Camperdown NSW

DATE STARTED 13/5/17 **COMPLETED** 13/5/17 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR IVAN DRILLING Pty Ltd **SLOPE** -90° **BEARING** ---

EQUIPMENT Truck Mounted Drill Rig **HOLE LOCATION**

HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
DT / ADT				0			Concrete.		No fibro-cement fragements observed, No hydrocarbons odour noted, No staining, PID=0
							Clayed Sand, medium to coarse grained, dark grey, with grave, grass, silt.	D1/SS1	
				1					
							Silty Sand, fine grained, yellow.		
				2			Gravelly Sand, fine grained, grey/dark grey, with gravel and metals.		
				3					
				4			Silty Clay, low plasticity, reddish brown, with gravel and sand.		
				5		CH	Silty CLAY, high plasticity, red/orange.		
				6		CI	Sand CLAY, medium plasticity, red/orange.		
				7					
				8			Borehole BH1 terminated at 7.6m		

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Petersham NSW 2049
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BOREHOLE NUMBER BH2

CLIENT Peter J Fitzhenry
PROJECT NAME Detailed Site Investigation
PROJECT NUMBER ES6874
PROJECT LOCATION 1-5 Chester Street, Camperdown NSW

DATE STARTED 13/5/17 **COMPLETED** 13/5/17 **R.L. SURFACE** _____ **DATUM** _____
DRILLING CONTRACTOR IVAN DRILLING Pty Ltd **SLOPE** -90° **BEARING** ---
EQUIPMENT Truck Mounted Drill Rig **HOLE LOCATION** _____
HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK
NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
DT						Concrete.		No fibro-cement fragements observed, No hydrocarbons odour noted, No staining, PID=0
ADT						Clayed Sand, medium to coarse grained, dark grey, with grave, grass, silt.		
			0.5			Borehole BH2 terminated at 0.5m		
			1.0					

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BOREHOLE NUMBER BH3

CLIENT Peter J Fitzhenry
PROJECT NAME Detailed Site Investigation
PROJECT NUMBER ES6874
PROJECT LOCATION 1-5 Chester Street, Camperdown NSW
DATE STARTED 13/5/17 **COMPLETED** 13/5/17
R.L. SURFACE **DATUM**
DRILLING CONTRACTOR IVAN DRILLING Pty Ltd
SLOPE -90° **BEARING** ---
EQUIPMENT Truck Mounted Drill Rig
HOLE LOCATION
HOLE SIZE 100mm
LOGGED BY LC **CHECKED BY** MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
DT						Concrete.		No fibro-cement fragements observed, No hydrocarbons odour noted, No staining, PID=0
ADT						Clayed Sand, medium to coarse grained, dark grey, with grave, grass, silt.		
			0.5			Borehole BH3 terminated at 0.5m		
			1.0					

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BOREHOLE NUMBER BH4

CLIENT Peter J Fitzhenry **PROJECT NAME** Detailed Site Investigation

PROJECT NUMBER ES6874 **PROJECT LOCATION** 1-5 Chester Street, Camperdown NSW

DATE STARTED 13/5/17 **COMPLETED** 13/5/17 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR IVAN DRILLING Pty Ltd **SLOPE** -90° **BEARING** ---

EQUIPMENT Truck Mounted Drill Rig **HOLE LOCATION** _____

HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
DT						Concrete.		No fibro-cement fragements observed, No hydrocarbons odour noted, No staining, PID=0
ADT						Clayed Sand, medium to coarse grained, dark grey, with grave, grass, silt.		
			0.5			Borehole BH4 terminated at 0.5m		
			1.0					

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BOREHOLE NUMBER BH5

CLIENT Peter J Fitzhenry **PROJECT NAME** Detailed Site Investigation

PROJECT NUMBER ES6874 **PROJECT LOCATION** 1-5 Chester Street, Camperdown NSW

DATE STARTED 13/5/17 **COMPLETED** 13/5/17 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR IVAN DRILLING Pty Ltd **SLOPE** -90° **BEARING** ---

EQUIPMENT Truck Mounted Drill Rig **HOLE LOCATION** _____

HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
DT						Concrete.		No fibro-cement fragements observed, No hydrocarbons odour noted, No staining, PID=0
ADT						Clayed Sand, medium to coarse grained, dark grey, with grave, grass, silt.		
			0.5			Borehole BH5 terminated at 0.5m		
			1.0					