Report Type: Remedial Action Plan and Asbestos Management Plan
Site Address: Arthur Phillip High School and Parramatta Public School
Report Number: 1915/ER-1-2
Report Date: 14th August 2015

Prepared for

NSW Department of Education
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Prepared by

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14th August 2015

NSW Department of Education
Level 4, 33 – 35 Bridge Street
Sydney, NSW, 2000

RE: REMEDIAL ACTION PLAN & ASBESTOS MANAGEMENT PLAN – ARTHUR PHILLIP HIGH SCHOOL AND PARRAMATTA PUBLIC SCHOOL

Alliance Geotechnical Pty Ltd (AG) hereby submits this Remedial Action Plan (RAP) and Asbestos Management Plan (AMP) for the above site.

This report documents the findings of all completed environmental tasks, including reviews of previous reports, documentation of procedures and standards to be followed in order to remove the risks posed by friable asbestos impacted soils identified during previous investigations, with recommendations for additional action, if necessary.

Should you require further information or clarification regarding any aspect of this report, please call the undersigned on 9675 1777.

For and on behalf of,
Alliance Geotechnical Pty Ltd

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1.0 INTRODUCTION

1.1 Background

Alliance Geotechnical Pty Ltd (AG) was engaged by NSW Department of Education (DEC, the client), to prepare a combined Remediation Action Plan (RAP) and Asbestos Management Plan (AMP) for Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta, NSW (herein referred to as 'the site'), refer to **Figure 1**. Arthur Phillip High School covered an area of approximately 1.24 hectares on the northern side of Macquarie Street and 0.9 hectares on the southern side of Macquarie Street and is comprised of the following Lots:

- Lot 65 Sec 17 in DP 758829;
- Lot 413 in DP 820541;
- Lot 64 Sec 17 in DP 758829;
- Lot 63A Sec 17 in DP 758829;
- Lot 63 in DP 758829;
- Lot 62 Sec 17 in DP 758829;
- Lot 1 in DP 115296;
- Lot 2 in DP 115296;
- Lot 3 in DP 115296; and
- Part of Lot 414 in DP 820542.

Parramatta Public School covered an area of approximately 0.87 hectares and is comprised of the following Lots:

- Part of Lot 414 in DP 820542;
- Lot 23 in DP 7809;
- Lot 24 in DP 7809;
- Lot 25 in DP 7809;
- Lot 26 in DP 7809; and
- Lot 27A in DP 449406.

The site is currently used as a high school and primary school with playgrounds and it is understood that the client is planning to develop two multi-storey school buildings with playgrounds, refer to site plans in **Appendix A**. A Detailed Site Investigation was prepared for the site (AG 2015a[1]) which identified non friable asbestos fragments and/or friable asbestos / asbestos fibre (AF/FA) impacted soil at the following sample locations (refer to **Figure 2 and 3)**:

- BH4-0.0-0.1;
- HA9-0.0-0.2; and

[1] *Detailed Site Investigation, Arthur Phillip High School and Parramatta Public School*, Alliance Geotechnical (Report reference number 1915-ER-1-1), 11th August 2015 (AG 2015a).

- HA16-0.0-0.2.

This combined RAP/AMP has been prepared with reference to relevant Australian Standards and guidelines made or approved by NSW Environment Protection Authority (EPA) and developed based upon the findings of AG (2015a).

1.2 Objectives

The objectives of this combined RAP/AMP are to:

- Document the procedures and standards to be followed in order to remove or manage the risks posed by non-friable asbestos fragments and friable asbestos / asbestos fibre impacted soils identified during previous investigations (AG 2015a);
- Identify a remedial strategy to make the site suitable for use as a high rise school with open space areas;
- Ensure the asbestos impacts are managed appropriately during construction works for protection of human health and the surrounding environment; and
- Outline an unexpected finds procedure to ensure any previously unidentified contamination is appropriately managed.

2.0 SITE CONDITION & SURROUNDING ENVIRONMENT

2.1 Site Location and Identification

The site was located at Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta, NSW (Ref. **Figure 1**). The nearest cross streets were Smith Street to the west and Charles Street to the east. Arthur Phillip High School covered an area of approximately 1.24 hectares on the northern side of Macquarie Street and 0.9 hectares on the southern side of Macquarie Street.

Arthur Phillip High School was legally identified as the following Lots:

- Lot 65 Sec 17 in DP 758829;
- Lot 413 in DP 820541;
- Lot 64 Sec 17 in DP 758829;
- Lot 63A Sec 17 in DP 758829;
- Lot 63 in DP 758829;
- Lot 62 Sec 17 in DP 758829;
- Lot 1 in DP 115296;
- Lot 2 in DP 115296;
- Lot 3 in DP 115296; and
- Part of Lot 414 in DP 820542.

Parramatta Public School covered an area of approximately 0.87 hectares on the southern side of Macquarie Street and is comprised of the following Lots:

- Part of Lot 414 in DP 820542;
- Lot 23 in DP 7809;
- Lot 24 in DP 7809;
- Lot 25 in DP 7809;
- Lot 26 in DP 7809; and
- Lot 27A in DP 449406.

The approximate geographic coordinates of the site were -33.816088 E, 151.007492 N.

2.2 Site Description

A site inspection was completed during soil investigation works on 9 – 13th July 2015 by one of AG's trained and experienced environmental consultants. During the site inspection, the site was observed to comprise a high school and primary school with Macquarie Street running through the centre (refer to **Figure 2** for locations of site features).

The portion of the site on the northern side of Macquarie Street was part of Arthur Phillip High School. The northern side of Macquarie Street consisted of approximately twenty (20) buildings, a car park with a driveway, a grassed sports ground and a soft bitumen covered sports courts. The school buildings consisted of a large school hall and approximately 19 demountable classrooms. In addition, a number of shipping containers were

observed to be used to store sporting equipment and school maintenance equipment. The car park and driveway were partially sealed with bitumen and partially unsealed with gravelly clay observed on the surface. The grassed sportsground was a flat, square area with a batter on the southern and western sides. The batter sloped down from Macquarie Street and the car park to the sportsground.

The portion of the site on the southern side of Macquarie Street consisted of the remainder of Arthur Phillip High School and Parramatta Public School. The southern portion of Arthur Phillip High School consisted of a number of large school buildings, a car park and a bitumen covered playground. The school buildings were located on the periphery of the site with the bitumen covered playground in the centre. The car park was also covered in bitumen and was located in the north-western corner of the southern portion of the site.

Parramatta Public School consisted of a large brick building, ten (10) demountable classrooms, a car park, a large metal awning and a number of playgrounds including a large area in the centre of the school which was covered in soft bitumen.

The entire site was bound by a 2.5 m high fence with secure gates. No underground storage tanks (USTs) or above ground storage tanks (ASTs) were observed. No bulk storage of dangerous chemicals or other hazardous goods was observed.

Suspected asbestos containing material (ACM) fragments were observed in the following areas (refer to **Figure 2**):

- On the ground surface to the north of the school hall (northern portion of the site);
- On the ground surface at the slope west of the demountable buildings (northern portion of the site); and
- On the ground surface at the centre of the southern boundary of the site (southern portion of the site).

Inaccessible areas at the time of the borehole drilling and site inspection included:

- The sports courts at the northern portion of the site;
- The building footprints at all site buildings (including demountable buildings due to restricted access); and
- The majority of the surface of the southern portion of the site due to the soft bitumen that covered the ground surfaces at Parramatta Public School and hard bitumen at Arthur Phillip High School.

2.3 Surrounding Areas

The site was bound by:

- Commercial / industrial buildings to the north, including office buildings and a mechanic workshop;
- Charles Street and commercial offices to the east;
- Little Street, a military museum and a commercial office building to the south; and
- Smith Street, Barrack Lane and commercial buildings to the west.

2.4 Topography and Site Drainage

The site was located on the crest of a hill and a relatively steady gradient (approximately 5 %) which generally sloped down towards the east. The site was also observed to slope slightly towards the north and south. Information on regional topographic conditions, referenced from the Central Mapping Authority of NSW

Penrith 9130 Topographic Map 1:25,000 (CMA, 1986), was consistent with this description and indicated that the property's elevation was approximately 10 m above sea level (i.e. 10 m Australian Height Datum (AHD)).

In unsealed areas of the site, precipitation is anticipated to infiltrate the ground surface until it reaches saturation point and then flow along the surface towards the low lying areas of the site i.e. towards the east. In sealed areas of the site, precipitation is anticipated to be captured by the building gutters and site stormwater drainage system.

The nearest surface water receptor was the Parramatta River, located approximately 240 m to the east of the site. Runoff and groundwater at the site is likely to find its way to this system.

2.5 Regional Geology and Soil Landscape

Information on regional sub-surface conditions, referenced from the Geological Survey of NSW / Department of Mineral Resources Sydney 1:100,000 Geological Series Sheet 9030 (GS NSW / DMR, 1983), indicated that the site overlies the Wianamatta Group Ashfield Shale (Rwa) which generally comprises black to dark grey shale and laminite.

Review of the NSW National Resource Atlas Acid Sulfate Soil Risk Maps indicated that the site overlies an area of "no known occurrence of acid sulphate soils". There is not anticipated to be a risk to current or future site buildings from acid sulphate soils.

2.6 Hydrogeology

A review of the NSW Office of Water groundwater database indicated that five (5) registered groundwater bores were located within a 1 km radius of the site. Groundwater bore information was supplied by the NSW Office of Water and is summarized in **Table 2.1** below.

Table 2.1: Groundwater Monitoring Bore Information

Groundwater Bore ID	Distance from site (m)	Total Depth (m bgs)	Standing Water Level (m bgs)	Geology
GW024667	750 m east	4.60	2.40	0.0 – 4.6 m – Sand
GW110912	900 m north-east	10.00	7.000	0.0 – 0.1 m – Concrete 0.1 – 0.5 m – Fill 0.5 – 3.5 m – Clay 3.5 – 10.0 m – Shale and sandstone
GW110913		10.00	7.000	0.0 – 0.1 m – Concrete 0.1 – 4.5 m – Clay 4.5 – 10.0 m – Sandstone and residual clay
GW110914		6.00	5.000	0.0 – 1.1 m – Fill 1.1 – 5.5 m – Clay and siltstone 5.5 – 6.0 m – Sandstone
GW108611	900 m north-west	60.50	6.200	0.0 – 1.0 m – Fill 1.0 – 3.0 m – Clay, brown 3.0 – 5.5 m – Shale 5.5 – 60.5 m – Sandstone

*ND = No data

Based on this information, groundwater in the vicinity of Parramatta River is expected to be at approximately 2.4 m bgs. Based on the regional geology maps, the soils in the vicinity of the site are higher than the areas of the groundwater wells in **Table 2.1**. A conservative approach to groundwater at the site would be to assume that groundwater is expected to be within 5 – 10 m below ground surface and will flow in an easterly direction towards Parramatta River.

2.7 Site History Summary

Based on the aerial photographs and land title information, the site appeared to have been used for agricultural purposes until c. 1918 – 1925. The site was used as a school and possibly other public uses until the present day. Other uses for the site included defence trenches during WWII.

The configuration of site buildings appeared to have changed throughout the years, the most significant being the removal of a large building at the northern portion of the site (similar location to the present day car park) and simultaneous earthworks to construct the slope on the western periphery of the school sports ground. This indicated the potential for the demolition of buildings of potentially hazardous building materials and the subsequent disposal / burial on-site.

The southern portion of the site did not appear to undergo any significant earthworks, however a number of buildings were removed and constructed prior to 1985. Construction materials used prior to 1985 are a higher risk of containing asbestos and/or lead paint.

3.0 PREVIOUS SITE ASSESSMENTS

With the exception of AG (2015a), there were no known previous environmental investigations that were undertaken at the site. The works and findings of AG (2015a) are summarised below.

3.1 Detailed Site Investigation (AG 2015a)

The main objective of this investigation was to assess the potential for soil and groundwater contamination at the site, based on a review of site setting and past land uses (i.e. site history). The scope of works comprised reviews of regional topographic, geological and soil landscape maps, assessment of local hydrogeological conditions, beneficial uses and flow direction, a site history review, a site walkover inspection and borehole drilling and collection of soil samples. The soil samples were transferred to a NATA accredited laboratory and the results were used to prepare a final report.

A site inspection was completed on 9 – 10th & 13th July 2015 by one of AG's trained and experienced environmental consultants. During the site inspections the site was observed to comprise a high school and primary school with Macquarie Street running through the centre.

The portion of the site on the northern side of Macquarie Street was part of Arthur Phillip High School. The northern side of Macquarie Street consisted of approximately twenty (20) buildings, a car park with a driveway, a grassed sports ground and a soft bitumen covered sports courts. The portion of the site on the southern side of Macquarie Street consisted of the remainder of Arthur Phillip High School and Parramatta Public School. The southern portion of Arthur Phillip High School consisted of a number of large school buildings, a car park and a bitumen covered playground. Parramatta Public School consisted of a large brick building, ten (10) demountable classrooms, a car park, a large metal awning and a number of playgrounds including a large area in the centre of the school which was covered in soft bitumen.

The entire site was bound by a 2.5 m high fence with secure gates. No underground storage tanks (USTs) or above ground storage tanks (ASTs) were observed. No bulk storage of dangerous chemicals or other hazardous goods was observed.

Suspected asbestos containing material (ACM) fragments were observed in the following areas (refer to **Figure 2**):

- On the ground surface to the north of the school hall (northern portion of the site);
- On the ground surface at the slope west of the demountable buildings (northern portion of the site); and
- On the ground surface at the centre of the southern boundary of the site (southern portion of the site).

Inaccessible areas at the time of the borehole drilling and site inspection included:

- The sports courts at the northern portion of the site;
- The building footprints at all site buildings (including demountable buildings due to restricted access); and
- The majority of the surface of the southern portion of the site due to the soft bitumen that covered the ground surfaces at Parramatta Public School and hard bitumen at Arthur Phillip High School.

Based on the aerial photographs and land title information, the site appeared to have been used for agricultural purposes until c. 1918 – 1925. The site was used as a school and possibly other public uses until the present day. Other uses for the site included defence trenches during WWII.

The configuration of site buildings appeared to have changed throughout the years, the most significant being the removal of a large building at the northern portion of the site (similar location to the present day car park) and simultaneous earthworks to construct the slope on the western periphery of the school sports ground. This indicated the potential for the demolition of buildings of potentially hazardous building materials and the subsequent disposal / burial on-site.

The southern portion of the site did not appear to undergo any significant earthworks, however a number of buildings were removed and constructed prior to 1985. Construction materials used prior to 1985 are a higher risk of containing asbestos and/or lead paint.

Based on the review of historical information and observations from the site inspection, the potential areas of environmental concern (AECs) identified at the site were:

- Former agricultural uses of the site;
- Potential for hazardous materials in footprints of former site structures;
- Known asbestos in building materials used to construct current site structures;
- Suspected ACM fragments on the ground surface at a number of locations at the site (refer to **Figure 2**); and
- Fill material of unknown origin at the site.

The following contaminants were therefore deemed to be of potential concern in the soils at this site:

- Heavy metals;
- Organochloride and Organophosphate Pesticides (OCP/OPPs);
- Total petroleum hydrocarbons (TPH);
- Benzene, toluene, ethyl-benzene and xylenes (BTEX);
- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated Biphenyls (PCBs); and
- Asbestos.

AG contracted Eurofins MGT at Lane Cove, NSW as the primary laboratory for the required analyses and Eurofins MGT – Melbourne as the secondary laboratory. The laboratories were NATA accredited for the selected analyses. The completed analysis schedule is summarised below:

AEC	Number of Samples Locations and Sample ID	Analysis Schedule (excluding QA/QC)
Previous agricultural uses of the site	10 sample locations	OCP/OPP – 10 samples Heavy Metals – 10 samples
Potential for hazardous building materials in former building footprints and potential for fill material of unknown origin at the site	53 sample locations	Heavy Metals – 55 samples PCB – 10 samples TPH/BTEX – 10 samples PAH – 10 samples Asbestos – 31 samples

A total of 37 mechanically advanced boreholes, 16 manually advanced boreholes and two (2) surface samples were excavated for soil investigation purposes. The total number of sample points was 55 in accordance with NSW EPA Sample Design Guidelines.

Fill material at the northern portion of the site generally ranged from depths of 0.3 to 1.0 m and was observed to comprise gravelly silty clay and gravelly sandy clay, brown to grey, dry to damp with foreign materials such as

brick, concrete and tile. ACM was observed at two locations on the surface (sample locations BH7 and HA9). No other indicators of contamination were observed in site soils, including hydrocarbon odours and staining.

Fill material at the southern portion of the site generally ranged from depths of 0.4 to 0.7 m and was observed to comprise gravelly clay and gravelly silty clay, brown to grey, dry to damp with foreign materials such as igneous gravels and bitumen. ACM was observed at one location on the surface (sample location HA16). No other indicators of contamination were observed in site soils, including hydrocarbon odours and staining.

All COPCs were reported below the human health and ecological based assessment criteria for residential land use with the exception of asbestos at soil sample locations:

- BH4-0.0-0.1 (non-friable ACM (and friable asbestos below the adopted criteria));
- HA9-0.0-0.2 (friable asbestos in soils); and
- HA16-0.0-0.2 (friable asbestos in soils).

The asbestos in these locations were deemed to be a risk to human health and will require remediation. A Remediation Action Plan (RAP) and Asbestos Management Plan (AMP) are required to be prepared to ensure that the asbestos is adequately removed or managed. Further assessment may be required prior to reusing asbestos impacted material on-site.

There were no potential chemical mixtures identified during the investigation that may pose a contamination issue at the site.

The ACM observed at locations BH7, HA9 and HA16 were removed to the laboratory during this site assessment. It is anticipated that all asbestos will be appropriately managed or removed during site remediation earthworks in accordance with a pre-approved RAP and AMP.

Based upon physical observations and chemical assessment of soil samples obtained from locations across the site, broad scale or gross contamination associated with the fill material was not apparent such that conditions may represent a potential migration risk.

Based on the findings, the site was considered able to be made suitable for use as a high rise school with open space areas with the following recommendations:

- Prior to any development works or earthworks, a Remediation Action Plan (RAP) should be prepared to evaluate appropriate remediation and/or management actions and to select a preferred strategy for the site, as well as to document relevant regulatory approvals and appropriate site controls and validation requirements for any remedial actions;
- There is the potential for beneficial reuse of asbestos impacted soils on-site pending further assessment;
- Due to the presence of asbestos at the site, an Asbestos Management Plan (AMP) should be prepared to ensure asbestos is appropriately managed during redevelopment works; and
- Following remediation, a final validation report should be prepared to demonstrate the adequate remediation of asbestos and any unexpected finds (if found) and to provide a statement on the suitability of the site for the proposed use.

4.0 SUMMARY OF KNOWN CONTAMINATION AND ADDITIONAL WORKS

4.1 Non-friable ACM Fragments

Several fragments of non-friable ACM were observed at soil sample locations BH7, HA9 and HA16, refer to **Figures 2 & 3**. The fragments were observed on the surface and were removed to the laboratory during the AG (2015a) site assessment. It is anticipated that soils below the ground surface could potentially contain further ACM fragments. Further assessment in these areas are recommended to further assess asbestos impacts at the site (refer to **Section 4.3**).

4.2 AF/FA Impacted Soils

Soil laboratory results indicated three sample locations with AF/FA impacted soils:

- BH4-0.0-0.1;
- HA9-0.0-0.2; and
- HA16-0.0-0.2.

These locations are shown in **Figure 3**. The volume of impacted material is currently unknown and further characterisation works are required to delineate the asbestos impacts at the site, refer to **Section 4.3.1** below.

4.3 Additional Characterisation Works

4.3.1 Asbestos Quantification in Areas of Identified Asbestos

Prior to remedial works, asbestos quantification test pits are required to be excavated on an approximate 10 m grid in the areas of identified asbestos. Based on AG (2015a) these areas are shown on **Figure 4** and are defined as:

- **Area 1** – Fifteen (15) test pit locations in the northern portion of the site, at the slopes to the south and west of the grassed sports grounds (location of boreholes / samples BH4 and BH7) – approximately 1500 m^2;
- **Area 2** – Eight (8) test pit locations in the northern portion of the site, at the area to the north of the school hall (sample location HA9) – 800 m^2; and
- **Area 3** – Five (5) test pit locations in the southern portion of the site, at the area between the demountable buildings and Little Street (sample location HA16) – 500 m^2.

The following methodology will be adopted:

- ACM will be quantified by the methods advised in NEPC (2013). At each sample location, the test pit shall be advanced through the fill soil profile, exposing the underlying natural soils and a 10 litre sample (per fill stratum, per metre, per location) of soil will be collected and placed on texture contrasting plastic, spread out and inspected using a 7 mm teethed rake. All identifiable ACM will be recovered and bagged.
- To assess for potential ACM and asbestos fines / fibres, one soil sample from each raked 10 L sample is required to be collected and submitted for asbestos analysis (500 mL). Collected soil samples will be immediately transferred to polyethylene zip-locked bags and shipped to the testing laboratory. A chain of custody form will be completed and forwarded with the samples.
- ACM collected from each 10 L samples shall be weighed using a scale with an accuracy of 1 g with the mass of asbestos for each sample location recorded.

Following calculation of the percentage soil asbestos (NEPC 2013) and receipt of the laboratory results for the asbestos analysis, the results shall be compared with the assessment criteria presented in NEPC (2013).

Material identified as meeting the assessment criteria will not require ongoing management with respect to health risks from asbestos. Where the asbestos quantification (AQ) assessment identifies further material with AF/FA impacts above the assessment criteria, the material will require ongoing management or off-site disposal to minimise the identified risk to human health. The proposed remedial strategy and validation program are discussed in **Section 7 and 9** respectively.

4.3.2 Inspection of Inaccessible Areas

In addition, currently inaccessible areas of the site include:

- The sports courts at the northern portion of the site;
- The building footprints of all site buildings (including demountable buildings due to restricted access); and
- The majority of the surface of the southern portion of the site due to the soft bitumen that covered the ground surfaces at Parramatta Public School and hard bitumen at Arthur Phillip High School.

Following removal of these structures / site features, the following is recommended:

- An inspection for visible signs of contamination such as ACM, hydrocarbon odours or staining, underground storage tanks (USTs) or any other sources of contamination;
- Collection of soil samples in areas of identified contamination; and
- Based on site observations and soil analytical results (particularly in the areas of former building footprints), complete asbestos quantification test pits in accordance with the methodology outlined in **Section 4.3.1**.

5.0 REMEDIATION OPTIONS

5.1 Remediation Objectives

The remediation objectives are outlined as follows:

- Remove unacceptable risks to human health;
- Validate the remedial works in accordance with the relevant NSW EPA guidelines and with reference to the site specific criteria; and
- Document the validation process.

The RAP has been prepared with reference to the following guidelines and legislation:

- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land* (DUAP 1998);
- *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, published by Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council (NHMRC), January 1992 (ANZECC/NHMRC 1992);
- *Contaminated Sites: Sampling Design Guidelines*, September 1995 (EPA 1995);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, August 2011 (OEH 2011);
- *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*, April 2006 (DEC 2006);
- *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013*, National Environment Protection Council (NEPC 2013);
- *Code of Practice for the Safe Removal of Asbestos, 2nd Edition*, National Occupational Health and Safety Commission, April 2005 (NOHSC 2005);
- *Work Health and Safety Act 2011*;
- *How to Safely Remove Asbestos: Code of Practice*, WorkCover (WorkCover 2012);
- *Management of asbestos in the non-occupational environment*, enHealth Council, 2005 (enHealth 2005);
- *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia*, (WA DOH 2009).

5.2 Extent of Remediation

Based on the findings of the previous investigations and subject to the limitations of these investigations, the anticipated extent of the proposed remediation is currently unknown. It is recommended that asbestos quantification test pits are excavated in the areas of identified asbestos to further delineate remediation extents, refer to **Section 4.3.1**.

Based on current data and using a conservative approach, the extents of remediation are identified in **Figure 5** and are summarised below:

- Area of approximately 250 m^2 centred on location BH4 to a depth of approximately 0.5 m bgs;
- Area of approximately 280 m^2 centred on location HA9 to a depth of approximately 0.4 m bgs; and
- Area of approximately 100 m^2 centred on location HA16 to a depth of approximately 0.4 m bgs (however, the total depth of fill material was unknown due to refusal reached at 0.4 m bgs).

Following additional characterisation works recommended in **Section 4.3.1**, the areas of asbestos impact will be delineated. Possible remedial options are discussed below.

5.3 Remedial Options Assessment

The *Contaminated Sites Guidelines for the NSW Auditor Scheme* (DEC 2006) states the policy of the then Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) on the remediation of contaminated sites is published in the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC & NHMRC 1992) and is followed in NSW. This means that soil remediation and management is implemented in the following preferred order:

- On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
- Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
- Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill; and
- Consolidation and isolation of the soil by containment within a properly designed barrier.

Consideration of each of these options is presented in **Table 5.1**.

Table 5.1 Remedial Options Screening Matrix

Option	Discussion	Suitability
Option 1 On-site treatment of the soil so the contaminants are either destroyed or the associated hazard is reduced to an acceptable level.	AF/FA Impacted Soil This option is not suitable for AF / FA impacted soil given there is no available technology to economically remove or destroy AF / FA in soil.	Not a suitable option.
	Bonded ACM and Bonded ACM impacted soils Hand picking of ACM within fill material is labour intensive and can be costly and time consuming. The success of the remediation method is highly dependent upon the soil type and the amount of other building rubble present, and also on the adopted validation criteria. The more clayey the soil, or the more building rubble present, the more difficult it is to identify and remove all ACM. For soils being retained onsite, validation is easier to achieve as the criteria allows for some ACM to remain in the soils. This is the preferred option for retaining soils containing non-friable ACM. Should the material be particularly high in ACM content, or prove difficult to achieve validation, consideration should be given to off-site disposal (**Option 3**).	The preferred option
Option 2 Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.	AF/FA Impacted Soil Treatment of AF/FA impacted soil is not possible / practical as discussed above and off-site treatment centres are currently not available.	Not a suitable option.
	Bonded ACM and Bonded ACM impacted soils As per **Option 1**, however there are reductions in noise and dust emissions on site in comparison to on-site treatment (**Option 1**), but these are offset by increased truck movements and the potential of exposure to emissions over	Not the preferred option

Option	Discussion	Suitability
	a wider area. Typically, the cost associated with returning the treated materials to site often result in them being disposed to landfill.	
Option 3 Excavation and off-site removal of the contaminated material.	AF/FA Impacted Soil There are currently suitably licensed waste facilities in the region capable of accepting AF/FA impacted soils. Given the unknown amount of AF/FA contaminated soils identified, this option could be feasible and is likely the fastest method of remediating the asbestos fibre contaminated material. Based on the results of the additional works outlined in **Section 4.3.1**, this option might not be the most cost effective.	A feasible option depending on the results of the asbestos quantification testing.
	Bonded ACM and Bonded ACM impacted soils There are currently suitably licensed waste facilities in the region capable of accepting ACM contaminated soils. Offsite disposal of ACM contaminated material is likely the fastest method of remediating the site fit for the proposed school land use. This option generates the highest quantity of waste, since the materials are disposed to landfill rather than treated and reused (i.e. **Options 1 & 2**) or retained on-site (**Option 4**). This option also generates additional truck movements and associated fuel/emissions over **Option 1** and **Option 4**, but less than **Option 2**, since materials are not returned to site. Given the likely success of remediation via hand picking, and the application of risk-based validation criteria, offsite disposal is not the preferred remedial option. However, should validation prove difficult to achieve because of the nature of fill or the ACM contamination, this option may be reconsidered.	A feasible option dependant on the success of remediation via **Option 1**.
Option 4 Consolidation and isolation of the soil by on-site containment within a properly designed barrier and ongoing management.	AF/FA Impacted Soil, Bonded ACM and Bonded ACM impacted soils There is the potential for on-site containment in the proposed areas of open space. This option will require long term site management and notification on title and planning certificates which could devalue the land and post restrictions on future land use.	A suitable option depending on the volume of material unsuitable to remain on-site.

5.4 Preferred Remediation Strategy

A number of potential remedial options have been outlined in **Table 5.1**. The preferred remedial strategy is:

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

Once all validation sampling is complete and all excavations reinstated, the site will be suitable for the proposed school and open space use.

6.0 REMEDIAL PLAN

The remedial scope of works is provided in the following sections

6.1 Further Assessment of Asbestos Impacted Soil

Following removal of site buildings, further assessment of soils at the site should be completed in accordance with the methodology outlined in **Section 4.3.1**. After the assessment, material identified as meeting the assessment criteria will not require ongoing management with respect to health risks from asbestos. Where the asbestos quantification (AQ) assessment identifies further material with AF/FA impacts above the assessment criteria, the material will require remediation as per the preferred options in **Section 5.4** to minimise the identified risk to human health.

6.2 Building Demolition and Hazardous Material Clearance

Following removal of site buildings, further assessment of soils at the site should be completed in accordance with the methodology outlined in **Section 5.3.2**, summarise below:

- An inspection for visible signs of contamination such as ACM, hydrocarbon odours or staining, underground storage tanks (USTs) or any other sources of contamination;
- Collection of soil samples in areas of identified contamination; and
- Based on site observations and soil analytical results (particularly in the areas of former building footprints), complete asbestos quantification test pits in accordance with the methodology outlined in **Section 4.3.1**.

After the assessment, material identified as meeting the assessment criteria will not require ongoing management with respect to health risks from asbestos. Where the asbestos quantification (AQ) assessment identifies further material with AF/FA impacts above the assessment criteria, the material will require ongoing management to minimise the identified risk to human health.

6.3 Approvals, Licenses and Notifications

SEPP 55 requires Council to be notified 30 days before Category 2 remediation works commence.

Excavation and removal of asbestos fibre contaminated soils are required to be conducted by a Class A licensed contractor. Excavation, remediation, and off-site disposal of bonded ACM contaminated soils are required to be conducted by a contractor holding at least a Class B license.

Before starting the works, the appointed contractor is required to obtain a site-specific permit approving the asbestos works from NSW WorkCover. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

6.4 Site Establishment

All safety and environmental controls are to be implemented as the first stage of remediation works. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess the need for traffic controls;
- Work area security fencing;

- Site signage and contact numbers;
- Stabilised site entry gate;
- Sediment fencing (attached to security fencing); and
- Stormwater runoff sediment controls.

All environmental controls including the details of asbestos management are specified **Section 9**.

6.5 Remedial Works

The remediation and validation works will be supervised by an appropriately qualified and experienced environmental consultant and undertaken by an appropriately licensed asbestos removal contractor.

6.5.1 Airborne Fibre Monitoring

During the remedial works, perimeter airborne fibre monitoring will be conducted on each of the site boundaries. Air monitoring will be conducted in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) *Asbestos Code of Practice and Guidance Notes*, in particular the *Guidance Note for the Estimation of Airborne Asbestos Dust* [NOHSC 3002:2005] as detailed in **Section 9.5.1**.

6.5.2 AF/FA Impacted Soils

Due to the preliminary stage of the project, the remedial works associated with **Option 3** in **Table 5.1** could be undertaken on AF/FA impacted soils identified in **Section 5.2** and **Figure 5** (and any other areas identified during asbestos quantification works outlined in **Section 4.3**):

- Excavation of the contaminated material to the extent of the grid 10 m x 10 m (unless hotspot(s) are delineated further);
- Disposal of the material to an appropriately licensed waste facility;
- Excavated contaminated materials may be loaded directly onto trucks and disposed at a licensed waste facility in accordance with requirements detailed in **Section 8.8.2 and 9**; or
- Prior to off-site disposal, excavated material may be stockpiled and managed in accordance with **Section 9**;
- Excavation(s) are to be validated as per **Section 8.3**. Should validation fail, the failed wall/s or base of the excavation will be excavated a further 0.5 m in the direction of the failure and the process repeated until validation is achieved; and
- Following validation of the excavation as outlined in **Section 8.3**, the excavations generated by the removal of impacted soil will be backfilled using natural soils (unless further excavation is required for construction of proposed buildings).

6.5.3 Bonded ACM and Bonded ACM Impacted Soils

The following remediation shall be undertaken following removal of AF / FA impacted materials:

- Excavation of the contaminated material and stockpiling prior to spreading within the pad sorting area and managed in accordance to **Section 9**;
- Collection of ACM fragments by raking and hand picking of the spread material;
- Offsite disposal of the collected ACM fragments to an appropriately licensed waste facility;

- Pads will be validated as per **Section 8.2**. Should validation fail, the pad will be subjected to an additional rake, walk/pick and re-validated until such time as validation is achieved;
- Excavations are to be validated as per **Section 8.2**. Should validation fail, the failed wall/s or base of the excavation will be excavated a further 0.5 m in the direction of the failure and the validation process repeated until validation is achieved; and
- Reinstatement of the validated pad materials into validated excavations and managed in accordance with **Section 9**.

6.6 Validation

Validation of the remedial works will be conducted to demonstrate the remediation objectives have been achieved. Details of the validation program are provided in **Section 8**.

6.7 Backfilling of Excavations and Imported Fill Materials

Upon confirmation of soil validation, excavations will be reinstated using validated material from the site or validated imported material where required. Materials proposed to be imported to the site will be assessed in accordance with **Section 8.5**.

6.8 Off-site Disposal of Material

All soils removed from the site shall be assessed in accordance with **Section 8.8.2**.

6.9 Site Dis-establishment

On completion of the remediation works, all plant/equipment and safety /environmental controls shall be removed from the site. Details are provided in **Section 9**.

7.0 CONTINGENCY PLAN

A review of remediation works has been undertaken to identify potential risks to meeting the specified site validation criteria. A number of potential risks have been identified. These are listed following contingencies that will be implemented to ensure that validation criteria are met.

Additionally, the associated remedial works, health and environmental risks/hazards and their minimisation/ mitigation are further discussed in **Section 9**.

7.1 Unexpected Finds Protocol

It is acknowledged that the previous investigation of the site has been undertaken to assess contaminants of potential concern. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- ACM in soils which have not been assessed/managed in accordance with NEPC (2013);
- Bottles / containers of chemicals (visible);
- Construction / demolition waste (visible);
- Ash and/or slag contaminated soils / fill materials (staining / discolouration visible); and
- Volatile organic compound contaminated soils (odourous).

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised below is to be followed:

- In the event of an 'unexpected find';
- Immediately cease work and contact site foreman;
- Site Foreman to construct temporary barricading to prevent worker access to the unexpected substance(s) and install appropriate controls;
- Site foreman to contact client and arrange inspection by environmental consultant;
- Environmental consultant to undertake detailed inspection and sampling & analysis in accordance with relevant EPA guidelines.
- Environmental consultant to assess field screening and/or analytical results against documented site assessment criteria;
    - If substance assessed as <u>not</u> presenting an unacceptable risk to human health;
    - Site foreman to remove safety barricades and environmental controls and continue work;
    - If substance assessed as presenting an unacceptable risk to human health;
    - Environmental consultant to supervise remediation and undertake validation / clearance as per the remediation/validation plan as discussed in **Section 8** of this RAP;
    - Site foreman to remove barricades and environmental controls and continue work
- Environmental consultant to submit assessment/validation to site foreman for distribution to client and appropriate regulatory authorities.

Should additional friable asbestos be identified during the earthworks and/or the validation process, the unexpected finds protocol should also be implemented.

7.2 Remedial Strategy Failure

In the event that the proposed remediation works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed (such as validation sampling repeatedly failing or closure of the landfill), the following actions will be considered to ensure firstly the safety and health of the people and the environment and secondly that the overall project objectives are achieved.

1. Continued controlled excavation until validation is achieved; and
2. Reassessment of remedial and validation options for asbestos contaminated soils.

7.3 Complaints

Due to the nature of the activities and type of contaminants identified at the site there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Noise and vibration arising from excavation; and
- Dust emissions arising from excavation, material handling and placement.

Monitoring of all environmental emissions shall be undertaken during the works as detailed in **Section 9** and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions:

- Disturbance of soils during meteorologically favourable periods only; and/or
- Covering or wetting down soils which are generating dust.

7.4 Severe Weather

Weather will be monitored on a daily basis via checking an internet based weather service provider. Should severe weather be forecast, works will stop until safe to re-commence. All site management controls will be implemented to the extent practicable as outlined in **Section 9** prior to any sever weather events.

8.0 VALIDATION PLAN

8.1 Overview

From review of the proposed remediation methods for the site, validation activities will be required for:

- Excavations formed by the removal of AF/FA contaminated areas;
- Excavations formed by the removal of Bonded asbestos contaminated areas;
- Waste materials requiring off-site disposal;
- Stockpiled material resulting from the hand-picking of bonded ACM impacted soils;
- Residual soils underneath stockpiles where contaminated material has been stored; and
- Any fill materials imported to the site.

8.2 Validation Inspection, Sampling and Analyses

Validation sampling is required to be undertaken to demonstrate that the site has been remediated to a standard suitable for the proposed school and open space land use.

All soil samples collected to be analysed for asbestos will be 500 mL in size, in accordance with WA DOH (2009) Guidelines. Samples will be analysed in accordance with Australian Standard *'Method for the Qualitative Identification in Bulk Samples'* (AS4964-2004) by NATA accredited laboratories.

All soil samples collected for waste classification purposes will be analysed for TPH/BTEX, PAHs, heavy metals, asbestos and TCLP (metals/PAHs) where required. Samples will be analysed in accordance with the analytical schedule in **Table 8.1**.

If required, soils may be imported onto the site to fill validated excavations and to make up volumes of any excavated material that must be disposed off-site. Imported fill will be accompanied by a letter of virgin excavated natural material (VENM) or excavated natural material (ENM) certification and will be sampled and compared against selected validation criteria, as per **Table 8.1**.

A suitably qualified person, trained and experienced in the identification of asbestos, will be required to undertake the validation inspections and sampling. Soil samples will be immediately transferred to sample containers of appropriate composition, which are supplied by the testing laboratory. All sample containers will be clearly labelled with a sample number, sample location, sample depth, sample date and samplers initials. The sample containers will then be transferred under chain of custody conditions to the testing laboratory. The samples will be analysed at a laboratory NATA accredited for the required analyses.

Table 8.1 Validation, Quantification and Analytical Schedule

Item	Sampling Frequency			Analytes
	Excavation base	Excavation walls	Materials	
Excavation formed by the removal of asbestos impacted soil (bonded ACM and AF/FA)	1 / 100 m^2 (10 m grid)	1 / 10 m (from each distinct horizon / 1 m vertical soil profile)	N/A	Asbestos (500 mL)
	Where bonded ACM is encountered, 10 L sample (per fill stratum, per metre, per location) of soil is to be collected and placed on texture contrast plastic, spread out and inspected with samples collected in accordance with process outlined in **Section 4.3.1**.			Collection of ACM fragments for quantification
Remediated (bonded asbestos) soils	N/A	N/A	1/20 m^3	Asbestos (500 mL)
	10 litre sample (per 100 m3) of soil to be collected and placed on texture contrast plastic, spread out and inspected with samples collected in accordance with process outlined in **Section 4.3.1**.			Collection of ACM fragments for quantification
Footprints of former asbestos impacted stockpiles	1 / 100 m^2 (10 m grid)	N/A	N/A	Asbestos (500 mL) No visible ACM
Waste classification of material requiring off-site disposal	1 / 100 m^3			Heavy metals TPH/BTEX OCP/PCB PAH Asbestos
Imported soil (ENM)	N/A	N/A	As per EPA 2014	Heavy metals TPH/BTEX OCP/PCB PAH Asbestos pH EC RTA 276 (foreign materials)
Imported soil (VENM)	N/A	N/A	Minimum 3 samples per 500 T	Heavy metals TPH/BTEX OCP/PCB PAH Asbestos
Final site surface	N/A	N/A	The final site surface will be raked and inspected on a 10 m x 10 m grid to ensure the top 10 cm are free of visible asbestos.	Validation Inspection

8.3 AF/FA Impacted Material

The validation program for excavations to remove asbestos fibre contaminated fill is:

- Inspection of the excavation base and walls (where excavations are no deeper than 1 m bgs) by a suitably trained and experienced person. If additional asbestos fibres or bundles are identified, the excavation will be extended and the affected excavation surface re-inspected until such time as visual validation is obtained.

- Following visual validation, soil samples will be collected as per **Table 8.1**. Soil samples will be collected using an excavator bucket where the excavation is greater than 1 m deep.
- If asbestos fibres are identified in any validation sample (laboratory), the excavation will be extended 0.5 m laterally in the direction relating to the failed sample, and the validation inspection and sampling process repeated until asbestos fibres are not identified by the laboratory, the excavation will be deemed to have been successfully remediated and validated.

8.4 Bonded ACM Impacted Fill Material

The validation program for bonded ACM contaminated fill excavations is:

- AG samples will be collected as per **Table 8.1**;
- The AQ samples will comprise a volume of fill material no less than 10 litres. The sampled material shall be spread on plastic and raked. All ACM within the AQ sample shall be recovered, bagged and weighed. The volume of the fill material within the AQ sample shall be calculated based on the volume of the sampled area within the excavation wall. The mass of fill will be calculated using a conservative soil density of 1.63 g/cm^3 (from US EPA 2003);
- The mass of recovered ACM and the mass of fill material within the sample will be used to calculate the concentration of ACM within the AQ sample which is representative of that wall or base;
- A soil sample will be analysed for laboratory analysis from within the AQ sample to confirm that no asbestos fibres are present. The sample will be analysed in accordance with the validation program summarised in Table 8.1;
- If the concentration of ACM within an AQ sample is calculated to be above the adopted criterion, or if asbestos fibres are identified in the soil sample, the excavation will be extended in the direction of the failed wall or base, and the validation process repeated;
- Alternatively, where concentration of ACM is calculated below the adopted criterion for all walls and the base, and asbestos fibres are not identified by the laboratory, the excavation will be deemed to have been successfully validated.

8.5 Validation of Remediated ACM Impacted Material

The validation program to remove ACM is summarised below:

- The stockpiled soils containing ACM fragments is to spread out into 10 m x 10 m x 0.1 m deep pads in a designated picking area at the site;
- In accordance with the methods advised in WA DoH (2009) and NEPC (2013), the pads are to be walked over and ACM removed by a licensed bonded asbestos removalist;
- The pads are then to be visually inspected by a suitably qualified environmental scientist and any ACM fragments identified collected and weighed for quantification;
- The pads are then to be stockpiled and surveyed for volume calculation;
- A soil sample (500 mL) is to be collected for laboratory analysis for asbestos by a NATA accredited laboratory; and
- The pads are then to be stockpiled temporarily until laboratory analytical data is reported confirming the presence of asbestos in soils in comparison to the adopted site assessment criteria;
- Once the results are obtained, each pad will either be validated as suitable for reuse on-site, or otherwise deemed to have failed validation and will require further remedial works or off-site disposal.

8.6 Footprint of Contaminated Stockpiles

If required, the validation program for the footprint of fibre impacted stockpiles is:

- Inspection of the stockpile footprint by a suitably trained and experienced person. If bonded ACM fragments are identified, surface soils are required to be removed and the footprint re-inspected until visual validation is obtained;
- Following a visual validation, soil samples will be collected from the footprint on a 10 m grid, and analysed in accordance with **Table 8.1**.;
- If asbestos is identified in a validation samples, the soil represented by the failed validation sample will be scraped and disposed off-site, and the validation inspection and sampling process repeated for the failed area. Alternatively, where asbestos is not identified by the laboratory, the footprint will be deemed to have been successfully validated.

8.7 Imported Materials

Fill materials imported on to the site are required to be VENM, ENM or any other suitable granted an applicable EPA Exemption under the *Protection of the Environment Operations (Waste) Regulation 2005*. Imported material will require validation prior to being imported to site. Validation will be undertaken in accordance with **Table 8.1** and include a minimum of 3 samples per 500 T per source site.

8.8 Soil Validation Criteria

8.8.1 Site Validation Criteria

Based on the proposed land use and in accordance with the decision process fir assessment of urban redevelopment sites (DEC 2006), concentrations in the soil will be compared against published levels as presented in **Table 8.2**, sourced from *Health based investigation levels (HILs) for Residential with accessible soils land use* – NEPC 2013, HIL-A.

Table 8.2 Health Based Soil Investigation Criteria

	Limit of reporting	Laboratory Method	HIL – A
ASBESTOS			
All visible asbestos	-	-	No visible asbestos on the site surface (includes identification by sample analysis by a NATA accredited laboratory)
AF/FA	0.1 g/kg	PLM / Dispersion Staining	0.001 %
Bonded ACM	0.1 g/kg	PLM / Dispersion Staining	0.01 %
Asbestos Fibres	0.1 g/kg	PLM / Dispersion Staining	No respirable asbestos fibres capable of being detected via sample analysis by a NATA accredited laboratory.

8.8.2 Offsite Disposal Criteria

Contaminated soils requiring off-site disposal shall be assessed in accordance with DECCW (2009) *Waste Classification Guidelines Part 1: Classifying Waste*.

8.8.3 Imported Soil Criteria

In accordance with current EPA policy, only material that does not represent an environmental or health risk at the receiving site may be considered for resource recovery. In accordance with this, only VENM as defined in

the POEO Act (1997) Schedule 1 or any other suitable material granted an applicable EPA Exemption under the POEO (Waste) Regulation (2005) may be imported to reinstate the excavations.

8.9 Quality Assurance / Quality Control

Soil analytical data will be assessed against NSW EPA endorsed criteria as identified in **Section 9.6.1**. Statistical analysis of the data will be undertaken, if required, in accordance with relevant guidance documents. The following statistical criteria shall be adopted:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) must be below the adopted criterion;
- No single analyte shall exceed 250% of the adopted criterion; and
- The standard deviation of the results must be below 50 % of the criterion.

Data generated during the project must be appropriate to allow decisions to be made with confidence. The acceptable limit on decision error is 95 % compliance with DQIs. Pre-determined DQIs are precision, accuracy, representativeness, comparability, completeness and sensitivity.

8.10 Validation Reporting

At the completion of the remedial works, a Validation Report will be prepared in general accordance with the *NSW EPA Guidelines for Consultants Reporting on Contaminated Sites* (OEH 2011), documenting the works as completed. This report will contain information including:

- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined data quality objectives (DQO) and the remediation acceptance (validation) criteria;
- Information demonstrating compliance with appropriate regulations and guidelines;
- Any variations to the strategy undertaken during the implementation of the remedial works;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents; and
- Other information as appropriate, including requirements (if any) for ongoing monitoring / management.

The report will serve to document the remediation works for future reference.

9.0 ASBESTOS MANAGEMENT PLAN

9.1 Application of AMP

This AMP will apply from the commencement of intrusive works (including any bulk earthworks, test pitting, trench excavation works, including minor hand excavations, drilling, bore holing and landscaping) as a part of the proposed site works and shall be in effect until the site is re-sealed (i.e. with hardstand or soil capping layer, where appropriate).

The responsibilities for site management with regards to any soils present at the site apply only to the proposed site works and associated intrusive works and do not apply for normal site operations following the completion of the proposed site works.

9.2 AMP Responsibilities During Proposed Works

9.2.1 Appointment of Principal Contractor

In accordance with the provisions of the Work Health and Safety Regulation 2011, a principal contractor shall be appointed for the proposed construction works.

9.2.2 Responsibilities of the Principal Contractor

Responsibilities of the Principal Contractor include, but are not limited to the following. The Principal Contractor must:

- Be responsible for the proposed project work at all times until the work is completed;
- Ensure that all persons involved with proposed project work have undertaken occupational health and safety training;
- Keep records of induction training for site workers and any site specific training;
- Ensure that any subcontractors provide safe work method statements for the activities for which they are engaged;
- Monitor any subcontractors to ensure that they are complying with the safe work method statements; and
- Maintain a hazardous substances register for all hazardous substances used or present on the site.

The Principal Contractor is responsible for co-ordinating health and safety activities for the project. Other responsibilities of the Principal Contractor include:

- Compliance with work health and safety and environmental legislation, regulations, standards, codes and the site-specific rules relating to safety contained in this AMP;
- Ensuring that sufficient funds are available to procure the necessary health and safety equipment such as personal protective equipment (PPE);
- Managing accident and emergency procedures; and
- Managing workplace injury management and rehabilitation.

The Principal Contractor has the authority to provide for the auditing of compliance with the provisions of this AMP, suspension or modification of work practices and administration of disciplinary actions for individuals whose conduct does not meet the requirements set forth herein.

9.2.3 Asbestos Consultant or Competent Person

An Asbestos Consultant or Competent Person (as defined in SWA 2011a) shall be engaged to supervise the excavation works at the site and assess any suspected asbestos containing materials when encountered. The asbestos consultant or competent person shall also complete airborne asbestos monitoring if required.

The asbestos consultant shall:

- Provide on-site advice, if required, in relation to suspected asbestos containing materials and the management of asbestos issues associated with the works; and
- Be available, if required, for consultation with regards to the conditions and requirements of this AMP, including revisions should further assessment at the site be completed.

Should previously unidentified asbestos be encountered during the planned excavation works, additional clearance inspections and clearance asbestos air monitoring may be required to confirm the suitability of the site for re-occupation.

9.3 Health and Safety Management

9.3.1 Safe Work Method Statement

Safe work method statements must be prepared by the Principal Contractor or by sub-contractors completing significant intrusive works and also covering other aspects of the proposed project works not related to significant intrusive works, prior to those activities commencing.

The Safe Work Method Statements must:

- Describe how work is to be carried out;
- Identify the safety risks;
- Describe the control measures that must be applied to the work;
- Describe the equipment used in the work;
- Describe any standards or codes applicable to the work; and
- Training and qualifications required of persons undertaking the work.

Safe work method statements for all workers must be reviewed and approved by the Principal Contractor.

9.3.2 Site Access Control

The Principal Contractor shall ensure that the area in which works are taking place is designated a construction area and that the construction area is securely fenced and that access is controlled. Entrance to the site will be via a dedicated entry point which will contain the following features in addition to site security measures as required for a construction site as per relevant health and safety provisions:

- Readily identifiable and delineated site access / egress point. Where possible this location shall be visibly identifiable by site fencing / barricading;
- Signage including “No Entry Without Required PPE” and a contact number for members of the public to direct any queries / complaints; and
- Emergency contact details.

The overall construction site boundary will be secured by fencing. Access to the construction site will be controlled and permitted by the person in charge of the site only after persons entering the site have been inducted into the requirements of this AMP.

Any authorised person accessing the site should do so in accordance with health and safety requirements as indicated in this AMP. The implementation of the health, safety and environmental requirements should be administered by the Principal Contractor.

Site access will not be allowed until the site personnel have been inducted, have signed in, and have donned the required PPE (**Section 9.3.5**).

9.3.3 Training and Certification

The Principal Contractor must not allow any person to carry out project works unless he/she are satisfied that the person has undergone WHS induction training.

The WHS induction training required by the Regulation is as follows:

- General occupational health and safety training for construction work;
- Work activity based health and safety training (job specific training); and
- Site-specific health and safety induction training.

For each person carrying out project works, for a period of three years, the Principal Contractor must keep a record of the following:

- A copy of relevant statements of WHS induction training, or a statement indicating that the Principal Contractor is satisfied that the relevant WHS induction training has been undertaken; and
- A brief description of the site –specific training undertaken by the person.

9.3.4 Site Safety Induction

It is the responsibility of the Principal Contractor to ensure that all persons carrying out construction work on site are given site specific occupational health and safety training. The induction shall be undertaken by the Principal Contractor and the Asbestos Consultant. The induction shall be undertaken as per the standard presentation which will address the following topics as per the requirements of this AMP:

- Identification of any site specific hazards and risk control measures in relation to the presence of friable asbestos in soils;
- Regulatory requirements or codes of practice relevant to identified site specific hazards related to asbestos;
- Directions on what to do if suspected asbestos containing materials or asbestos impacted soils are encountered;
- Site orientation at least including location of site access / egress points; and
- Site specific safety rules in relation to asbestos.

The Principal Contractor is responsible for establishing site specific safety rules. The rules must be displayed in an easily observable location (nominally in the site office) so as to ensure that all site workers, including any sub-contractors, have ready access.

At the completion of the Induction Presentation, each 'inducted person' shall be required to acknowledge that they have understood the requirements for the site works and health, safety and environmental obligations by completion of a Site Induction Form.

9.3.5 Personal Protective Equipment (PPE) Requirements

In the absence of any asbestos containing materials or asbestos impacted soils being encountered, no additional PPE is required above the standard construction site PPE outlined by the Principal Contractor for the site.

If friable asbestos above sub-trace levels is encountered or airborne asbestos is identified via static airborne asbestos monitoring, as determined by the supervising asbestos consultant, the following additional items of PPE are required in addition to the standard construction site PPE outlined by the Principal Contractor for the site. Additional PPE applies for any ground workers within an asbestos work area as defined by the supervising asbestos consultant and includes:

- Disposable 'tyvek' coverall suits must be worn;
- Disposable gloves – non-disposable gloves must be cleaned within a decontamination unit in accordance with SWA (2011a);
- P2 class respirator or higher – non disposable respirators must be cleaned in a decontamination unit in accordance with SWA (2011a); and
- Laceless steel capped rubber soled work shoes or gumboots.

If asbestos above sub-trace levels is encountered, plant operators must close cabin doors and windows and set air conditioning to re-circulate when operating within the asbestos work area.

9.3.6 Management of Subcontractors

Contractors and sub-contractors working on-site will be required to adopt the provisions of this AMP and will be advised of potential safety and environmental issues on site during the site-specific induction training. This induction will include the occupational health and safety responsibilities, requirements and controls for all sub-contractors working on the site. All sub-contractor activities will be monitored by the Principal Contractor, the licensed asbestos removal contractor, if required, and the Asbestos Consultant to ensure compliance with the requirements of this AMP.

Contractors and subcontractors whose works will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information contained in this AMP.

They shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. All contractors and subcontractors are responsible for:

- Providing their own PPE as required by the Principal Contractor and the conditions set out in this AMP;
- Training their employees in accordance with applicable laws;
- Providing medical surveillance and obtaining medical approvals for their employees, as appropriate;
- Ensuring their employees are advised of and meet the minimum requirements of this AMP and any other additional measures required by their site activities; and
- Designating their own site safety officer.

Subcontractors must sign an acceptance form prior to commencing work on site. Subcontractors may only modify, and then only to improve, the conditions specified in this AMP with approval from the Principal Contractor, or their nominee.

9.4 Environmental Management

9.4.1 Significant Intrusive Works

In the event that significant intrusive works are to be carried out then the following management measures will apply:

Prior to any intrusive work commencing

- Review of the information available for the site;
- The Principal Contractor's must review the job specific risk assessment (JSRA) and safe work method statements (SWMS) of any subcontractors and ensure that site personnel and/or contractors who will undertake the works are inducted into the AMP;
- The asbestos consultant must complete regular inspections for the presence of visible asbestos;
- The works must be isolated from casual entry using temporary barriers and only personnel inducted in the requirements of the AMP will be permitted to enter the works area;
- Sufficient room must be provided within the works area to allow stockpiling of spoil from excavations, if required; and
- A water supply must be provided to the works area for the purpose of maintaining exposed fill or soil in the excavations and stockpiles in a moist state.

During intrusive work

- Personnel entering the works area must wear appropriate PPE in accordance with **Section 9.3.5**;
- Stockpiles of excavated spoil must be managed in accordance with **Section 9.4.2**; and
- Air monitoring requirements must be met as outlined in **Section 9.5.1**.

Should visible asbestos be identified by the asbestos consultant or airborne asbestos monitoring results identify airborne asbestos fibres in the vicinity of the works area, specific requirements for working with asbestos containing materials or asbestos impacted materials shall be enforced as outlined in this AMP.

9.4.2 Stockpile Management

Any stockpiles of excavated materials, including topsoil and grass cover, will be kept moist by periodically spraying with water to control dusts.

In the event that covers are required, they shall extend beyond the perimeter of the stockpiles and shall be secured to prevent being blown away by wind.

Stockpiles must be placed in a secure location on-site and covered if to remain for more than 24 hours.

9.4.3 Dust Management

Dust levels shall be managed by ensuring:

- Water sprays will be used on the excavation areas, stockpiles and haulage pathways;

- Any haulage vehicles shall be covered and leave via the designated (stabilised) site access;
- All access roads are sufficiently maintained to ensure no visible dust at the site boundary; and
- Dust suppressors will be fitted to equipment as required.

If dust is visible at the site boundary, then additional dust control measures shall be employed, which may include:

- Temporarily suspending activities until wind speeds reduce; and/or
- Additional use of water sprays.

9.4.4 Waste Management

There shall be no wastes brought onto the site for storage, treatment, processing, reprocessing or disposal unless permitted by a licence issued under the POEO Act.

All wastes will be classified, managed and disposed in accordance with the off-site disposal criteria.

All wastes disposed of off-site will be controlled as per the EPA's requirements for waste tracking and acceptance. These are as follows:

- Obtain a written consignment authorisation number from an EPA-licensed waste disposal or treatment facility before moving waste to the facility;
- Accurately completed a waste data form signed by the consignor before the waste is dispatched;
- The waste consignor, the waste transporter and the waste facility must each keep a copy of the waste data form for up to four years for auditing purposes;
- The waste consignor must give a completed copy of the waste data form to the transporter, who must check that it is completed and then sign it. The driver must carry the waste data form in the vehicle;
- The transporter must give a completed copy of the waste data form to the waste facility on arrival at the destination. The waste facility operator must check the load details on the form. The waste data form must be signed by a representative of the waste facility on receipt of the waste at the destination.
- The waste consignor must receive from the waste facility written confirmation of receipt of the waste within 21 days of dispatch. This must be kept for up to four years for auditing purposes.

9.5 Monitoring Program

To ensure that the control measures being implemented at the site are effective, the following monitoring procedures will be implemented during the construction of the proposed site works:

- Daily static airborne asbestos fibre monitoring at site boundaries during significant intrusive works;
- Daily dust monitoring at site boundaries to ensure dust levels are kept to a minimum; and
- Site inspections

9.5.1 Daily Static Airborne Asbestos Fibre Monitoring

During asbestos impacted soil removal works, airborne asbestos fibre monitoring will be undertaken by the Asbestos Consultant using calibrated portable air sampling pumps. Monitoring will be conducted at 4 locations

around the site boundaries each day over an approximate 4 – 6 hour period and targeting any neighbouring sensitive receptors and with consideration to the daily location of works.

At the end of each monitoring period the pump and attached filter will be collected and the filter analysed at a NATA-accredited laboratory in accordance with NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition (NOHSC:3003 [2005]).

The results of air monitoring will be available on a 24 hour turnaround time basis. Daily air monitoring reports shall be displayed in a common area outside of the asbestos work area (e.g. site office or lunch shed) or be able to be produced upon request.

The following action levels will be applied upon receipt of daily results, as outlined in SWA (2011a):

- Reading of less than 0.01 fibres/mL – control measures in place are working effectively, site works to continue;
- Reading between 0.01 and 0.02 fibres/mL – a review of control measures shall be completed in the work area; and
- Reading greater than 0.02 fibres/mL – works shall cease until the cause of contamination is identified and rectified.

It is noted that these action levels are more conservative than the exposure standard for airborne asbestos (0.1 fibres/mL (TWA)) as outlined in the Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC: 1003 (1995)] for an 8 hour shift.

10.0 CONCLUSION

Subject to the successful implementation of the measures detailed in this RAP and subject to the limitations in **Section 11**, it is considered that the site can be made suitable for the proposed residential land use with no requirement for an Environmental Management Plan and no notation on the Title.

11.0 STATEMENT OF LIMITATIONS

This report has been prepared for use by the client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from the client and other parties. The report has been prepared specifically for the client for the purposes of the commission, including the use by a Site Auditor acting as an agent of the client in this respect (if required). No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by Alliance Geotechnical Pty Ltd.

Limited sampling and laboratory analysis were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site or material investigated, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, AG reserves the right to review the report in the context of the additional information.

This report remains the property of Alliance Geotechnical subject to payment of all fees due for the assessment. The report shall not be reproduced except in full and with prior written permission by Alliance Geotechnical Pty Ltd.

Should you require additional information or clarification regarding any aspect of this report, please call the undersigned on (02) 9675 1777.

For and on behalf of,
Alliance Geotechnical Pty Ltd

Benjamin Regan
Senior Environmental Consultant
Alliance Geotechnical Pty Ltd

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FIGURES

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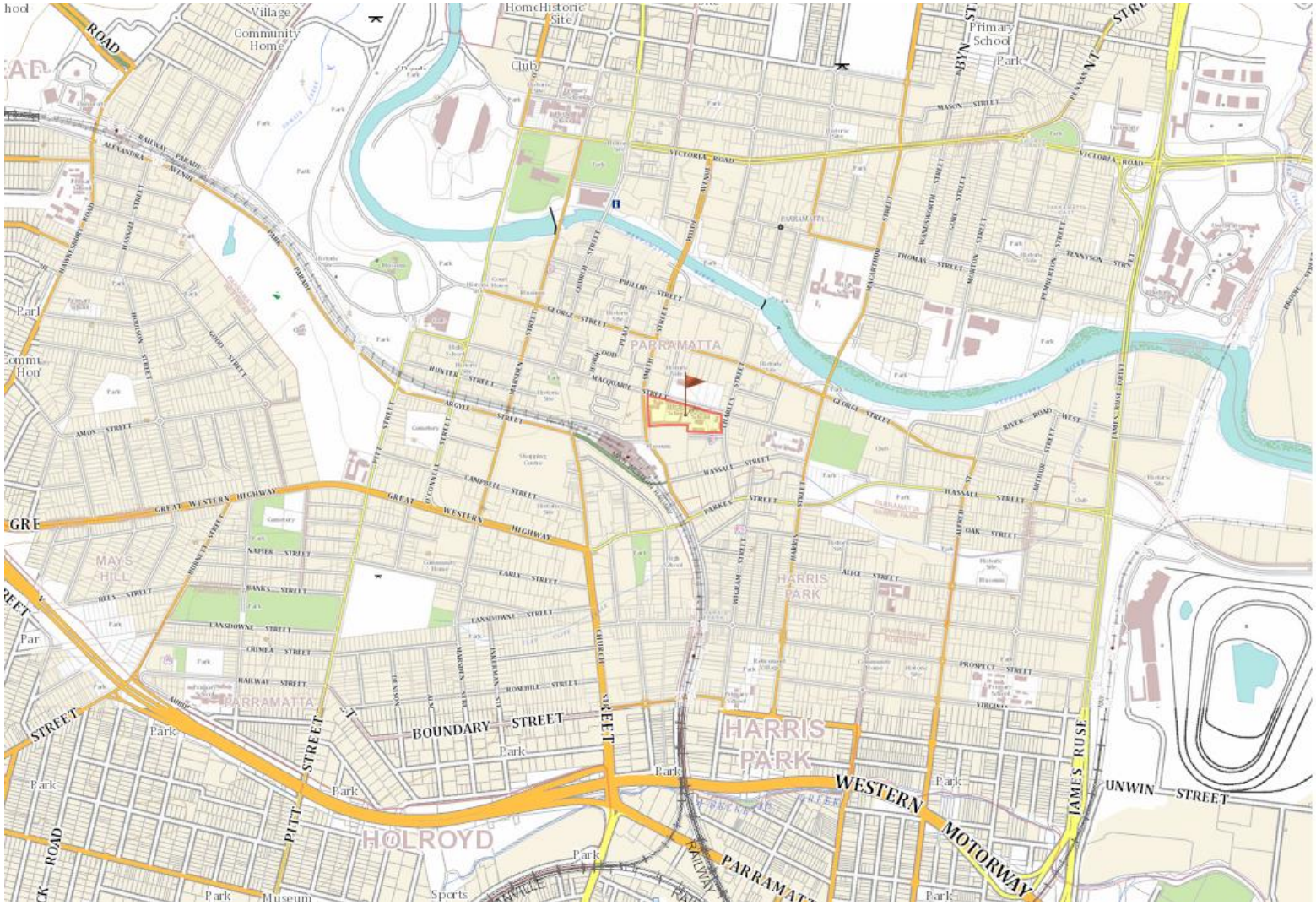
ENGINEERING | ENVIRONMENTAL | TESTING

Site Location - Drawing Number: 1915-ER-1-A

Not To Scale

N



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

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

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Site Features - Drawing Number: 1915-ER-1-B

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N

Source: SIX Maps

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Sample Locations – Drawing Number: 1915-ER-1-C

Not To Scale

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

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Sample Locations – Drawing Number: 1915-ER-1-D

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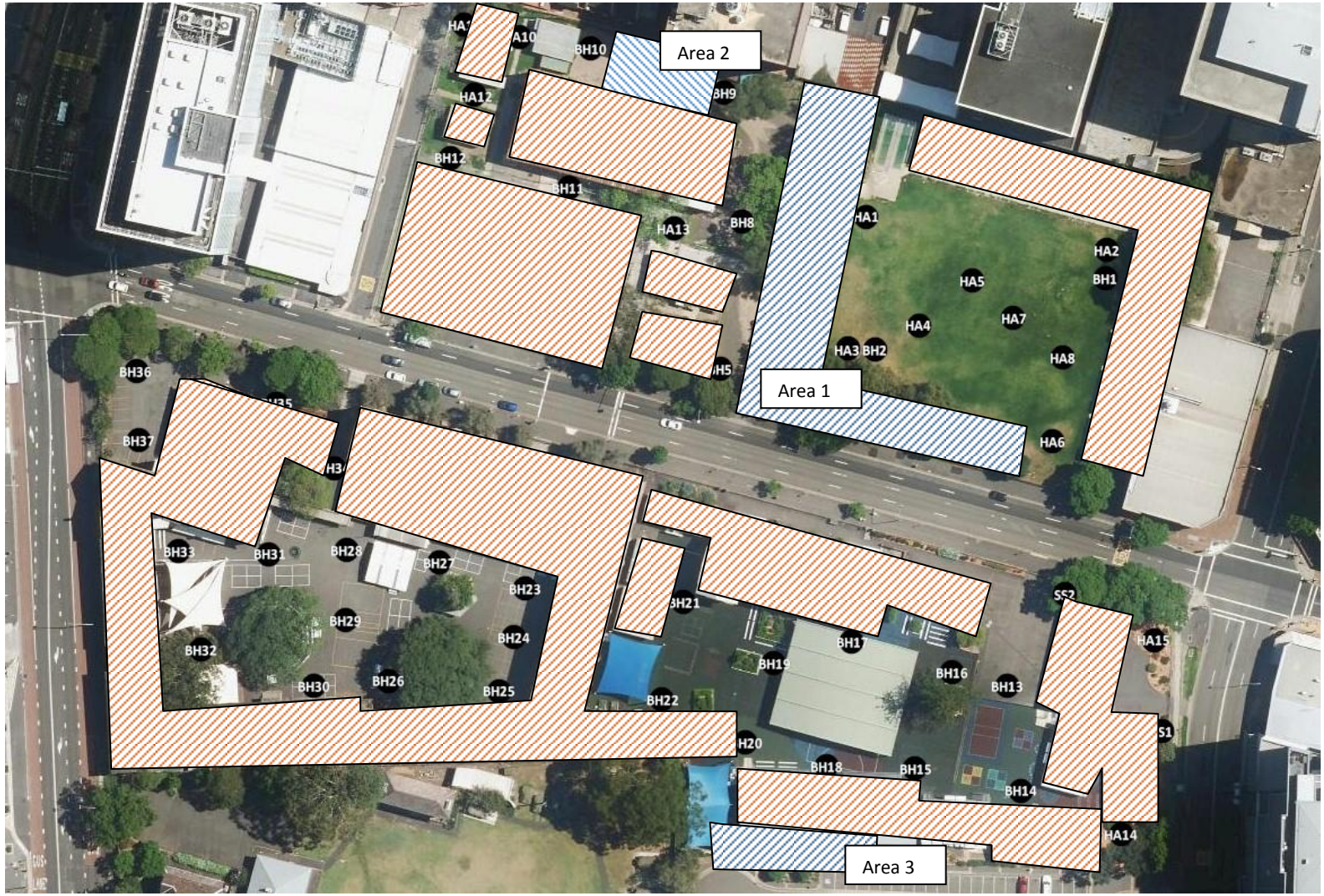

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Sample Locations – Drawing Number: 1915-ER-1-E

Not To Scale

N

Current Remedial Extents

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

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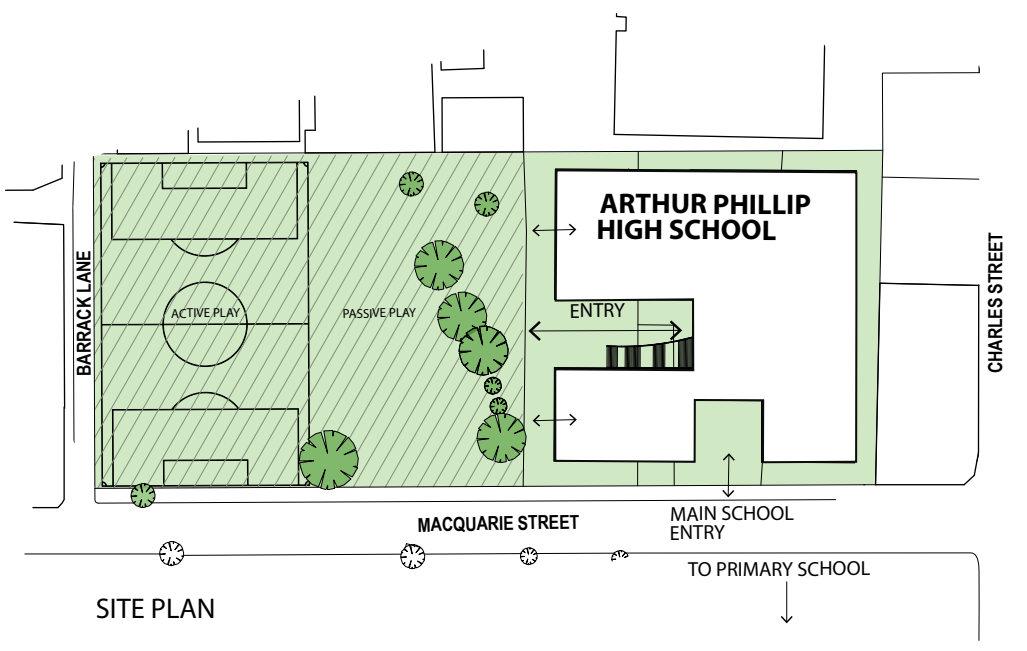
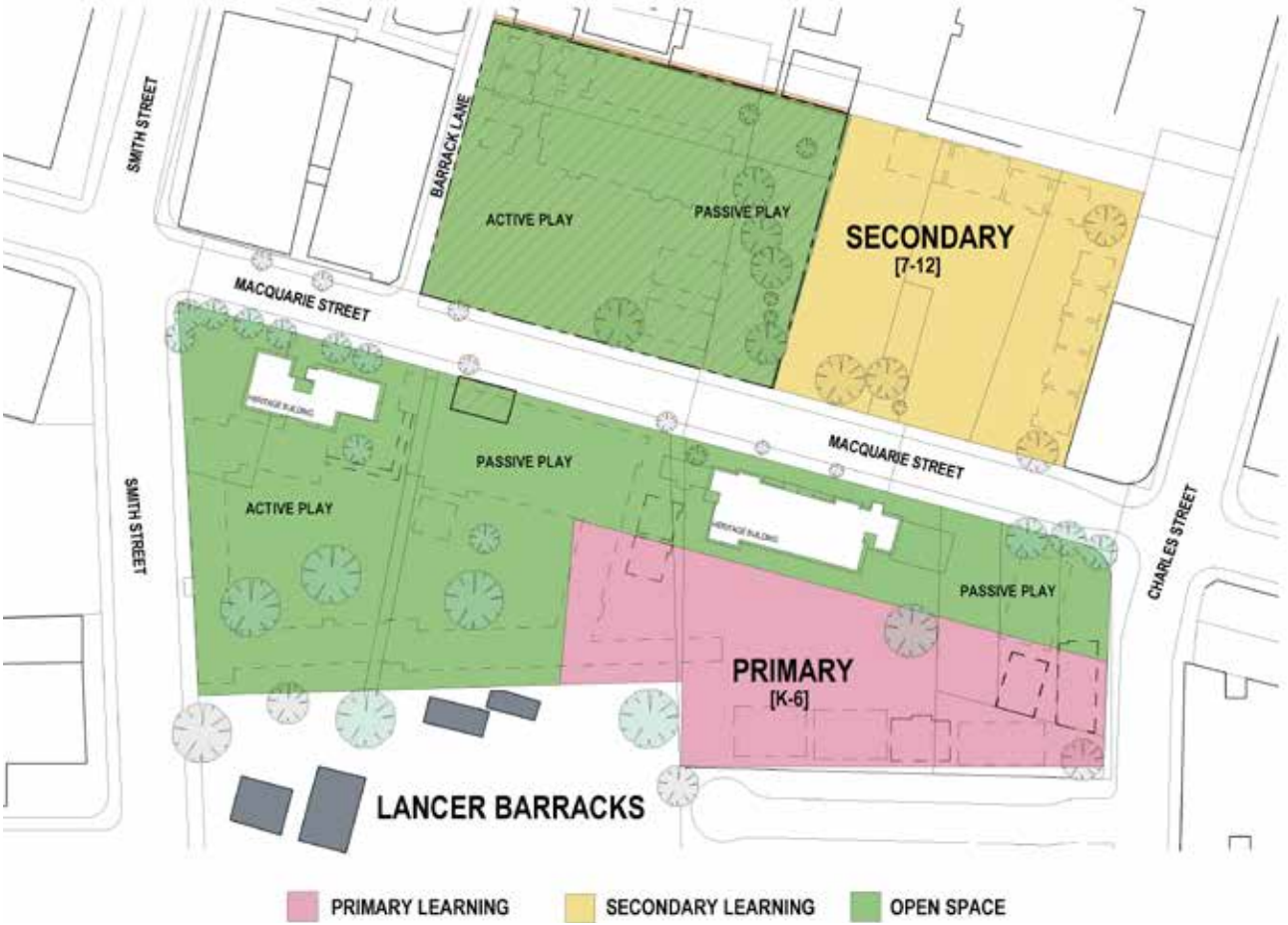
Job Number: 1915
Report Number: 1915-ER-1-2
Report Date: 14/08/2015

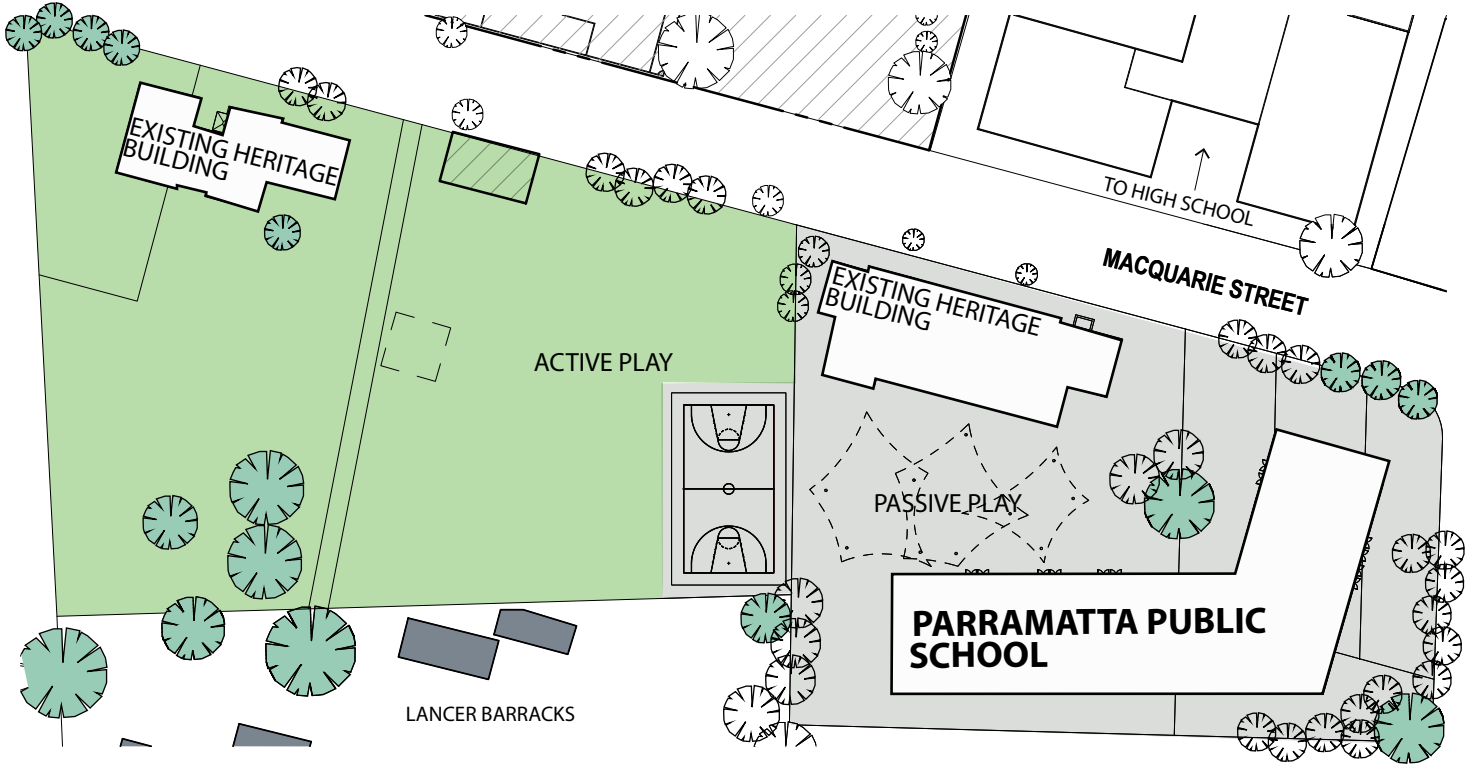
APPENDIX A: PROPOSED SITE PLANS


ARTHUR PHILLIP
HIGH SCHOOL
BARRACK LANE
CHARLES STREET
ACTIVE PLAY
PASSIVE PLAY
ENTRY
MACQUARIE STREET
MAIN SCHOOL
ENTRY
TO PRIMARY SCHOOL

SITE PLAN



Option 1a: Education Precincts - Preferred Option


EXISTING HERITAGE BUILDING
TO HIGH SCHOOL
MACQUARIE STREET
EXISTING HERITAGE BUILDING
ACTIVE PLAY
PASSIVE PLAY
PARRAMATTA PUBLIC SCHOOL
LANCER BARRACKS

SITE PLAN

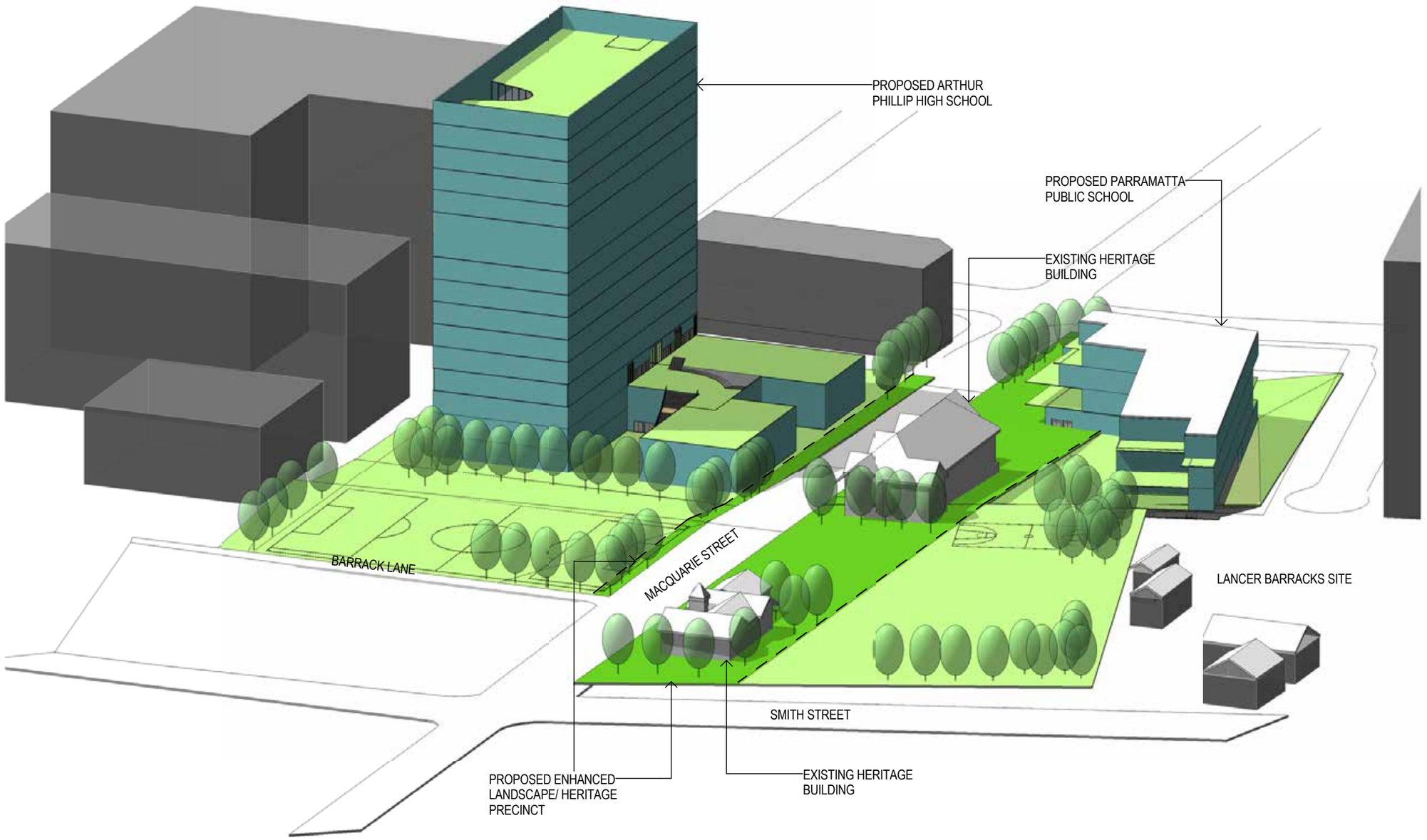


Image of preferred massing options for both schools