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Project 85374.01
21 March 2016
85374.01.R.001.Rev1
TW:jlb

Attention: Ms Louise Browne

Email: Louise.Browne@grimshaw-architects.com

Dear Sirs

Review of Reports – Site Contamination
Arthur Phillip High School and Parramatta Public School
Macquarie Street, Parramatta

1. Introduction

This letter provides a review of existing reports relating to the proposed redevelopment of Arthur Phillip High School (APHS) and Parramatta Public School (PSS), Macquarie Street, Parramatta (the site). The proposed redevelopment includes the retention of heritage buildings, demolition of other existing buildings and the construction of a seventeen storey secondary school (APHS) on the northern part of the site and a four storey primary school (PPS) on the southern part of the site.

2. Scope of Works

The scope of works comprised a review of existing site contamination reports provided by the client, the provision of a summary of the findings and potential data gaps or omissions, and provision of initial advice regarding further investigations and remediation / management options in relation to the proposed redevelopment.

The following existing site contamination reports were reviewed:

- Alliance Geotechnical Report; *Detailed Site Investigation, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-1, dated 11 August 2015 (AG, 2015a); and
- Alliance Geotechnical Report; *Remedial Action Plan and Asbestos Management Plan, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-2, dated 14 August 2015 (AG, 2015b).

3. Site Description

The site is located on Macquarie Street in Parramatta CBD and comprises two existing schools. APHS is located on the northern and southern sides of Macquarie Street and PPS is located on the southern side of Macquarie Street (refer to AG Drawing Number: 1915-ER-1-B attached). APHS occupies a total area of approximately 2.14 ha (1.24 ha in the north and 0.9 ha in the south) and PPS occupies an area of approximately 0.87 ha.

4. Review of Reports

The following sections summarise the findings of the report review and identifies potential data gaps or omissions.

4.1 AG (2015a)

AG (2015a) comprised a detailed site investigation which included a site history review, a site walkover and an intrusive investigation comprising soil sampling and analysis.

The site history review indicated that the site appeared to have been used for agricultural purposes until c. 1918 to 1925. The site was used as a school and possibly other public uses until the present day. The part of the site north of Macquarie Street was used for defence purposes in c. 1930s (potential barracks adjacent to Barrack Lane) to 1940s (zig-zag trenches). Minor earthworks and the construction and demolition of buildings had occurred on the site over the years.

The findings of a site walkover conducted by AG on 9, 10 and 13 July 2015 are summarised as follows (refer to AG Drawing Number: 1915-ER-1-B attached):

- The site was bound by:
 - o North: Commercial/ industrial buildings including offices and a mechanics workshop;
 - o East: Charles Street and commercial offices beyond;
 - o South: Little Street, a military museum and a commercial office building;
 - o West: Smith Street, Barrack Lane and commercial buildings;
- The part of APHS to the north of Macquarie Street (north site) included a gymnasium and 19 demountable classrooms, a number of shipping containers, a car park, a driveway, a grassed sports field and a soft bitumen sports court. Suspected fragments of asbestos-containing materials (ACM) were observed on the ground surface north of the gymnasium and on the surface of a slope west of the demountable classrooms;
- The part of APHS to the south of Macquarie Street (south site) included a number of brick school buildings around a central bitumen covered playground. A car park in the north west was also bitumen covered;

- PPS comprised a large brick building and ten demountable classrooms, a bitumen car park, a large metal awning and a number of bitumen and soft bitumen playgrounds. Suspected ACM fragments were observed on the ground surface in the south west of the PPS site;
- The site was bound by a 2.5 m high fence with secure gates;
- No underground or above ground storage tanks were observed; and
- No bulk storage of dangerous chemicals or other hazardous goods were observed.

The site history review and site walkover did not include obtaining and reviewing Council Section 149 Certificates or a WorkCover storage of dangerous goods search, a search of councils records, or interviews with site personnel. These sources of information could have provided further information relating to the storage of dangerous goods on site. However, this omission could be mitigated provided that site personnel can confirm the current or historical storage of dangerous goods on site.

AG (2015a) includes a conceptual site model (CSM), site assessment criteria (SAC) and quality assurance / quality control assessment. There are a number of errors / omissions in these sections but generally these are not considered to have impacted on the conclusions of the report. However, the SAC in AG (2015a) should not be used as remediation acceptance criteria due to these errors. Also it is not clear how the ecological investigation levels (EIL) have been calculated. The calculation of the EIL for copper nickel and zinc requires the analysis of soil samples for cation exchange capacity (CEC) and pH. AG (2015a) does not include soil results for CEC or pH, nor the calculation of the EIL. Given the elevated concentrations of zinc recorded this may or may not be an issue depending on the details of the proposed development.

The fieldwork comprised a combination of mechanically advanced boreholes, hand augered boreholes and surface samples, with a total number of 55 sampling locations (refer to AG Drawing Number: 1915-ER-1-C attached). The borehole logs include surface levels but not coordinates, so relocating the sampling points would need to be based on the locations shown on the figures in AG (2015a) which can prove to be problematic.

The sampling and analysis plan indicates that the numbers of sampling points were consistent with the requirements of the NSW EPA *Sampling Design Guidelines*, 1995 (EPA, 1995) with 25 locations in the north site and 30 locations in the south site (55 locations in total). However, there is no rationale provided for the selection of the samples analysed, nor is there a rationale for the selected contaminants of concern analysed in each sample. The following tables summarise the contaminants of potential concern (CoPC) identified in the CSM contained in AG (2015a), the numbers of sampling locations from AG (2015a) and the numbers of samples of filling (the most likely source of contamination) analysed for each of the CoPC.

Table 1: Summary of Analysis – North Site

CoPC	Metals	TRH/BTEX/PAH	OCP/OPP/PCB	Asbestos
Sampling Locations	25	25	25	25
Filling Samples Analysed	23	5	10	17

Notes:

TRH – total recoverable hydrocarbons
 BTEX – benzene, toluene, ethylbenzene and xylene
 PAH – polycyclic aromatic hydrocarbons
 OCP - Organochlorine pesticides
 OPP - Organophosphorous pesticides
 PCB – polychlorinated biphenyls

Table 2: Summary of Analysis – South Site

CoPC	Metals	TRH/BTEX/PAH	OCP/OPP/PCB	Asbestos
Sampling Locations	30	30	30	30
Filling Samples Analysed	5	1	0	4

The filling in the north site was encountered to depths of between 0.3 m and 1.0 m below ground level (bgl) and comprised brown to grey gravelly silty/sandy clay with foreign materials such as brick, concrete and tile. Fragments of ACM were observed in two locations; the ground surface north of the gymnasium (HA9) and on the surface of a slope west of the demountable classrooms (BH7) (refer to AG Drawing Number: 1915-ER-1-C attached), however, the condition of the fragments is not given. The presence of building debris such as brick, concrete and tile can be secondary indicators of the presence of ACM.

The filling in the south site was encountered to depths of between 0.4 m and 0.7 m bgl and comprised brown to grey gravelly clay/silty clay with foreign materials such as igneous gravel and bitumen. Fragments of ACM were observed on the ground surface in the south west of the PPS site (HA16) (refer to AG Drawing Number: 1915-ER-1-C attached), however, the condition of the fragments is not given.

No indicators of contamination, other than the foreign materials and ACM, such as hydrocarbon odours or staining were observed in the site soils.

Natural material below the filling across the site comprised red to brown clay over shale.

The recorded concentrations of OCP, OPP and PCB were below the laboratory limit of reporting and the SAC. However, only ten samples of filling from the north site were analysed for these CoPC (Tables 1 and 2 above).

The recorded concentrations of PAH were below the laboratory limit of reporting and the SAC and the recorded concentrations of TRH and BTEX were below the laboratory limit of reporting and / or the

SAC. However, of the ten samples analysed four were samples of natural soil. Five samples of filling were analysed from the north site and only one from the south site (Tables 1 and 2 above).

The recorded concentrations of metals were below the SAC apart from concentrations of lead above the human health SAC (300 mg/kg) in the following samples:

- HA4-0.0-0.1 – 320 mg/kg (north site – filling);
- HA10-0.0-0.2 – 410 mg/kg (north site – filling); and
- BH19-0.5-0.6 – 740 mg/kg (south site – natural soil).

Statistical analysis of the recorded lead concentrations was undertaken and AG (2015a) concluded that the upper 95% confidence limit on the average lead concentration was below the SAC. However, it is noted that the analysis was based on the full data set and did not differentiate between the results from the filling and the natural soils which may have affected the outcome of the analysis.

Thirty one samples were analysed for asbestos, however, ten of the samples analysed were natural soils and would not be expected to contain asbestos. Of the remaining 21 samples (17 from the north site and four from the south site – Tables 1 and 2 above) AG (2015a) states that three samples exceeded the SAC, however, it is not stated how the concentrations of asbestos %w/w were calculated. Asbestos was reported in the laboratory certificate to be present in the following four samples (refer to AG Drawing Number: 1915-ER-1-C attached):

- HA9-0.0-0.2 – chrysotile, amosite and crocidolite in fibre cement fragments, and chrysotile and amosite in loose fibre bundles (north site – filling);
- HA16-0.0-0.2 – chrysotile, amosite and crocidolite in fibre cement fragments and in loose fibre bundles (south site – filling);
- BH4-0.0-0.1 – chrysotile and amosite in fibre cement fragments (north site – filling); and
- BH12-0.0-0.1 – chrysotile in loose fibre bundles (north site – filling).

As there is no description of the condition of the fragments of ACM identified it is not clear whether the fibre bundles are a results of degradation of ACM fragments in poor condition or whether there is a separate source of friable asbestos.

AG (2015a) concluded that *'the site is able to be made suitable for residential with accessible soils land use with the following recommendations'*:

- Preparation of a remediation action plan (RAP);
- There is the potential for beneficial re-use of asbestos impacted soils on-site pending further assessment;
- Preparation of an asbestos management plan (AMP) to manage asbestos during redevelopment; and
- Preparation of a validation report to demonstrate adequate remediation of asbestos and any unexpected finds, and to provide a statement on the suitability of the site for the proposed use.

4.1.1 DP Comments

A number of data gaps and omissions have been identified in AG (2015a), some of which appear to have limited impact on the conclusions of the report, but others require further assessment.

DP recommends that the following are undertaken in addition to the recommendations in AG (2015a):

- Seek confirmation from site personnel whether or not dangerous goods (e.g. underground or above ground storage tanks, chemicals etc) are currently, or have been historically, stored on site;
- Re-assess the copper, nickel and zinc results against EIL calculated based on site derived criteria (soil samples analysed for CEC and pH) or based on reasonably conservative assumed values of CEC and pH for the soils types encountered. This should be undertaken with reference to the current design of the proposed development;
- Undertake a detailed assessment of the analytical data to assess the impact of the limited extent of analysis of the filling undertaken for the identified CoPC to inform the requirement for further sampling and analysis either prior to or during redevelopment works;
- Further statistical analysis of the lead concentrations recorded in filling and natural soils; and
- Further assessment of the potential extent of asbestos impacted filling identified to date.

4.2 AG (2015b)

AG (2015b) comprises a RAP and asbestos management plan (AMP) and includes the following:

- A summary of AG (2015a);
- A scope of additional assessment works;
- A review of remediation options;
- A remedial plan;
- A contingency plan;
- A validation plan; and
- An AMP.

The comments in Section 4.1 above apply equally to Section 3 of AG (2015b) which summarises the findings of AG (2015a).

4.2.1 Additional Assessment Works

Section 4 of AG (2015b) summarises the known contamination and outlines additional characterisation works in areas of identified asbestos and areas which are currently inaccessible.

Fragments of non-friable ACM were observed at sample locations HA9, HA16 and BH7 which could be indicative of ACM impacted filling at depth in these locations. Therefore further assessment of these areas is recommended.

AG (2015b) states that soils impacted by friable asbestos (AF/FA – asbestos fines / fibrous asbestos) were present in three locations; HA9, HA16 and BH4. However, the asbestos identified in the sample from BH4 was not in a friable form; and friable asbestos was also recorded in a sample from BH12. To summarise the results as reported by AG (2015a), as corrected by the contents of the laboratory certificate of analysis, asbestos / asbestos impacted soil was recorded in the following locations (refer to AG Drawing Number: 1915-ER-1-C attached):

- HA9 – non-friable on the surface and, friable and non-friable at 0.0-0.2 m depth – north site; HA16 - non-friable on the surface and, friable and non-friable at 0.0-0.2 m depth – south site;
- BH4 – non-friable at 0.0-0.1 m depth – north site;
- BH7 – non-friable on the slope surface – north site; and
- BH12 - friable at 0.0-0.1 m depth – north site.

Additional asbestos quantification works in areas of identified asbestos are proposed by AG. It is proposed by AG to excavate test pits on a 10 m grid in three areas (Areas 1 to 3), however, the rationale for the 10 m grid is not provided and the three areas do not include BH12. The National Environment Protection Council *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013) refers to the WA DoH *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, 2009 (WA, 2009) for the investigation, assessment and management of asbestos in soil. WA (2009) includes sampling densities which have not been referred to in the RAP.

In areas which are currently inaccessible (the sports courts, building footprints and areas covered with hard or soft bitumen, refer to AG Drawing Number: 1915-ER-1-D attached) AG (2015b) recommends the following post removal of the buildings / surfaces:

- An inspection for visible signs of contamination such as ACM, hydrocarbons staining or odours, underground storage tanks or other sources of contamination; and
- Collection of soil samples in areas of identified contamination, which may include test pits for ACM assessment.

4.2.2 Remediation and Validation

AG (2015b) notes that the extent of remediation required is currently unknown but based on a conservative approach approximate areas of remediation are provided. The areas of remediation (refer to AG Drawing Number: 1915-ER-1-E attached) are much smaller than the three areas previously identified as requiring additional asbestos quantification works (refer to AG Drawing Number: 1915-ER-1-D attached). However, there is no rationale provided for these reduced areas and the areas do not include BH12.

AG (2015b) considers a number of potential remediation options before identifying the preferred strategy as being:

- On-site treatment of bonded ACM and bonded ACM impacted material;
- Off-site disposal of AF/FA impacted soils (depending on the volume calculated); and
- Consolidation and isolation of AF/FA impacted material (depending on the volume calculated).

However, the requirements for the assessment, consolidation and isolation of AF/FA impacted material on-site are not included in AG (2015b).

The proposed remediation works for on-site treatment of bonded ACM and bonded ACM impacted material are not strictly in accordance with WA (2009) and will require amending accordingly.

A contingency plan is included to deal with *inter alia* unexpected finds of contamination not previously identified. However, AG (2015b) does not include SAC or remediation acceptance criteria (RAC) for such unexpected finds. As noted in Section 4.1 above the SAC in AG (2015b) should not be used as remediation acceptance criteria due to errors.

The validation plan is contradictory in places, does not include justification for the sampling frequencies, does not include minimum sampling numbers and requires further clarification / detail rather than just referring to WA (2009). In addition the site validation criteria are for asbestos only and the validation criteria for imported materials are rather loose and refer to out of date guidance.

4.2.3 DP Comments

Whilst the overall remediation strategy is practical there are areas which require further detail and clarification prior to implementation of the RAP which include the following:

- Updating to include the requirements of WA (2009);
- Reassessment of the extent of the areas requiring additional asbestos quantification works and areas of remediation;
- Inclusion of the requirements for the assessment and consolidation and isolation of AF/FA impacted material; and
- Updating of the validation plan and inclusion of RAC.

Amendments / an addendum to the RAP could be made following the results of the works recommended by DP in Section 4.1 above and the proposed additional assessment works provided in AG (2015b), taking into account the findings of the review above.

5. Limitations

Douglas Partners (DP) has prepared this report for this project at Macquarie Street, Parramatta in accordance with DP's proposal dated 12 February 2016 and acceptance received from Paul Altree-

Williams of Grimshaw Architects LLP dated 3 March 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Grimshaw Architects LLP for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully

Douglas Partners Pty Ltd



Tim Wright

Senior Associate

Reviewed by



Paul Gorman

Senior Associate

Attachments:

About this Report

Alliance Geotechnical Drawing Number: 1915-ER-1-B

Alliance Geotechnical Drawing Number: 1915-ER-1-C

Alliance Geotechnical Drawing Number: 1915-ER-1-D

Alliance Geotechnical Drawing Number: 1915-ER-1-E

About this Report

Douglas Partners



Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



Not To Scale



Source: SIX Maps

Your On-Site Geotechnical Specialists
Phone Us Today - 02 9675 1777

Client: NSW Department of Education
Project: Arthur Phillip High School and Parramatta Public School
Location: 175 Macquarie Street, Parramatta, NSW

Job Number: 1915
Report Number: 1915-ER-1-2
Report Date: 14/08/2015



Not To Scale

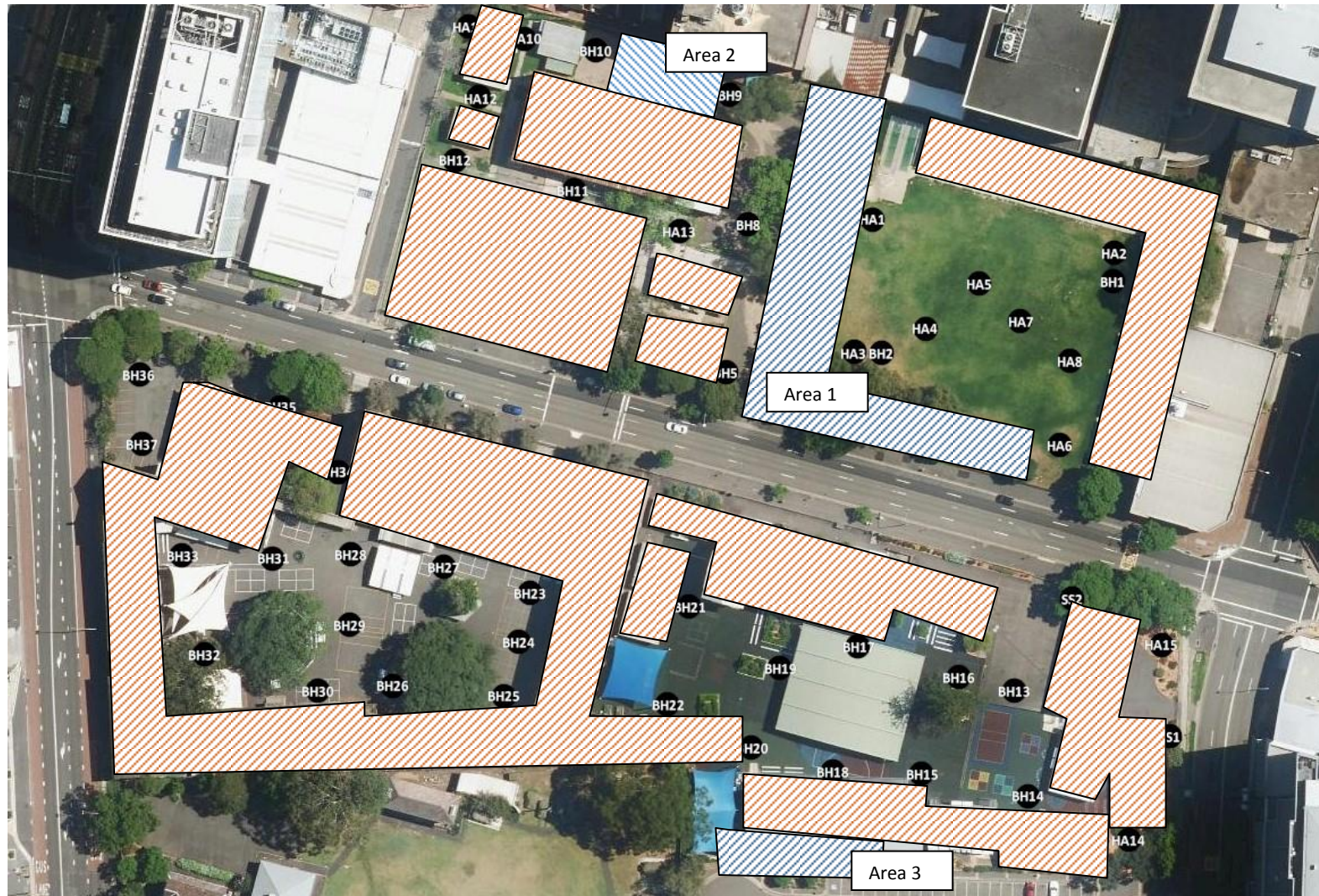


Source: SIX Maps (www.maps.six.nsw.gov.au)

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Not To Scale



-  Areas of Identified Asbestos
-  Inaccessible Areas

Source: SIX Maps (www.maps.six.nsw.gov.au)

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Not To Scale



Current
Remedial
Extents

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