CONTAMINATION REPORT ADDENDUM TO STAGE 1 PRELIMINARY SITE INVESTIGATION FOR 1650 THE HORSLEY DRIVE, HORSLEY PARK

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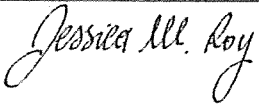
Jessica Roy	Environmental Scientist		08 September 2017
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EXECUTIVE SUMMARY

Benbow Environmental was engaged by Bethel Mar Thoma Church, Sydney Inc., to undertake additional soil sampling required for a Stage 1 Preliminary Site investigation for the site located at 1650 The Horsley Drive, Horsley Park (the subject site).

The original Stage 1 Preliminary Site Investigation (PSI) was undertaken in order to provide surety of the contamination status of the site and to determine if the site is suitable for its proposed land use. Two Stage 1 PSI reports were prepared for the subject site by Environmental & Safety Professionals (ESP), in 2012 and 2016.

As stated in the conclusions of the second Stage 1 PSI report by EPS, "*comparison of soil sample results from both ESP investigations reported no samples in excess of the adopted ecological and health based criteria in a commercial/industrial land use exposure setting*". The two Stage 1 PSI reports indicated that there is "*no information to suggest the site is not suitable for the proposed land use*". Despite these conclusions, Fairfield City Council was not satisfied with the sampling program conducted to date and has requested additional sampling and testing to be carried out, comprising of the following:

- Further sampling of Areas 1 and 5, to be done in on the same basis as sampling carried out for areas 2, 3 and 6 in the 2012 Stage 1 PSI, prepared by ESP (Report No. 18746-R2.0);

- Detailed soil investigation of Area 4. Composite sampling is not acceptable for this area, which is to be assessed in accordance with the *NSW DEC Guidelines for Assessing Former Orchards and Market Gardens*. Results are to be assessed against to Residential 'A' standards from schedule B1 of the National Environmental Protection (Assessment of Site Contamination) Measure 2011; and

- Sampling and analysis of the stockpile adjacent to the onsite dam for the presence of asbestos.

Based on discussions with Council, the results from this additional sampling round can be presented as an addendum to the previous Stage 1 PSI reports and therefore also include the previous laboratory analysis. As such, soil sampling and laboratory analysis by Benbow Environmental was undertaken for certain contaminants of concern, based on the specific Council requests stated above, and on the review of all available information, including the site history and the previous Stage 1 PSI reports prepared by ESP.

Sampling by Benbow Environmental was undertaken in three of the sub-divided areas (from which additional samples were required), on 22 August 2017.

A judgmental sampling pattern was adopted for Areas 1 and 5 based on the knowledge of the probable distribution of contaminants on site and the specific Council requests for additional sampling: one composite sample was collected for each area, and each composite sample was formed by three sub-samples. Sub-samples were taken from the top 200 mm of the soil profile, immediately below any vegetative or detritus layers. For Area 4, a systemic sampling pattern was adopted instead, with use of a square grid to select sampling points at regular and even intervals. A total of 10 discrete samples were taken from nine sampling locations. Each location was sampled within the top 150 mm of the soil profile, below any vegetative or detritus layers.

The results show the concentrations of all tested analytes, except asbestos, as being well below the adopted SAC; i.e. no exceedances were found for Metals, PCB, OCP, OPP, Phenols, PAH, TRH and BTEX. The calculations of the average 95% UCL concentrations for each analyte were undertaken using Procedure D, normal distribution, as outlined in the *Sample Design Guidelines* (NSW EPA, 1995). All calculated 95% UCL values were found to be well below the site assessment criteria. As a result of these findings, no further testing for the above mentioned analytes is considered warranted.

However, asbestos concentrations in exceedance of the NEPM HIL A SAC were detected by the laboratory in two of the three soil samples from the fill stockpile in Area 4. Two pieces of suspected bonded asbestos (ACM) of approximately 10 cm x 5 cm were found in the immediate sub-surface of the stockpile material at sampling point STOCK 2, which was confirmed to be bonded ACM by lab testing. No asbestos was visible in pit STOCK 3, however, lab results indicated the presence of fibrous asbestos (ACM in a degraded condition).

During detailed sampling of Area 4, it was noted that the soil surface and soil samples taken from the sub-surface stratum were free from any visible asbestos. Based on the site history and other collected samples, there is no reason to suspect buried asbestos materials on site (excluding within the stockpile in Area 4).

When combined, the analytical results presented by ESP and Benbow Environmental indicate that the site can be suitable for its proposed future use following clean-up of asbestos contamination detected in the stockpile within Area 4.

A remediation action plan must be prepared to guide the removal of asbestos contamination. Benbow Environmental recommends that the whole stockpile is sent for disposal to an appropriate waste facility. Following the remediation works (i.e. removal of asbestos-contaminated stockpiles), a validation programme would be undertaken to ensure that surface soil in the affected portion of the site (Area 4) is free from any form of asbestos potentially released during the removal of stockpile material. Soils in Areas 1, 2, 3, 5 and 6 do not require remediation/validation for presence of any chemicals of concern.

Upon removal of the stockpile and validation of Area 4, the site would be suitable for the proposed use.

Contents

		Page
EXECUTIVE SUMMARY		I
1.	INTRODUCTION	1
1.1	Purpose of Report and Objectives	1
2.	SITE IDENTIFICATION	2
2.1	Site conditions	2
3.	SITE HISTORY REVIEW	6
4.	SAMPLING, ANALYSIS AND DATA QUALITY OBJECTIVES	8
4.1	Requirement for additional Sampling	8
4.2	Decision rule	8
4.3	Sampling Rationale	9
4.4	Sampling Methods	11
4.4.1	Sampling Equipment and Methods	11
4.4.2	Equipment Decontamination Procedures	11
4.4.3	Sample Handling Procedures	11
4.4.4	Sample Preservation Methods	11
4.5	Laboratory Testing	12
4.5.1	Analytes	12
4.5.2	Testing Methods	12
5.	QA/QC EVALUATION	13
5.1.1	Duplicate Results	13
6.	SITE ASSESSMENT CRITERIA	15
7.	RESULTS AND DISCUSSION	17
8.	CONCLUSION AND RECOMMENDATIONS	24
9.	LIMITATIONS	25
10.	REFERENCES	26

Tables

Page

Table 2-1: Site Identification 2
Table 3-1: Preliminary Conceptual Site Model and Additional Requirements 7
Table 5-1: QA/QC Data Evaluation 14
Table 7-1: Soil Results for Metals, PCBs, OCPs, and OPPs Against Industrial/Commercial NEPM 2013 Guidelines (Units mg/kg unless otherwise specified) 19
Table 7-2: Soil Results for Phenols, PAHs, TRH, and BTEX Against Industrial/Commercial NEPM 2013 Guidelines (Units mg/kg unless otherwise specified) 20
Table 7-3: Soil Results for Metals and Asbestos Against Residential NEPM 2013 Guidelines (Units mg/kg unless otherwise specified) 22
Table 7-4: Soil Results for OCPs and OPPs Against Residential NEPM 2013 Guidelines (Units mg/kg unless otherwise specified) 23

Figures

Page

Figure 2-1: Site and Lot Boundaries 3
Figure 2-2: Aerial Photograph of the Site 4
Figure 2-3: Surrounding Land Use Zoning 5
Figure 4-1: Site Sample Locations 10
Figure 7-1: Bonded Asbestos Found on the Soil Surface at Pit STOCK 2 on the Stockpile in Area 4 18
Figure 7-2: Building Waste Found in sampling point STOCK 3 on the Stockpile in Area 4 18

Attachments

Attachment 1: Preliminary Site Investigation Report
Attachment 2: Borehole logs
Attachment 3: Chain of Custody Forms
Attachment 4: QA/QC Compliance
Attachment 5: Quality Control Report
Attachment 6: Analytical Results

ABBREVIATIONS

ACM	Asbestos Containing Material
AF	Asbestos Fines
APHA	American Public Health Association
BTEX	Benzene, Toluene, Ethyl Benzene, Xylene
CEC	Cation Exchange Capacity
COC	Chain of Custody
CSM	Conceptual Site Model
EIL	Ecological Investigation Level
ESL	Ecological Screening Level
ESP	Environmental & Safety Professionals (ESP)
FA	Fibrous Asbestos
HIL	Health Investigation Level
HSL	Health Screening Level
LCS	Laboratory Control Spikes
LEP	Local Environmental Plan
LOR	Limit of Reporting
MB	Method Blanks
MS	Matrix Spikes
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percent Difference
SAC	Site Assessment Criteria
TB	Trip Blanks
TPH	Total Petroleum Hydrocarbons
TS	Trip Spikes
UCL	Upper Confidence Level

1. INTRODUCTION

Benbow Environmental was engaged by Bethel Mar Thoma Church, Sydney Inc., to undertake additional soil sampling required for a Stage 1 Preliminary Site Investigation (PSI) for the site located at 1650 The Horsley Drive, Horsley Park (the subject site).

The site is proposed to be utilised as a place of worship by the Bethel Mar Thoma Church. In conjunction with the construction of the new church, a vicar's residence will be built on site.

The original Stage 1 PSI was undertaken in order to provide surety of the contamination status of the site and to determine if the site is suitable for its proposed land use. Two Stage 1 PSI reports were prepared for the subject site by Environmental & Safety Professionals (ESP), in 2012 and 2016. Despite the site was deemed suitable for the proposed use by ESP, Fairfield City Council has requested additional sampling and testing to be carried out for specific areas of the site and particular contaminants.

Therefore, soil sampling and laboratory analysis has been undertaken for certain contaminants of concern, based on specific Council requests, and on the review of all available information, including the site history and the previous Stage 1 PSI reports prepared by ESP.

1.1 PURPOSE OF REPORT AND OBJECTIVES

The purpose of this study is to verify the presence of certain contaminants in the soil on site, within identified areas of potential concern, and to determine whether the levels of site contamination pose an unacceptable risk to human health and/or the environment for proposed use of the land.

As such, this assessment has the following objectives:

- To assess the potential for contamination of the soil based on analytical results; and
- To determine suitability to use the land for its future purposes, as a place of worship for the local community and as a residence for the vicar.

This assessment comprises the following tasks:

- Review the completed Stage 1 PSI reports, including site history information;
- Design an inspection and a soil sampling program across the site;
- Target any areas of potential concern identified in the Stage 1 PSI and by Council;
- Sample soil across identified areas of the site in the immediate sub-surface (between 150 and 200 mm) and within the on-site stockpile, for chemicals or contaminants of concern;
- Laboratory analysis of representative soil samples for chemicals of potential concern;
- Compare analytical data against adopted guidelines;
- Determine if the site is suitable for its intended land use ; and
- Prepare a report which outlines the above-listed aspects.

2. SITE IDENTIFICATION

The subject site consists of one land holding, which forms a rectangular parcel of land. Site identification and land use details for the subject site are summarised in Table 2-1.

Table 2-1: Site Identification

Address	1650 The Horsley Drive, Horsley Park NSW 2170
Lot and DP Numbers	Lot 90A DP 17288
Local Government Area	Fairfield
Approximate site area	28,950 m^2 (2.89 ha)
Current Land Zoning	RU2 – Rural Landscape

Note: [1]Measured from north-eastern corner

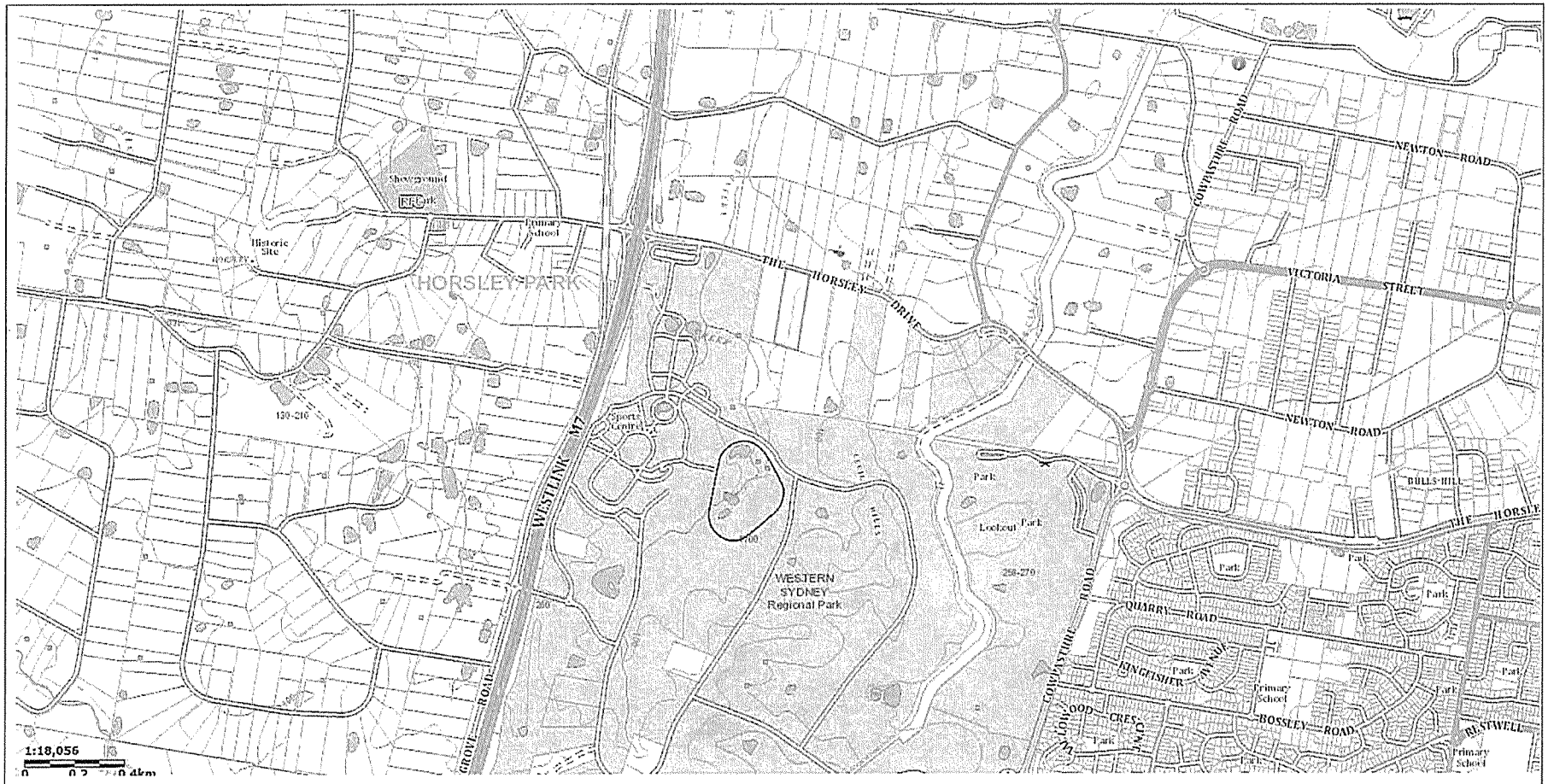
The site location displaying the lot boundaries is presented in Figure 2-1 and an aerial photograph of the site is shown as Figure 2-2. The site is bordered by The Horsley Drive to the north, by a BP service station to the north-eastern corner and by rural land along the remaining lot boundaries. Access to the site is from The Horsley Drive.

The Land Zoning Map from the Fairfield Local Environmental Plan (LEP) 2013 shows the land use zoning of the subject site and the surrounding area. The map was obtained from the NSW Government Planning Viewer website and is presented in Figure 2-3.

2.1 SITE CONDITIONS

The lot features a house, occupied by a tenant, in the north-east corner of the site as well as two sheds along the eastern boundary. The rest of the site is a vacant parcel of land, currently covered by tall grass throughout. A dam surrounded by native trees and a stockpile of soil (of uncertain origin) are also present on site to the western boundary.

Figure 2-1: Site and Lot Boundaries



Source: SixMaps NSW

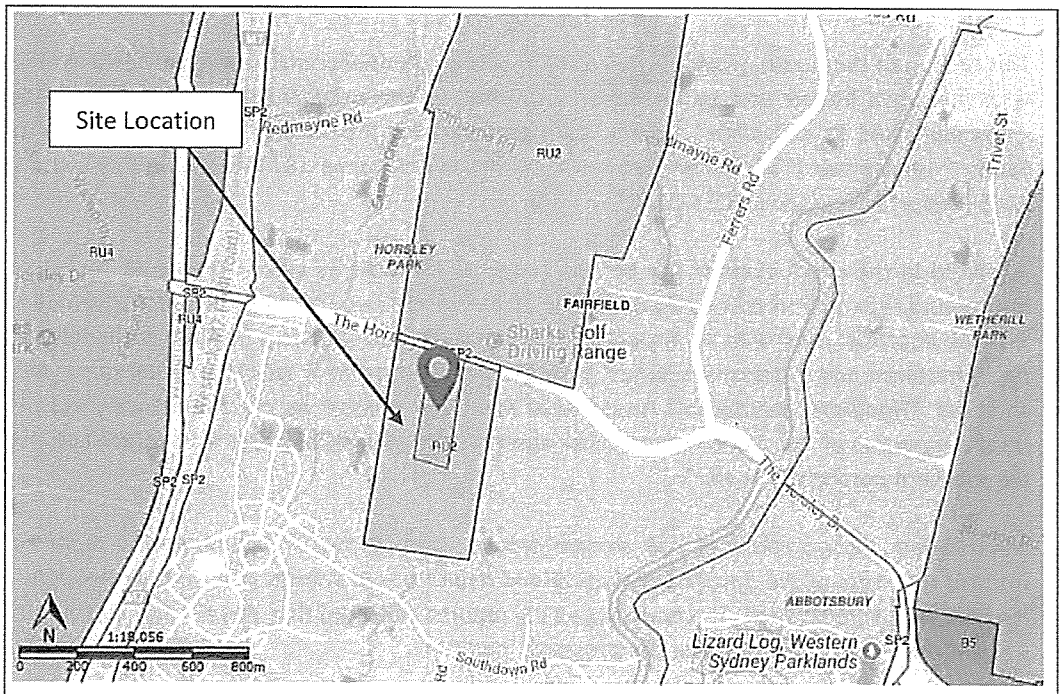
↑N	Legend: Site	Benbow Environmental 13 Daking Street, North Parramatta NSW 2151

Figure 2-2: Aerial Photograph of the Site

Source: SixMaps NSW

↑N	Legend: Site	Benbow Environmental 13 Daking Street, North Parramatta NSW 2151

Figure 2-3: Surrounding Land Use Zoning



Source: https://www.planningportal.nsw.gov.au Data Fairfield Local Environmental Plan 2013

Legend:

Land Zoning

- B5 - Business Development
- IN1 - General Industrial
- RU2 - Rural Landscape
- RU4 - Primary Production Small
- SP2 - Infrastructure

Suburbs

- Suburbs

3. SITE HISTORY REVIEW

This section of the report provides an overview of the potential contamination aspects associated with the site's history and past usage, as outlined in the original Stage 1 PSI. Two *"Stage 1 Preliminary Site Investigation"* reports were prepared for the subject site by Environmental & Safety Professionals (ESP) in December 2012 (Report Reference 18746-R2.0) and in September 2016 (Report Reference J34021-R1.0).

As stated in the conclusions of the second Stage 1 PSI report by EPS *"A review of available site history and information collected during the course of the two investigations indicate that there was the potential for soil to be impacted from previous land uses (e.g. market garden activities, filling material and a decommissioned underground storage tank which was identified onsite)"* and that *"Significant aesthetical issues were identified predominantly on surface level at the northern portion of the site, however minor observations of general waste was noted scattered at the southern portion of the site".*

Nevertheless, *"comparison of soil sample results from both ESP investigations reported no samples in excess of the adopted ecological and health based criteria in a commercial/industrial land use exposure setting"*. The two Stage 1 PSI reports indicated that there is *"no information to suggest the site is not suitable for the proposed land use"*.

As part of the two PSI reports, a Conceptual Site Model (CSM) was prepared by ESP, based on the site history review and the site inspection undertaken. The primary contaminant sources, the contaminants of concern and the release mechanisms from the CSM prepared by ESP are summarised in Table 3-1, together with data gaps identified by Fairfield Council, which warrant additional soil testing.

Table 3-1: Preliminary Conceptual Site Model and Additional Requirements

Primary Contaminant Sources	Contaminants of Concern	Release Mechanisms	Requirement for Additional Data
General market garden activities (e.g. fertilising, pesticide and herbicide application)	Pesticides, herbicides or heavy metals	Direct application, leaks and/or spills	Detailed assessment of pesticides and heavy metals in Area 4, for residential use
Fuel storage tank	Petroleum hydrocarbons and heavy metals	Leaks and/or spills	No additional assessment warranted
Imported fill material	Heavy metals, petroleum hydrocarbons, pesticides, herbicides, polychlorinated biphenyls and asbestos	Settlement and/or storage of filling material	Assessment of asbestos in fill stockpile.
North east portion of site (fill material, building material storage and general debris storage)		Settlement and/or storage of filling material, leaks and/or spills of stored product	Assessment of all contaminants of concern, excl. asbestos, in Area 1 (the north east portion) and Area 5 to complete data set
(OFFSITE) Service station - East of site	Petroleum hydrocarbons, solvents and heavy metals	Surface and subsurface Leaks and/or spills	No additional assessment warranted

4. SAMPLING, ANALYSIS AND DATA QUALITY OBJECTIVES

A soil assessment is necessary in order to evaluate whether there is soil contamination which presents an unacceptable risk to human health and the environment and, consequently, to determine if the site is suitable for the proposed use. The following sections describe the development of a decision rule for the assessment, and the sampling rationale and methodology.

4.1 REQUIREMENT FOR ADDITIONAL SAMPLING

Fairfield City Council has requested additional sampling and testing to be carried out, comprising of the following:

- Further sampling of Areas 1 and 5, to be done in on the same basis as sampling carried out for Areas 2, 3 and 6 in the 2012 Stage 1 PSI, prepared by ESP (Report No. 18746-R2.0);

- Detailed soil investigation of Area 4. Composite sampling is not acceptable for this area, which is to be assessed in accordance with the *NSW DEC Guidelines for Assessing Former Orchards and Market Gardens*. Results are to be assessed against to Residential 'A' standards from schedule B1 of the National Environmental Protection (Assessment of Site Contamination) Measure 2011; and

- Sampling and analysis of the stockpile adjacent to the onsite dam for the presence of asbestos.

The location of the various subdivided areas and of the stockpile on site, as mentioned above, is illustrated in Figure 4-1.

Based on discussions with Council, the results from this additional sampling round can be presented as an addendum to the previous Stage 1 PSI reports, and therefore also include the previous laboratory analysis. As such, soil sampling and laboratory analysis by Benbow Environmental was undertaken for certain contaminants of concern, based on the specific Council requests stated above, and on the review of all available information, including the site history and the previous Stage 1 PSI reports prepared by ESP.

4.2 DECISION RULE

The site is assessed on the basis of on-site observations and analytical results on collected soil samples, in order to establish whether concentration of the chemicals of concern exceed the adopted soil investigation and screening levels for the proposed land use; all results are assessed against the relevant Site Assessment Criteria (SAC) defined in Section 6.

The decision rule in characterising the site will be as follows:

- Laboratory test results for systematic soil samples will be analysed statistically to ascertain the 95% upper confidence level (UCL) of average concentrations for each analyte (except for asbestos, where it is not appropriate);
- Soil sampling results will be compared to the relevant Site Assessment Criteria (SAC) defined in Section 6 to determine whether the soil on-site is contaminated or not;

- The site will be deemed as not being significantly impacted by a particular contaminant, if the following criteria are fulfilled:
  - The 95% UCL of the arithmetic mean of the data set is less than the SAC;
  - The standard deviation of the data set is less than 50% of the SAC;
  - No individual test result is greater than 250% of the SAC; and
- Further investigation, remediation and/or management will be recommended if the site is found to be contaminated or containing contamination "hot spots".

4.3 SAMPLING RATIONALE

The sampling regime adopted in the current assessment meets the minimum sampling density specified in the *Sampling Design Guidelines* (NSW EPA, 1995) for the characterisation of a site of its size. The site was previously sub-divided into six smaller areas for more effective sampling, and the sampling density is calculated for the individual sub-divisions that require assessment. Sampling by Benbow Environmental was undertaken in three of the sub-divided areas (from which additional samples were required), on 22 August 2017.

The study boundaries extend to Area 1, 4 and 5 within the subject site (as shown in Figure 4-1), with two different levels of investigations undertaken for Areas 1 and 5, and for Area 4.

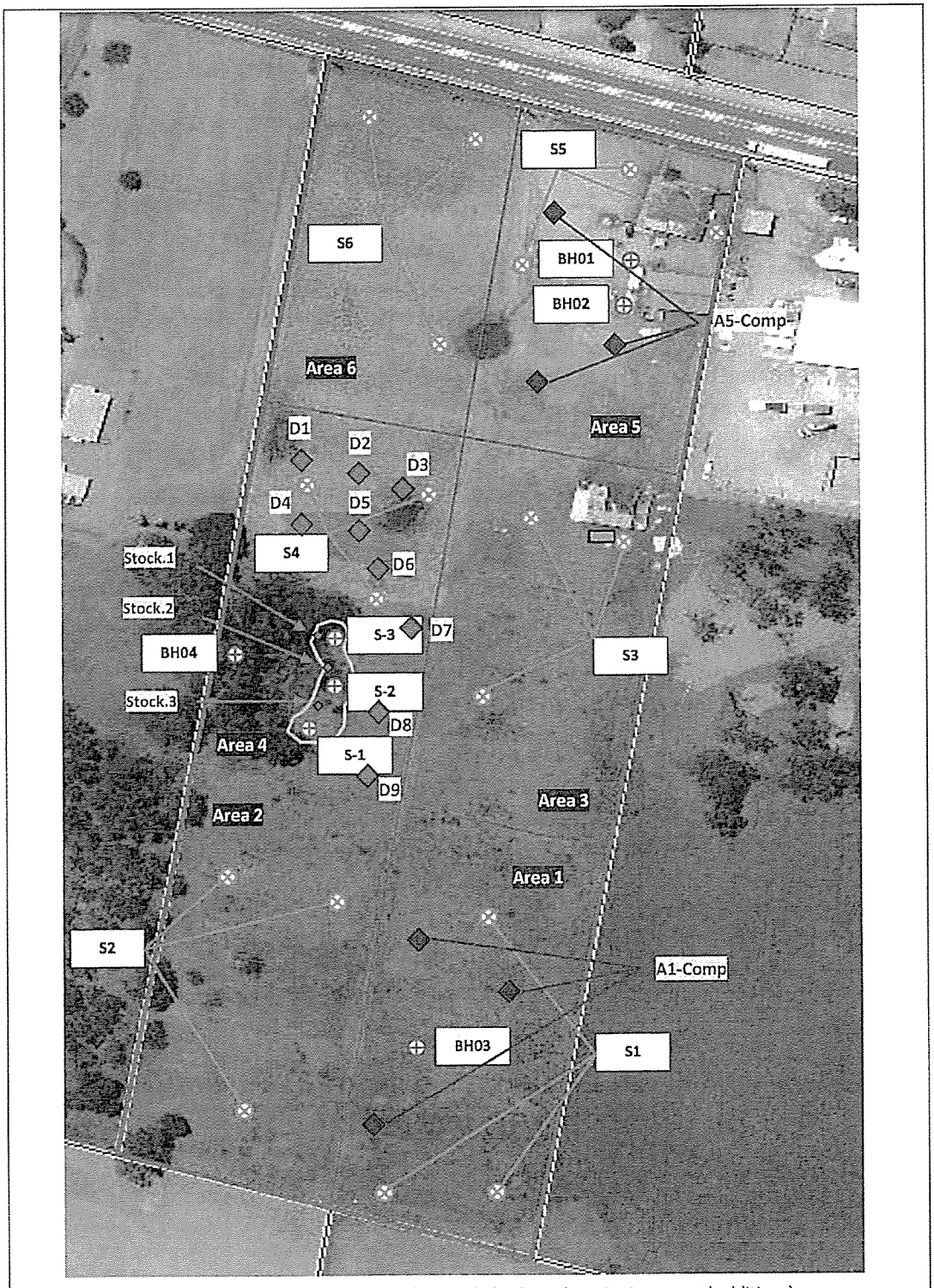
A judgmental sampling pattern was adopted for Areas 1 and 5 based on the knowledge of the probable distribution of contaminants on site and the specific Council requests for additional sampling: one composite sample was collected for each area, and each composite sample was formed by three sub-samples. Sub-samples were taken from the top 200 mm of the soil profile, immediately below any vegetative or detritus layers.

For Area 4, a systemic sampling pattern was adopted instead, with use of a square grid to select sampling points at regular and even intervals. A large portion of Area 4 is currently occupied by an on-site dam surrounded by large trees and shrubs, as well as a soil stockpile covered in tall grass. This portion of the site was not suitable for soil sampling, and was therefore excluded from the sampling area, which is 0.3 ha in size (for the purpose of defining the minimum number of sampling points required). A total of 10 discrete samples were taken from nine sampling locations, as shown in Figure 4-1; therefore, including a field duplicate sample. Each location was sampled within the top 150 mm of the soil profile, below any vegetative or detritus layers, in accordance with the *Guidelines for Assessing Former Orchards and Market Gardens* (DEC NSW, 2005).

Figure 4-1 shows an overview of all points sampled during the three sampling events undertaken on the subject site (Benbow Environmental in 2017 and ESP in 2016 and 2012).

Borehole logs provide further information on the type of soil encountered at each sampling location (Attachment 2).

Figure 4-1: Site Sample Locations



Source: J34021 –R1.0, Environmental & Safety Professionals (with Benbow Environmental additions).

4.4 SAMPLING METHODS

4.4.1 Sampling Equipment and Methods

Test pits were excavated with the use of an excavator fitted with a narrow bucket. Soil samples were then collected from the excavated material and/or the exposed walls of the test pits, by using a stainless steel scoop. Soil was placed into 150 mL glass jars supplied by the ALS laboratory. The soil was packed tightly into the container so that no air space or voids were left.

4.4.2 Equipment Decontamination Procedures

Between each sampling process all the sampling equipment has been decontaminated in order to avoid cross contamination. A decontaminating solution of 2%-5% Decon90 diluted in distilled water was prepared. Decontamination of the sampling equipment was obtained by scrubbing the utensils with decontaminating solution and rinsing with distilled/deionised water.

4.4.3 Sample Handling Procedures

Each sample is identified by the following information, which was written on the container label:

- BE job number;
- Sampler;
- Sample ID (composed of the test pit number and depth code); and
- Date and time of sampling.

Immediately after collection, samples were placed in an esky containing ice to keep cool. At the end of the day of sampling, the samples were transported to the laboratory for analysis. All sample bottles were covered in a 50 mm layer of ice. The Chain of Custody (COC) forms were also completed containing the required information and submitted to the lab along with the samples. These are included in Attachment 3.

4.4.4 Sample Preservation Methods

The samples were placed into a chilled esky and after sampling were stored in a refrigerator until transport to the laboratory occurred. A laboratory technician noted on the COC form that the samples were received in a satisfactory condition in relation to transport time and chilled condition. No chemical preservatives were added to the soil sample containers. Samples were analysed within acceptable holding times.

4.5 LABORATORY TESTING

4.5.1 Analytes

The selection of analytes is based on the site history, CSM and analytical results presented in the Preliminary Site Investigation, with particular consideration to chemicals of potential concern that are generally associated with former market garden site as well as with imported/contaminated fill.

Composite samples from Area 1 and 5 were tested for the following analytes:

- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Heavy metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Zinc (Zn);
- Organochlorine Pesticides (OCP) and Organophosphorus Pesticides (OPP);
- Phenolic compounds;
- Polychlorinated Biphenyls (PCB);
- Polycyclic Aromatic Hydrocarbons (PAH); and
- Total Petroleum Hydrocarbons (TPH).

Discrete samples from Area 4 were tested for the eight heavy metals listed above, OCP and OPP. The stockpile within Area 4 was only tested for bonded and friable Asbestos, which includes bonded ACM, fibrous asbestos and asbestos fines as defined below.

NEPC (2013) defines the various asbestos types as either:

- Bonded ACM: Asbestos containing material which is in sound condition, bound in a matrix of cement or resin, and cannot pass a 7 mm x 7 mm sieve.
- FA: Fibrous asbestos material including severely weathered cement sheet, insulation products and woven asbestos material. This material is typically un-bonded, or was previously bonded and is now significantly degraded.
- AF: Asbestos fines including free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve.

4.5.2 Testing Methods

The soil samples were analysed by ALS laboratories. This is a NATA accredited laboratory, which undertakes analytical methods based on well-established, internationally-recognised procedures such as those published by the US EPA, the American Public Health Association (APHA), Australian Standards and the NEPM guidelines (NEPC, 2013). The methods used for each analyte tested are described in the QA/QC Compliance Assessment report provided by the laboratory and included in Attachments 4.