



Health Infrastructure NSW
Wagga Wagga Rural Referral Hospital
Redevelopment Project
Remedial Action Plan

Stage 3
Sturt Highway, Wagga Wagga, NSW

9 May 2018
54397/114204 (Rev 3)
JBS&G

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Appendices

Appendix A: Unexpected Finds Protocol

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Savills Australia on behalf of Health Infrastructure NSW (HI, the Client) to prepare a Remedial Action Plan (RAP) for Stage 3 (the site) of the broader Wagga Wagga Rural Referral Hospital Redevelopment project (also referred to as Wagga Wagga Base Hospital). **Figure 1** presents the site location and **Figure 2** presents the site layout.

The site is located in the north western portion of the broader Wagga Wagga Rural Referral Hospital and covers an area of approximately 7,000 m². The site currently comprises a number of built structures, demountable structures and concrete paved and unsealed surfaces.

The proposed redevelopment works within the site include the demolition of existing structures and construction of a new car park facility.

Previous investigations of the site, as discussed in **Section 3**, have identified friable asbestos in surface soils beneath the Old Hospital Building sub floor area and in an isolated location adjacent the south eastern corner of Robinson House, as well as elevated levels of lead and Benzo(a)pyrene (B(a)P) in one location adjacent the southern face of the Old Hospital Building.

1.2 Objectives

The objectives of this RAP are to document:

- The procedures and standards to be followed in order to address the contamination identified at the site;
- The required procedures to appropriately investigate and assess data gaps previously identified at the site;
- The requirements to ensure the protection of human health and the surrounding environment; and
- The procedures to ensure contamination is remediated / managed in such a manner as to make the site suitable for the proposed future uses.

2. Site Condition & Surrounding Environments

2.1 Site Identification

The location of the site is shown on **Figure 1**. The layout of the site is shown on **Figure 2**. The site details are summarised in **Table 2.1**.

Table 2.1 Summary Site Details

Lot/DP	Part Lot 334 in DP 1190643
Site Address	Sturt Highway, Wagga Wagga, NSW
Local Government Authority	City of Wagga Wagga
Site Area/s (ha)	Approximately 7,000 m ²
Current Land Use	Public Hospital
Proposed Land Use	Public Hospital
Current Land Owner	NSW State Government

2.2 Site Description

The site comprises a parcel of land that was previously utilised as the Wagga Wagga Rural Referral Hospital. A number of brick and demountable structures exist on the site covering approximately 50% of the site area. The remaining areas of the site comprise grass, concrete hardstand and unsealed surfaces.

The site was an operational public hospital site up until late 2017 when it ceased operation in preparation for the current proposed redevelopment works.

2.3 Surrounding Land-use

The surrounding land-uses of the site are detailed below.

- North – Asphalt sealed public carpark with the Sturt Highway beyond this, and low density mixed residential and commercial structures further beyond.
- East – Stage 2 of the Wagga Wagga Rural Referral Hospital Redevelopment Project with other hospital grounds beyond this.
- South – Other hospital grounds associated with the Wagga Wagga Rural Referral Hospital.
- West – Docker Street with low density residential areas and an operational petrol station beyond this.

2.4 Topography

The site is flat with no alterations to site topography expected to have occurred. The site has an approximate elevation at Australian Height Datum (AHD) 185 m AHD.

2.5 Geology and Soil

Review of eSPADE¹ indicated that the site soils are constituted of the Becks Lane soil landscape which comprises slope washed and alluvial-colluvial sands, clays and gravels, mostly derived from Ordovician metasedimentary rocks. The Wagga Wagga 1:250,000 Geological Series Sheet (SI 55-15) indicates the site is underlain by Quaternary alluvium comprising unconsolidated gravel, sand,

¹ <http://www.environment.nsw.gov.au/eSpade2WebApp#>. Department of Environment and Heritage, NSW Government. Accessed 22/02/2018.

silt and clay, close to the boundary with Wagga Wagga Marginal Basin sediments to the south, comprising shale, sub-greywacke, quartzite, sandstone, carbonaceous slate, and siltstone.

Previous investigations (summarised in **Section 3**) have confirmed a disturbed terrain (fill material) in accessible areas of the Stage 3 site. Natural materials were noted to be present at varying depths but generally between 0.3 and 0.8 m below ground surface.

2.6 Acid Sulfate Soils

Review of eSPADE² indicated that there are no known suspected occurrences of acid sulfate soils expected to be present at the site.

2.7 Hydrology

The nearest water body is the Murrumbidgee River, located approximately 1.7 km to the north east of the site.

Surface water is anticipated to primarily enter the stormwater system with infiltration in the accessible soils, and garden beds.

Based on City of Wagga Wagga interactive mapping³, the site is not within the area mapped as Flood Prone Land.

2.8 Hydrogeology

Regional groundwater is anticipated to flow in a northerly direction towards the Murrumbidgee River, with possible northeast to northwest components. Groundwater is anticipated to be greater than 6 m, based on consideration of DP (2014⁴) summarised in **Section 3**.

The site is within an area mapped as a Groundwater Sensitive Area on the Wagga Wagga Local Environmental Plan (LEP) 2010 *Natural Resources Sensitivity – Water* map.

2.9 Meteorology

Mean monthly temperature ranges from 2.8 degrees Celsius to 31.7 degrees Celsius. Mean monthly average rainfall ranges from 40.2 mm to 56.9 mm.

Data from Wagga Wagga Airport Meteorological Office (AMO)⁵ approximately 10 kilometres to the south-south west of the site.

² [http://www.environment.nsw.gov.au/eSpadeWeb\(a\)Pp/](http://www.environment.nsw.gov.au/eSpadeWeb(a)Pp/). Department of Environment and Heritage, NSW Government. Accessed 22/02/2018.

³ <https://eservices.wagga.nsw.gov.au/P1/WWCustom/maps/Maps.aspx?f=WW.P1.MAPS.VIW>, accessed 1 March 2017.

⁴ Geotechnical Investigation. Wagga Wagga Base Hospital – Stage 3. Edward Street, Wagga Wagga. Douglas Partners Pty Ltd, August 2014 (DP 2014).

⁵ <http://www.bom.gov.au/climate/data/index.shtml>. Accessed 22/02/2018.

3. Previous Site Investigations

Limited environmental and geotechnical investigations have been previously completed within the Stage 3 area of the Wagga Wagga Rural Referral Hospital. The following investigation reports were available for review as part of the preparation of the RAP:

- *Geotechnical Investigation. Wagga Wagga Base Hospital – Stage 3. Edward Street, Wagga Wagga.* Douglas Partners Pty Ltd, August 2014 (DP 2014).
- *Preliminary Sub Surface Soil Assessment – Old Hospital Building, Wagga Wagga Base Hospital, Wagga Wagga, NSW.* JBS&G Australia Pty Ltd, 16 June 2017 (JBS&G 2017a).
- *Subsurface Site Investigation – Stage 3, Wagga Wagga Rural Referral Hospital, Wagga Wagga, NSW.* JBS&G Australia Pty Ltd, 19 September 2017 (JBS&G 2017b).

The following sections present a summary of relevant information included in each of the above reports.

3.1 Geotechnical Investigation (DP 2014)

The consultant completed a geotechnical investigation to assess the geotechnical suitability for the proposed development.

A summary of the relevant finding made in DP 2014 are as follows:

- The consultant reported the depth to groundwater is expected to be at least 6 m below the current ground surface, and possibly deeper, noting that a monitoring well installed to 10 m remained dry during the investigation works. Previous groundwater levels of between 175 and 177 m AHD have also been noted.
- Bore log descriptions from the investigation and previous investigations in other areas of the broader Wagga Wagga Rural Referral Hospital site identify fill materials to be present at ground surface to between 0.2 and 0.8 m below ground surface at the site. The fill is underlain by stiff to very stiff and hard silty clays to depths of approximately 10 m, underlain by sands and gravels. The depth and extent of various natural soils is anticipated to vary due to their alluvial nature.

3.2 Preliminary Subsurface Soil Assessment – Old Hospital Building (JBS&G 2017a)

JBS&G 2017a was a preliminary subsurface investigation completed surrounding the existing Old Hospital Building within Stage 3 of the site. It included the installation of 13 hand augers to an approximate depth of 1.0 m below ground surface in accessible areas surrounding the Old Hospital Building and an additional hand auger (HA14) installed to approximately 0.3 m below ground surface within a sub floor area in the Old Hospital Building footprint. Sampling locations from JBS&G 2017a are presented in **Figure 3** as HA01 to HA14.

Soil data as generated by this investigation was compared to health-based investigation and screening levels advised by NEPC (2013) for residential land uses with minimal access to soils (HIL/HSL-B). Though a hospital is used for a commercial/industrial purpose, the selection of more sensitive residential with minimal soil access criteria rather than commercial/industrial land use criteria is consistent with NEPC (2013) guidance.

The key findings arising from the completion of JBS&G 2017a are summarised as:

- Friable asbestos and asbestos fines (AF/FA) impacted soils at sampling location HA14 beneath shotcrete encapsulation within the sub floor area of the eastern portion of the Old Hospital Building footprint. The concentration of identified friable asbestos exceeded the adopted HIL-B threshold of 0.001 %w/w.

- HA10 was only extended approximately 0.2 m below ground surface before refusal was met within fill materials. The depth of fill below ground surface has not been confirmed.
- Limited access to remaining sub floor areas within the Old Hospital Building footprint was available during this investigation. As such, it was recommended that all areas with shotcrete encapsulation be assumed to contain friable asbestos contamination unless additional investigation can indicate otherwise.
- Elevated levels of Lead that exceed the HIL-B threshold of 1200 mg/kg and carcinogenic PAHs as Benzo(a)pyrene toxicity equivalent quotient (BaP TEQ) that exceed the HIL-B threshold of 4 mg/kg at sampling location HA10 to the southern face of the Old Hospital Building. These materials were encapsulated by hardstand concrete at the time of investigation.
- All other sample results reported chemical concentrations that were below adopted HIL-B thresholds.

3.3 Subsurface Soil Assessment – Stage 3 Wagga Wagga Rural Referral Hospital

JBS&G 2017b was a subsurface investigation completed across the Stage 3 area of the site. It included the collection of soil samples at 26 locations via installation of hand augers or surface grab samples. Sampling locations from JBS&G 2017b investigations are presented in **Figure 3** as HA15 – HA40.

Soil data as generated by this investigation was compared to health-based investigation and screening levels advised by NEPC (2013) for residential land uses with minimal access to soils (HIL/HSL-B).

The key findings arising from the completion of JBS&G 2017b are summarised as:

- FA/AF impacted soils at sampling location HA38 in the western portion of the Old Hospital sub floor area. The concentration of identified friable asbestos exceeded the adopted HIL-B threshold of 0.001 %w/w.
- Suspected non-friable asbestos containing materials (ACM) as fibre cement debris was observed to ground surfaces in sub floor areas of the Old Hospital Building, however, could not be accessed to collect representative samples.
- FA/AF impacted soils was identified below the adopted HIL-B threshold of 0.001 %w/w at HA31, located to the external south eastern corner of Robinson House. These materials were encapsulated by hardstand concrete at the time of investigation.
- Potential shotcrete surfaces were observed beneath Robinson House, however, a detailed inspection could not be completed due to confined spaces restrictions.
- Elevated levels of carcinogenic PAHs (as BaP TEQ) at sampling location HA24 which are equal to the HIL-B threshold of 4 mg/kg.
- Elevated levels of dieldrin and chlordane at sampling location HA30 and HA31 which were below the adopted HIL-B thresholds, but require appropriate regulatory controls under the NSW EPA Chemical Control Orders (CCO) for waste management.
- All other sample results reported chemical concentrations that were below adopted HIL-B thresholds.

4. Summary Site History

A summary site history relating to the Wagga Wagga Rural Referral Hospital is presented below. This is based on limited available historical information obtained to date.

Table 4.1: Wagga Wagga Rural Referral Hospital, Part Lot 334 in DP 1190643, History Summary

Period	Activity	Source
1910	Wagga District Hospital was built on the site	Wagga Wagga and District Historical Society ⁶
1922	The first Children's Ward at the Wagga District Hospital was completed.	Wagga Wagga and District Historical Society
1944	Shows a complex of buildings predominantly in the northern portion of the hospital land, with landscaped lawns in the north fronting Sturt Hwy, and open space in the south including what may be a tennis court. Some of the buildings in the main complex are consistent with buildings present in Stage 3, including the Old Hospital Building. There appears to be some disturbance of land south of the main building complex that indicates either the impression of a former building or preparation for new building. This area is outside the Stage 3 area.	City of Wagga Wagga Intramap
1948-1952	Two storey domestic brick block (named Lewis House) for nurses commenced to be built until a three-storey Nurse's Home could be built. It was completed in 1952 after some delays.	Wagga Wagga and District Historical Society
2014-2017	Site assessments undertaken by Douglas Partners and JBS&G.	As referenced in Section 3 .

⁶ <http://www.wwdhs.org.au/inside-wagga-district-hospital/>, accessed 1 March 2018.

5. Contamination Status

5.1 Summary of Known Contamination

Contamination of land is defined by the CLM Act⁷ as “the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.”

5.1.1 Asbestos Contaminated Fill

Based on the previously completed investigations at the site, asbestos contamination of fill materials is known and/or suspected to occur in the locations shown in **Figure 6** and detailed in below in **Table 5.1** with anticipated volumes based on completed works also indicated.

Table 5.1: Known Asbestos Contamination Summary

Contamination Type	Location	Anticipated Volume	Previous Investigation Reference
Friable asbestos contaminated fill materials above HIL-B	Old Hospital Building footprint beneath shotcrete encapsulation	600 m ³ (based on 1200 m ² footprint and estimated depth of fill of 0.5 m bgs)	JBS&G 2017a JBS&G 2017b
Suspected friable asbestos contaminated fill materials	Robinson House footprint beneath shotcrete encapsulation	1000 m ³ (based on 1000 m ² footprint and estimated depth of fill of 1.0 m bgs)	JBS&G 2017b

5.1.2 Lead and B(a)P Contaminated Soil

Based on the previously completed investigations at the site, asbestos contamination of fill materials is known and/or suspected to occur in the locations shown in **Figure 5** and detailed in below in **Table 5.2** with anticipated volumes based on completed works also indicated.

Table 5.2: Known Lead and B(a)P Contamination Summary

Contamination Type	Location	Anticipated Volume	Previous Investigation Reference
Lead and B(a)P contaminated fill materials above HIL-B	HA10 – southern face of Old Hospital Building	13 m ³ (based on 25 m ² area surrounding HA10 and estimated depth of fill of 0.5 m bgs)	JBS&G 2017a

5.2 Summary of Potential Contamination Data Gaps

Soils underlying previous built and demountable structures present within the Stage 3 area during JBS&G 2017a and JBS&G 2017b have not been adequately assessed due to access issues (existing structures). The assessment of these data gaps is required to be undertaken in accordance with the sampling regime in **Table 7.4**. Data Gap assessment areas are shown in **Figure 4**.

⁷ Contaminated Land Management Act 1997 (CLM Act).

6. Remediation Options

Remedial options are based on the known identified contaminants and their extent at the site based on investigations to date. The suitability and effectiveness of selected remedial options may change following the completion of data gap assessments during the proposed redevelopment works.

6.1 Extent of Remediation

6.1.1 Asbestos Impacted Fill

FA/AF was detected above health based criteria (0.001 %w/w) in shallow (0-0.05 m bgs) fill materials within the Old Hospital Building footprint (HA14 and HA38). All areas of shotcrete encapsulated soils within the Old Hospital Building footprint are assumed to potentially contain FA/AF contamination. The lateral extent of shotcrete encapsulated surfaces is unknown and is therefore assumed to extend over the entire Old Hospital Building footprint (approximately 1,200 m²). The depth of fill materials is anticipated to extend to approximately 0.5 m bgs, however, this depth is required to be confirmed by the site remediation consultant following the demolition of the Old Hospital Building.

FA/AF was detected below health based criteria (0.001 %w/w) in fill materials at depth (0.75 – 0.85 m bgs) adjacent the south eastern corner of Robinson House (HA 31). Shotcrete encapsulation materials were also observed within the Robinson House sub floor area (JBS&G 2017b) that were inaccessible at the time of previous investigations. These areas are suspected to encapsulate FA/AF impacted fill materials. The lateral extent of shotcrete encapsulated surfaces is unknown and is therefore assumed to extend over the entire Robinson House Building footprint (approximately 1,000 m²). The depth of fill materials is anticipated to extend to approximately 1.0 m bgs, however, this depth is required to be confirmed by the site remediation consultant following the demolition of the Robinson House Building.

The extent of remediation of known FA/AF impacted fill is shown on **Figure 6**.

The vertical extent of remediation must achieve the required remedial depths detailed in **Section 7**, with consideration to the specific designs options for the site.

6.1.2 Lead and B(a)P Impacted Soils

Lead and B(a)P concentrations have been identified above adopted HIL-B within fill materials at previous sampling location HA10 (JBS&G 2017a) to the southern face of the Old Hospital Building. A lateral extent of 25 m² surrounding location HA10 is recommended to be included within the remediation of this contamination and a vertical depth to the base of fill materials (anticipated to be approximately 0.5 m bgs).

6.1.3 Data Gaps

The data gaps of the under building soils have been incorporated within the RAP and are to be addressed during the validation works and are shown on **Figure 4**.

Data gap areas and assessment requirements are presented in **Table 7.1**.

Should data gap assessment sampling not meet the adopted site criteria, additional remediation of these areas may be required, in order to achieve remediation objectives (**Section 6.2**).

6.2 Remediation Objectives

The remediation objectives are outlined as follows:

- Removal of unacceptable risks to human health and the environment from the identified asbestos contaminated fill and identified lead and B(a)P contaminated fill at the site, such that the site is suitable for the proposed future land use;
- Validate the remedial works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria; and
- Document the validation process.

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

- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land*; (DUAP 1998).
- *Contaminated Sites: Sampling Design Guidelines*, September 1995 (EPA 1995).
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, August 2011 (OEI 2011).
- *Contaminated Sites: Guidelines for NSW Site Auditor Scheme – 3rd Edition*, October 2017 (NSW EPA 2017).
- *National Environment Protection (Assessment of Site Contamination Measure) Measure 1999*, as amended 2013, National Environment Protection Council (NEPC 2013).
- *Work Health and Safety Act 2011* (WHS Act).
- *How to safely remove asbestos - Code of Practice*, Safe Work Australia, 2011 (SWA 2016a).
- *How to manage and control asbestos in the workplace - Code of Practice*, Safe Work Australia, 2011 (SWA 2016b).
- *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 Department of Health, 2009 (WA DoH 2009).

6.3 Consideration of Possible Remediation Options

6.3.1 NSW EPA 2017 Guidance

The preferred hierarchy of options for remediation (clean up) and/or management adopted by NSW EPA has been established within the NEPC (2013) Assessment of Site Contamination Policy Framework as follows:

- On-site treatment of the soil so that the contaminant is either destroyed or the associated risk is reduced to an acceptable level; and
- 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; or

if the above options are not practicable:

- Consolidation and isolation of the soil on site by containment with a properly designed barrier; and

- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material; or
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

In addition, when deciding which option to choose, consideration is also required to be given to the sustainability (environmental, economic and social) aspects of each option to ensure an appropriate balance between the benefits and effects of undertaking remedial/management options.

In cases where no readily available or economically feasible method is available for remediation, it may be possible to adopt appropriate regulatory controls or develop other forms of remediation.

Consideration of each of the approaches (EPA 2017), is presented in **Table 6.1**.

6.3.2 WA DoH 2009 Guidance

WA DoH 2009 provides specific guidance in the remediation and management of asbestos.

WA DoH 2009 note the following considerations as important when assessing the acceptability of any remediation:

- Minimisation of public risk;
- Minimisation of contaminated soil disturbance; and
- Minimisation of contaminated material/soil moved to landfill.

Consideration of each of the WA DOH 2009 guidance is presented in **Table 6.1**, taking into account the proposed development works at the site.

6.4 Possible Remedial Options

Table 6.1: Remedial Options Matrix

Option of Treatment	Discussion	Conclusion
Option 1: On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level.	<u>FA / AF impacted soils</u> FA / AF are typically heterogeneously distributed throughout impacted soils and are not readily visible to the naked eye. On this basis, there is no option considered appropriate to remove asbestos fibres from impacted soils on site. Furthermore, attempted removal of FA / AF from impacted soil would result in increased disturbance of FA / AF impacted soils.	Not a suitable Option.
	<u>Lead and B(a)P Impacted Soils</u> The estimated low volume of material anticipated to require remediation for lead and B(a)P concentrations is considered to be too low to be cost or time effective to pursue potential on-site treatment options.	Not 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.	<u>FA / AF impacted soils</u> As with Option 1, treatment of these materials is not a viable option.	Not a suitable Option.
	<u>Lead and B(a)P Impacted Soils</u> As in option 1, due to the estimated low volume of material requiring remediation, implementation of off-site treatment is also considered not to be cost or time effective.	Not a suitable option.
Option 3: Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill.	<u>FA / AF impacted soils</u> There are currently suitably licensed waste facilities in the Wagga Wagga region capable of accepting asbestos contaminated soils. Offsite disposal of FA / AF impacted soils is likely the fastest method of remediation, but also involves significant disturbance of the FA / AF impacted materials and should be limited to excess material that cannot remain contained onsite. 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.	A suitable option for excess material that cannot be retained onsite.
	<u>Lead and B(a)P Impacted Soils</u> For the estimated small volume of material requiring remediation, excavation and off-site disposal is a viable option, involving short timeframe and relatively low cost.	The preferred option.

Option of Treatment	Discussion	Conclusion
<p><u>Option 4:</u> Consolidation and isolation of the soil on-site by containment within a properly designed barrier.</p>	<p><u>FA / AF impacted soils</u> Given the extent of FA / AF impacted soils at the site, a remediation objective was to minimise disturbance of FA / AF impacted soils where possible, which is in accordance with guidance provided by WA DoH 2009. It is considered that extensive remediation, removal and disposal of FA / AF heavily impacted soils would cause a greater adverse effect than if the impacted soils remain in-situ where possible and are contained and managed in the long term. It is noted that containment of contaminated soil would require the potential exposure to contamination to be managed by the implementation of a Long Term Environmental Management Plan (LTEMP). There must be acceptance by the ultimate custodian of the land that future controls will be implemented, and that a notation will be made on the Title of the land. Implementation of a LTEMP is considered feasible for the site given the proposed long term uses as a car park within a health services facility.</p>	<p>The preferred option.</p>
	<p><u>Lead and B(a)P Impacted Soils</u> Containment of lead and B(a)P impacted soil at the site is not a suitable option given the potential for migration of contaminants via leaching to underlying natural soils and groundwater if not contained within an expensive engineered sealed containment cell.</p>	<p>Not a suitable option.</p>

6.5 Preferred Remedial Strategy

A number of potential remedial options have been outlined in **Table 6.1**. The preferred remedial strategy for the site is:

- Containment of FA/AF impacted soils onsite beneath concrete sealed surfaces associated with the proposed car park construction, implementation of a LTEMP and notation on the land Title;
- Offsite disposal of any excess asbestos impacted soils that cannot be contained on site due to space constraints; and
- Excavation of identified lead and B(a)P impacted soil and disposal offsite to a suitably licensed waste facility.

7. Remediation Plan

7.1 Approvals, licences and notifications

The proposed remediation works are considered Category 2 remediation works, based on the following assessment of clause 9 of SEPP 55:

- the work is not considered Designated Development.
- the work is not on land identified as critical habitat.
- the work is not likely to have a significant effect on threatened species, populations, ecological communities or their habitats.
- is carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:
 - coastal protection;
 - conservation or heritage conservation (it is noted that the existence of heritage listed structures is, or has previously been, present within the site area, however, based on information provided by the client, heritage listed items have already been addressed under separate approvals for demolition works);
 - habitat area, habitat protection area, habitat or wildlife corridor,
 - environment protection;
 - escarpment, escarpment protection or escarpment preservation;
 - floodway;
 - littoral rainforest;
 - nature reserve;
 - scenic area or scenic protection; and
 - wetland.
- is not carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).

Category 2 remediation works require that notice is given to the City of Wagga Wagga Council at least 30 days prior to the commencement of the works. A notice complying with the requirements of Clause 16(3) of SEPP 55 should be prepared. Notice of completion of remediation works must also be provided within 30 days after completion of the work, consistent with clauses 17(2 & 3) and 18.

An appropriately experienced and licensed Class A asbestos remediation Contractor is required to undertake the works, under the supervision of an appropriately qualified and experienced Remediation Consultant. The remediation consultant shall also be a SafeWork NSW Licensed Asbestos Assessor (LAA). The Class A licensed contractor must submit a site specific permit application to SafeWork NSW to undertake friable asbestos works at the site. This permit application must be made at least seven working days before and friable asbestos works are commenced.

Remediation works shall not commence until all required approvals, licences and notifications have been granted and/or received.

Furthermore, all required environmental and health and safety documentations must be completed prior to the commencement of remedial works, and should as a minimum include the Construction Environmental Management Plan (CEMP) and Work Health and Safety Plan (WHSP), as detailed in **Section 11**.

7.2 Site Establishment

The boundary of the extent of remediation will be defined by the Remediation Consultant. The appointed remediation contractor shall secure these areas to ensure that all safety and environmental controls are implemented. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess need for and implement any necessary traffic controls;
- Work area security fencing;
- Site signage and contact numbers;
- Stabilised site entry gate;
- Appropriate decontamination areas for personnel and plant;
- Sediment fencing (attached to security fencing) where necessary; and
- Stormwater runoff and sediment controls (e.g. silt fences and hay bales) where necessary.

7.3 Buildings and Structures Demolition

Existing structures on the site require demolition and removal from the site. The key processes are briefly summarised below:

- Removal and disposal of all hazardous building materials in accordance with relevant regulatory guidance including SWA 2016a and Waste Classification Guidelines 2014 (EPA 2014);
- Conduct hazardous materials clearance inspection;
- Demolish remainder of buildings;
- Beneficial reuse of environmentally validated material onsite (i.e. reuse of crushed recycled concrete) or lawfully remove all materials off-site; and
- Expose underlying soils for data gap and confirmation sampling by Remediation Consultant (refer to **Section 7.4**).

7.4 Data Gap Assessment

Identified data gaps must be appropriately assessed by the appointed remediation consultant prior to the main earthworks and remediation program commencing. Following the demolition of built structures and removal of overlying concrete hardstand surfaces, the data gap assessment shall be completed in accordance with the direction outlined in **Table 7.1**.

Table 7.1: Data Gap Assessment Requirements

Location	Data Gap Assessment	Assessment plan	Analyses
Old Hospital Building footprint	1,200 m ² area	7 sampling locations systematically placed over total area. Samples to be collected at surface (0-0.1 m), near surface (0-0.3 m) and then 0.5 m intervals until natural materials encountered	Heavy Metals (As, Cd, Ch, Cu, Hg, Pb, Ni, Zn) Total Recoverable Hydrocarbons (TRH) Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) Polycyclic Aromatic Hydrocarbons (PAHs) Organochlorine & Organophosphorus Pesticides (OCP & OPP) Polychlorinated Biphenyls (PCBs) Asbestos (500 mL)
Old Hospital Building	Depth of Fill to be confirmed via test pitting and visual confirmation	7 locations	N/A
Old Hospital Building	Lateral extent of shotcrete surfaces to be confirmed via visual confirmation	Lateral extent	N/A
Robinson House	1,000 m ² area	7 sampling locations systematically placed over total area. Samples to be collected at surface (0-0.1 m), near surface (0-0.3 m) and then 0.5 m intervals until natural materials encountered	Heavy Metals (As, Cd, Ch, Cu, Hg, Pb, Ni, Zn) Total Recoverable Hydrocarbons (TRH) Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) Polycyclic Aromatic Hydrocarbons (PAHs) Organochlorine & Organophosphorus Pesticides (OCP & OPP) Polychlorinated Biphenyls (PCBs) Asbestos (500 mL)
Robinson House	Depth of Fill to be confirmed via test pitting and visual confirmation	7 locations	N/A
Robinson House	Lateral extent of shotcrete surfaces to be confirmed via visual confirmation	Lateral extent	N/A
Built Structure to southern portion of Stage 3	370 m ²	5 sampling locations systematically placed over total area. Samples to be collected at surface (0-0.1 m), near surface (0-0.3 m) and then 0.5 m intervals until natural materials encountered	Heavy Metals (As, Cd, Ch, Cu, Hg, Pb, Ni, Zn) Total Recoverable Hydrocarbons (TRH) Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) Polycyclic Aromatic Hydrocarbons (PAHs) Organochlorine & Organophosphorus Pesticides (OCP & OPP) Polychlorinated Biphenyls (PCBs) Asbestos (500 mL)
<u>OPTIONAL</u> HA10 (southern face of Old Hospital Building)	Further assessment of identified lead and B(a)P contamination, to re-assess waste classification	3 samples within HA10 remedial area (25 m ²) at 0.5m depth intervals within fill materials	TCLP Lead TCLP B(a)P

Results of the data gap assessment and any remediation requirements shall be reported in accordance with NEPC 2013 and NSW EPA requirements and presented as a Data Gap Assessment Report to be included as an Addendum to this RAP. Updates to remedial methodologies may be required dependant on any additional contamination identified during the data gap assessment.

7.5 Lead and B(a)P Remediation Plan

Lead and B(a)P impacted soils at sampling location HA10 are estimated to include a 25 m² area to a depth of 0.5 m below ground surface and are proposed to be disposed off site to a suitably licensed waste facility.

Additional soil investigation works may be undertaken, including Toxicity Characteristic Leachate Procedure (TCLP) analysis, to determine a more accurate classification of these soils for waste disposal purposes.

Alternatively, with currently available data, these materials exceed the adopted HIL-B concentration of lead of 1200 mg/kg. (primary sample 1800 mg/kg, duplicate sample 3700 mg/kg) and the adopted HIL-B concentration of B(a)P of 4 mg/kg (primary sample 4.32 mg/kg, duplicate sample 10 mg/kg) and must be removed from the site as Hazardous Solid Waste in accordance with the below recommendations.

7.5.1 Preliminaries

The extent of the area represented by this sample location is shown in **Figure 5** and is identified as approximately 5 m x 5 m surrounding HA10 and to the depth of fill materials (expected to be approximately 0.5 m below ground surface).

A summary of the required preliminary works prior to the lead and B(a)P remediation works commencing is as follows:

- A waste classification report shall be prepared by the remediation consultant based on previous soil data reported in JBS&G 2017a and JBS&G 2017b. Based on current data, these materials shall be classified as Hazardous Solid Waste in accordance with NSW EPA 2014. As noted above, alternate classification may be possible subject to additional sampling, analysis and data assessment.
- The remediation contractor shall manage the excavation and off site disposal of the Hazardous Solid Waste from the site. The remediation contractor shall prepare all required documentation to undertake the hazardous waste removal works, in accordance with the requirements outlined in the Protection of the Environment Operations (Waste) Regulation 2014 (POEO 2014). These requirements include:
 - Use of a leak-proof vehicle and covering of the load prior to leaving the removal site;
 - Notification to the NSW EPA of the intent to transport/disposal of the waste as per tracking requirements applicable at the date of proposed transport; and
 - Disposal to a facility lawfully able to receive Hazardous Solid Waste.
- Landfill tipping dockets shall be provided by the remediation contractor to the remediation consultant.

7.5.2 Lead and B(a)P Remediation Area Establishment

The proposed lead and B(a)P remediation area shall be established at the site, separate to the normal site area and boundaries. Given the anticipated small volume of materials to be removed, temporary barricades are considered sufficient to demarcate the lead and B(a)P removal area.

The remediation contractor shall be responsible for undertaking a pre-start 'toolbox' talk with all personnel involved. No unauthorised/non-inducted personnel may enter the Lead and B(a)P removal area.

- The remediation contractor shall ensure that sufficient PPE, in addition to normal site PPE requirements, is available for all personnel for the duration of the lead and B(a)P remediation works including:
 - Disposable coveralls;
 - P2 half face respirator (or higher class);
 - Disposable gloves; and
 - Rubber footwear or disposable boot covers.
- The remediation contractor shall ensure that sufficient decontamination facilities, including hand wash facilities, are available for all personnel following the completion of the lead and B(a)P remediation works.

7.5.3 Lead and B(a)P Remediation Works

A summary of the requirements for the proposed lead and B(a)P remediation works is as follows:

- All personnel entering the lead and B(a)P remediation area shall don the required PPE at all times when within the lead and B(a)P remediation area.
- When exiting the lead and B(a)P remediation areas, all personnel shall undergo appropriate decontamination procedures including disposal of used PPE and thoroughly washing hands and face.
- The proposed lead and B(a)P remediation area shall be kept damp by water spraying at all times during disturbance to reduce the possibility of dust generation.
- Bulk excavation of the lead and B(a)P impacted soils shall be undertaken via excavator.
- The excavated hazardous waste shall be transported by suitable haulage vehicles to a suitably licensed waste facility. There should be no storage of hazardous waste in stockpiles at the site.
- Landfill tipping dockets shall be provided to the remediation consultant for verification and to be included in the validation report.
- The lead and B(a)P remediation area shall be excavated to the depth of fill materials, anticipated to be approximately 0.5 m below ground surface.
- The remediation consultant shall collect soil validation samples from the excavation walls and base in accordance with the lead and B(a)P validation program (refer **Section 8, Table 8.2**).
- Validation of the excavation shall be achieved once all validation samples and associated quality assurance samples return results that are below the adopted HIL-B thresholds for lead and B(a)P (as TEQ) (1200 mg/kg and 4 mg/kg respectively).
- Where validation samples are reported as exceeding the adopted HIL-B threshold, additional excavation in the identified area shall be undertaken and then additional validation samples collected by the remediation consultant (as outlined in previous points and **Table 8.2**).

- Where lead and/or B(a)P is detected in validation samples, but below the adopted HIL-B threshold, site workers may be required to maintain levels of PPE outlined in **Section 7.5.2** for the remaining works to protect against potential exposure hazards.

7.6 Friable Asbestos Remediation Plan

Once the finalised volumes of asbestos impacted fill materials have been confirmed following the completed Data Gap Assessment, and the lead and B(a)P remediation and validation works have been satisfactorily completed, the friable asbestos remediation works shall be completed in accordance with the following requirements.

7.6.1 Preliminaries

The remediation contractor shall prepare all required documentation in accordance with their asbestos removal licence and the proposed friable asbestos remediation works, including, but not limited to:

- A Safe Work NSW permit to remove friable asbestos application (refer **Section 7.1**);
- An Asbestos Removal Control Plan (ARCP); and
- Safe Work Method Statements (SWMS).

The remediation consultant shall undertake airborne asbestos fibre monitoring during all friable asbestos removal works (refer to **Section 11.9.1**). Full time supervision by the remediation consultant of the friable asbestos removal works is not compulsory but is considered to be best practice to ensure that asbestos removal works are conducted appropriately and in accordance with this RAP.

The proposed friable asbestos remediation works cannot commence until the above preliminary requirements have been met.

7.6.2 Friable Asbestos Remediation Area Establishment

The proposed friable asbestos remediation area shall be established at the site, separate to the normal site area and boundaries. A summary of the requirements for the establishment of the friable asbestos remediation area prior to asbestos removal works commencing is as follows:

- The friable asbestos remediation area/s shall be marked out by the remediation contractor in consultation with the remediation consultant. Temporary fencing, or other easily recognisable barriers may be used to demarcate the proposed asbestos removal area. It is expected that the friable asbestos remediation area shall encompass the whole of the Old Hospital Building footprint plus additional areas surrounding the perimeter to allow for waste storage and plant movements entering, exiting and within the remediation area.
- The remediation contractor shall install asbestos warning signs to asbestos removal works boundaries for the duration of the asbestos removal works and until final validation and clearance has been provided by the remediation consultant.
- A decontamination area shall be established for site personnel to enter and exit the asbestos removal area.
- The remediation consultant shall install static asbestos air monitors at locations surrounding the asbestos remediation works. Air monitoring shall be conducted for the duration of each shift and shall be completed in accordance with the National Occupational Health and Safety Commission's *Guidance Note on the Membrane Filter*

method for Estimating Airborne Asbestos Fibres – 2nd Edition [NOHSC: 3003 (2005)] (refer **Section 11.9.1**).

- The remediation contractor shall be responsible for undertaking a pre-start ‘toolbox’ talk with all personnel involved. No unauthorised/non-inducted personnel may enter the asbestos removal area.
- The remediation contractor shall ensure that sufficient asbestos related personal protective equipment (PPE), in addition to normal site PPE requirements, is available for all personnel for the duration of the asbestos remediation works including:
 - Disposable coveralls;
 - P3 half face respirator (or higher class);
 - Disposable gloves; and
 - Rubber footwear or disposable boot covers.

7.6.3 Friable Asbestos Remediation Works

Friable asbestos remediation works are required to be undertaken in three stages:

- Stage 1 – excavation and stockpile of friable asbestos impacted materials;
- Stage 2 – excavation of containment cell; and
- Stage 3 – placement of friable asbestos impacted materials within designated containment cell.

Stage 3 cannot commence until appropriate construction of the containment cell is finalised, therefore, excavated friable asbestos impacted materials must be stored onsite until such time as the containment cell is completed.

7.6.3.1 Stage 1 Friable Asbestos Remediation Works

The anticipated volume of friable asbestos impacted soils from both the Old Hospital Building and Robinson House footprint areas is estimated to be approximately 1,600 m³. This estimated volume shall be confirmed following the completion of the data gap assessment (**Section 7.4**)

A summary of the requirements for the friable asbestos excavation works is as follows:

- The Class A contractor shall have total control of the asbestos work area for the duration of the friable asbestos remediation works and shall undertake all works in accordance with the requirements of their Class A licence.
- All personnel entering the asbestos removal area shall do so through the decontamination area and don the required PPE at all times when within the asbestos removal area.
- The proposed asbestos remediation area shall be kept damp by water spraying at all times during disturbance to reduce the possibility of dust generation.
- Bulk excavation of the friable asbestos impacted soils shall be undertaken via excavator.
- Excavated friable asbestos impacted soils shall be transported to a designated stockpile area for storage prior to placement within the containment cell.
- Any asbestos impacted materials that are proposed to be stored on site must be kept damp and covered with durable geo-textile covers (or equivalent) if they are to remain on site for period of more than 24 hours.

- The Old Hospital Building Footprint shall be excavated to a depth of 0.5 m below ground surface, or to a depth defined during the data gap assessment.
- Once a clean surface is achieved, the remediation consultant shall inspect the excavation surface to confirm the presence or absence of visible ACM. Once satisfactorily completed, the remediation consultant shall collect 500mL soil validation samples and appropriate QA/QC samples in accordance with the asbestos validation program (**Section 8, Table 8.2**).
- Validation of the excavation shall be achieved once all validation samples and associated quality assurance samples return results that are below the adopted HIL-B threshold of 0.001% w/w.
- Where validation samples are reported as exceeding the adopted HIL-B threshold, additional excavation in the identified area shall be undertaken and then additional inspections completed and validation samples collected by the remediation consultant (as outlined in previous points and **Table 8.2**).
- Where friable asbestos is detected in validation samples, but below the adopted HIL-B threshold, site workers will be required to maintain levels of PPE outlined in **Section 7.6.2** for the remaining works to protect against potential asbestos exposure hazards.

7.6.3.2 Stage 2 Containment Cell Construction

The location and dimensions of the proposed containment cell are yet to be confirmed.

The containment cell must be constructed to a depth that allows for below ground services to be installed above the cell if required.

Once the location and dimensions of the containment cell are finalised and approved the following requirements for the containment cell excavation and construction works must be considered:

- Excavated natural materials generated during the construction of the containment cell shall be stored on site for potential reuse. Excess materials may be reused in other areas of the site if deemed suitable by the remediation consultant, or can be recycled to external sites if they are deemed to meet the definition of Virgin Excavated Natural Materials (VENM) as defined in POEO 2014, or satisfies the requirements of the NSW EPA *Excavated Natural Material Order* (2014). Alternatively, any excess excavated materials must be appropriately classified in accordance with NSW EPA Waste Classification Guidelines 2014 (EPA 2014) prior to off site disposal.
- Following the excavation of the containment cell, a geofabric marker layer/s shall be installed to containment cell walls and base to delineate the extent of contained friable asbestos impacted fill materials.
- The marker layers shall consist of a bright orange coloured (or other colour readily distinguished from underlying and overlying materials) non-woven polyester continuous filament or PET (such as nonwoven geotextiles) or similar with a minimum density of approximately 150 grams per square metre (or equivalent). The marker layer must:
 - Be easily recognisable within soils (i.e., bright orange in colour);
 - Be durable as a long term marker layer (i.e., > 150 grams per square metre); and
 - Maintain integrity during remedial/civil works such as capping layer installation and road/building construction.

- The remediation consultant shall inspect and document the installation of geofabric marker layers to the containment cell for inclusion into site validation reporting requirements (**Section 8.6**),
- The specific details of the marker layer are required to be included in the site validation report and LTEMP documents (**Section 8.6.2**) in addition to surveyed plans showing the location and extent of the containment cell within the site.
- Validation of the containment cell arrangements will be required as outlined in **Table 8.2**, including inspections by the Remediation Consultant, a survey plan prepared by a registered surveyor showing the level and lateral extent of the marker layer, interim capping and permanent capping in relation to the site boundaries.

It is noted that the volume of contaminated materials required to be placed within the containment cell may vary based on the results of the data gap assessment, consequently containment cell capacity may be required to be varied.

7.6.3.3 Stage 3 – Containment of Friable Asbestos Impacted Materials

Once the containment cell has been constructed and geofabric marker layers installed to excavation walls and base and the remediation consultant has approved its use, the friable asbestos impacted materials may be placed into the containment cell.

A summary of the required works for the placement of friable asbestos impacted materials is as follows:

- If feasible, an asbestos works area should be defined for the duration of the friable asbestos placement works encompassing the stockpiled friable asbestos material location, any proposed travel routes and the containment cell.
- The Class A contractor shall have total control of the asbestos work area for the duration of the friable asbestos placement works and shall undertake all works in accordance with the requirements of their Class A licence.
- The remediation consultant shall undertake airborne asbestos fibre monitoring for the duration of the friable asbestos impacted materials containment works.
- All personnel entering the asbestos works area shall do so through the decontamination area and don the required PPE at all times when within the asbestos works area.
- The friable asbestos stockpiled materials shall be kept damp by water spraying at all times during disturbance to reduce the possibility of dust generation.
- Friable asbestos stockpiled materials shall be loaded into appropriate vehicles via excavator. Vehicles shall transport friable asbestos materials to the containment cell via designated routes.
- Friable asbestos impacted materials shall be either tipped directly into the containment cell by vehicles or stockpiled adjacent the containment cell and installed via excavator.
- Any areas where friable asbestos impacted materials are stockpiled on clean soils, shall require clearance and validation of footprint areas following their removal in accordance with **Section 8.3**.
- Compaction testing and assessment requirement may need to be addressed intermittently throughout the placement of friable asbestos impacted materials.
- Once all friable asbestos impacted materials have been placed into the containment cell, or when the containment cell has reached capacity (whichever occurs first), the geofabric

marker layer shall be installed overlying the friable asbestos impacted materials. Asbestos control measures can be removed once the overlying geofabric layer has been installed and approval/clearance has been provided by the remediation consultant.

- Previously excavated natural materials from the containment cell construction shall then be installed overlying the encapsulated friable asbestos impacted materials to levels required.

8. Validation Plan

8.1 Overview

Validation data is required to be collected to verify the effectiveness of the remedial works and document the final site conditions as being suitable for the proposed future use as a health care facility.

The following sections establish the Data Quality Objectives (DQOs) to be adopted during validation of the site remediation works.

8.2 Data Quality Objectives

Data Quality Objectives (DQO's) have been developed for the site validation and are discussed in the following sections.

8.2.1 State the Problem

The site is proposed to continue use as a health care facility. Previous investigations, as detailed in **Section 3**, have identified friable asbestos in fill materials and an isolated occurrence of lead and B(a)P contamination in soil requiring remediation/management.

8.2.2 Identify the Decision

The following decisions are required to be made during the validation works:

- Have identified lead and B(a)P impacted soils been successfully removed from the site?
- Have identified friable asbestos impacted soils been successfully excavated from identified locations?
- Have friable asbestos impacted soils been successfully contained within containment cell in accordance with RAP requirements?
- Have waste materials been suitability classified and lawfully disposed?
- Are analytical data generated by the validation works reliable?
- Is a Long Term Environmental Management Plan required?
- Is the site suitable for the proposed future land use?

8.2.3 Identify Inputs to the Decision

The inputs to the decision are:

- Field observations, sampling and analytical data for off-site disposal of waste materials;
- Observation and photographic log of containment cell construction;
- Observation and photographic log of friable asbestos impacted soils placement and encapsulation within containment cell;
- Survey of containment cell vertical and lateral extents;
- Field observations, sampling and analytical data for imported materials;
- Field observations, sampling and analytical data of any unexpected finds;
- Documentation of appropriate classification of imported materials;
- Documentation of appropriate classification and disposal of exported waste materials;

- Environmental monitoring data to demonstrate that potential airborne pollutants as generated by the handling of environmentally impacted materials on the site has not impacted off-site locations; and
- Data quality indicators as assessed by quality assurance/quality control (QA/QC).

8.2.4 Define the Study Boundary

The study boundaries of the site are defined as follows:

- The lateral extent of the works relevant to this RAP as defined by the remedial areas on **Figure 5 & 6** and from the completed data gap assessment; and
- The vertical extent of the works is defined as the depth of impacted fill soils in specific locations as detailed in **Section 7.5**, and from the completed data gap.

8.2.5 Develop a Decision Rule

Analytical data will be initially assessed against EPA published / endorsed criteria for constituents of concern:

- NSW EPA (2017), Guidelines for the NSW Site Auditor Scheme 3rd Edition, October 2017;
- NEPC (2013), National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999; and
- NSW EPA (2014) Waste Classification Guidelines. Part 1: Classifying Waste, November 2014.

The decision rules adopted to answer the decisions identified in **Section 8.2.2** are discussed below.

Have identified lead and B(a)P impacted soils been successfully removed from the site?

The identified lead and B(a)P impacted soils associated with the previous sampling location HA10 must be excavated and removed from the site. Results of laboratory analysis of soil samples collected from the base and walls of resultant excavations shall be assessed against adopted health based criteria (HIL-B) as presented in **Table 8.3**.

Generally, if an excavation validation sample exceeds the criteria, further remediation (by excavation of soils) and subsequent validation of the affected area may be required.

If an elevated sample only slightly exceeds the criteria, is an isolated occurrence and there are no visual indications to suggest extensive contamination, statistical methods (such as the 95% UCL of the arithmetic mean) may be used to determine if the excavation has been adequately validated.

Have identified friable asbestos impacted soils been successfully excavated from identified locations?

The identified friable asbestos impacted soils associated with the Old Hospital Building and Robinson House must be excavated in preparation for placement within the containment cell. Results of laboratory analysis of soil samples collected from the base and walls of resultant excavations shall be assessed against adopted health based criteria (HIL-B) as presented in **Table 8.3**.

Generally, if an excavation validation sample exceeds the criteria, further remediation (by excavation of soils) and subsequent validation of the affected area may be required.

Have friable asbestos impacted soils been successfully contained within containment cell in accordance with RAP requirements?

The friable asbestos impacted materials must be placed within the constructed containment cell and appropriately encapsulated with a marker layer and overlying concrete surfaces (car park slab). The vertical and lateral extents of the marker layer should be surveyed along with consistent and comprehensive photographic evidence.

Have waste materials been suitably classified and lawfully disposed?

All waste requiring off-site disposal must be suitably characterised and classified in accordance with *Waste Classification Guidelines* (EPA 2014), and disposed to appropriately licensed waste disposal facilities. The Remediation Contractor will be required to provide all waste tracking and disposal documentation for wastes removed from the site, including individual tipping dockets.

Are analytical data generated by the validation works reliable?

If the analytical data meets the Data Quality Indicators established in **Section 8.2.8**, then the analytical data are considered to be reliable.

All other data, such as visual observations, photographic logs and surveys will be qualitatively assessed to ensure they contain sufficient information to inform the validation report.

Is a Long Term Environmental Management Plan required?

A suitable Long Term Environmental Management Plan (LTEMP) is required at the site due to the containment and management strategy of residual asbestos impacted fill materials within the containment cell. A LTEMP will detail the management strategies required to ensure the long-term integrity of the containment cell, such as accidental penetrations and required controls for scheduled works within the containment cell.

Is the site suitable for the proposed open space use?

The site will be considered suitable for the proposed use if the following conditions are met:

- Remediation works have been completed in accordance with this RAP;
- The containment cell has been appropriately constructed, encapsulated and documented;
- Waste materials have been suitably characterised and lawfully disposed;
- Analytical data generated is considered reliable; and
- A suitable Long Term Environmental Management Plan will be implemented at the site.

8.2.6 Specify Limits of Decision Error

A qualitative assessment shall be undertaken of potential decision errors associated with the data, in accordance with the provisions in NEPC 2013.

8.2.7 Optimise the Design for Obtaining Data

The validation sampling design for each specific type of validation works anticipated is discussed in detail in **Section 9.3**. The general sampling methodologies are discussed below.

8.2.7.1 Soil Sampling Methodology

Soil sampling will be conducted by the Remediation Consultant. The soil sampling method shall be determined by the Remediation Consultant as consistent with the observations of the site sub-surface and appropriate to generate representative samples. The soil sampling method shall be consistent with the data quality indicators in **Section 8.2.8**.

8.2.7.2 Soil Sample Containers

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination shall be noted on field reporting sheets / field logs.

Collected soil samples shall be immediately transferred to sample containers of appropriate composition (glass jars) fitted with Teflon sealed lids for chemical analysis (lead and B(a)P).

Minimum 500 mL samples shall be collected and placed in new zip lock bags where asbestos analysis is required.

Sample labels shall record sample identification number and date and time of sampling. Sample containers shall be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form shall be completed and forwarded with the samples to the testing laboratory.

8.2.8 Quality Assurance/Quality Control

To demonstrate the effectiveness of the remedial works, validation sampling, inspections and analysis will be conducted. The quality of the validation data must be sufficient to draw conclusions regarding the suitability of the site. Hence, the quality assurance / quality control (QA/QC) program employed as part of the remediation works will involve pre-determined data quality indicators (DQIs).

The DQIs are summarised following and in **Table 8.1**:

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is normally assessed by calculating the Relative Percent Difference (RPD)⁸ of duplicate samples. However, this calculation is not applicable due to the presence/ absence nature of asbestos, and as such, the agreement between the sample pairs will be assessed instead.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples, ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

$$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

8

Where C_o is the analyte concentration of the original sample
C_d is the analyte concentration of the duplicate sample

- **Sensitivity** - expresses the appropriateness of the chosen field and laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 8.1: Summary of QA/QC Control Program

Table 01: Summary of QA/QC Control Program		
Data Quality Indicator	Frequency	Data Quality Acceptance Criteria
Precision		
Blind duplicates (intra laboratory)	1 / 20 samples	<50% RPD or agreement between asbestos presence/absence
Blind duplicates (inter laboratory)	1 / 20 samples	
Accuracy		
Surrogate spikes	All organic samples	70-130%
Matrix spikes	NA for asbestos analysis. Otherwise 1 per lab batch.	70-130%
Representativeness		
Sampling appropriate for media and analytes	All Samples	All Samples
Samples extracted and analysed within holding times.	-	NA for asbestos, organics (14 days), inorganics (6 months)
Trip spike	1 per sampling event targeting volatiles	70-130% recovery
Trip blank		<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All samples
Standard analytical methods used for all analyses	All Samples	All samples
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples
Limits of reporting appropriate and consistent	All Samples	All samples
Completeness		
Soil description and COCs completed and appropriate	All Samples	All samples
Appropriate documentation	All Samples	All samples
Satisfactory frequency and result for QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Field and analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	All Samples	LOR < Site assessment criteria (where possible)

If the RPD between duplicates is greater than the pre-determined DQI, a judgement will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field. For asbestos agreement, the highest concentration of the primary, duplicate or triplicate will be recorded as the result for that sample location, thus eliminating any non-conformance between primary, duplicate and triplicate samples.

8.3 Validation Inspections, Sampling and Analyses

8.3.1 Overview of Validation Sampling

The proposed soil validation sampling, quantification and analytical program is outlined in Table 8.2.

Table 8.2: Validation Sampling and Analytical Plan

Validation Area	Sampling Frequency	Analytes
Lead and B(a)P impacted hotspot (HA10)	1 sample per 10 m linear excavation face. 1 sample per 20 m ² excavation base.	Lead B(a)P
Old Hospital Building footprint area	1 sample per 10 m linear excavation face per 0.5 m depth of excavation. 1 sample per 100 m ² from the base of excavation.	Asbestos (500mL)
Robinson House footprint area	1 sample per 10 m linear excavation face per 0.5 m depth of excavation. 1 sample per 100 m ² from the base of excavation.	Asbestos (500mL)

8.3.2 Containment Cell Inspection and Survey

Visual inspection will be undertaken by the Remediation Consultant to verify the placement of friable asbestos impacted materials within the containment cell and placement of overlying marker layer. Photographic records and a survey of the marker layer installation, including vertical and lateral extents by the Contractor, will be retained for inclusion in the validation report.

8.3.3 Capping Layer Validation

It is proposed that the containment cell will be overlayed with approximately 1.0 m of previously excavated natural soils generated during the containment cell excavation. This can also include any required sub slab drainage or installation materials associated with the proposed car park.

Photographic records and a survey of the capping layer installation, which details the final thicknesses of the capping layer, including the surveyed vertical and lateral extents by the Contractor, will be retained for inclusion in the validation report.

8.3.4 Waste Disposal Off-site

All wastes requiring off-site disposal must be classified in accordance with *Waste Classification Guidelines* (EPA 2014). The Contractor is responsible for the lawful disposal of the classified waste to a licensed waste disposal facility lawfully able to accept the waste.

Disposal dockets for each individual off-site waste disposal load must be provided to the Principal and to the Remediation Consultant by the remediation Contractor to demonstrate appropriate off-site disposal of waste occurred for site validation purposes. The Contractor must advise the Consultant of the disposal facilities for all waste loads prior to removal.

8.4 Soil Validation Criteria

The site is proposed to be redeveloped for ongoing use as a hospital facility.

The hospital land use represents a scenario that does not fall under the standard health investigation land use scenarios presented in NEPM (2013). Schedule B7 of NEPM (2013) states “the HILs developed for the commercial/industrial land use scenario are not applicable to a site used frequently by more sensitive groups such as children (within childcare centres, hospitals and hotels) and the elderly (within hospitals, aged care facilities and hospices).” Given that children, elderly and other sensitive sub-populations (such as patients with immunosuppression and pre-existing illness) are frequent users of the site, a more sensitive land use scenario is required to be adopted. To this extent, the HIL B – standard residential land use scenario with minimal opportunities for soil access has been adopted as one of the validation criteria for all COPCs except asbestos for the site.

As such, based on the proposed land use and in accordance with the decision process for assessment of urban redevelopment sites (DEC 2006), concentrations will be compared, where required, against published levels as presented in **Tables 8.3**, sourced from the following:

- Health Investigation/screening Levels (HIL/HSLs) for residential with minimum opportunities for soil access – NEPC 2013, HIL/HSL-B;
- Generic and derived ecological investigation/screening levels (EIL/ESLs) based on NEPC (2013) for urban residential and public open space, noting these will not be applicable to areas beneath hardstand or other areas where uptake by ecological receptors such as plants is unlikely;
- Given the typically sand based fill materials / soils, coarse soil criteria will be used in the HSLs/ESLs. Management Limits may also be referenced where appropriate.
- Where there are no NSW EPA endorsed thresholds the laboratory limit of reporting (LOR) has been adopted as an initial screening value for the purposes of this assessment.
- In addition to the numerical criteria, consideration shall be given to the presence of soils that are odorous or discoloured as a result of contamination, contain visible ACM, excessive extraneous material, for qualitative aesthetic purposes.
- Where required, results will be statistically assessed in accordance with the method summarised in **Section 8.6**.

Table 8.3: Adopted Soil Validation Criteria

Constituent	Limit of Reporting	Laboratory Method	Health Investigation / Screening Levels: HIL B (mg/kg)	Ecological Investigation / Screening Levels: (mg/kg)
Heavy Metals				
Lead	5 mg/kg	ICP-AES (USEPA 200.7)	1200	1,480
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as B(a)P TEQ)	-	-	4	-
Total PAHs	0.5 mg/kg	-	400	-
B(a)P	0.5 mg/kg	GCMS (USEPA8270)	-	0.7
Asbestos				
ACM	0.01 % w/w	N/A	0.04 % w/w	-
FA/AF	0.001 % w/w	PLM / Dispersion Staining	0.001 % w/w	-

8.5 Application of Soil Criteria

For soil to be considered as validated (i.e., not posing an unacceptable risk) all reported concentrations are below the site remediation criteria. For chemical analysis the following statistical criteria shall be adopted with respect to the health based criteria:

- 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 concentration shall exceed 250% of the adopted criterion; and
- The standard deviation of the results must be less than 50% of the criterion.

8.6 Validation Reporting

8.6.1 Validation Report

The validation report shall be prepared by the Remediation Consultant written in general accordance with *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, NSW Office of Environment and Heritage (OEH 2011).

The validation report should contain information including:

- Results of previous investigations conducted at the site;
- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RAP have been achieved, in particular the validation data and assessment of the data against both the pre-defined data quality objectives 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 any requirements for ongoing monitoring / management.

8.6.2 Long Term Environmental Management Plan

In addition to the requirements of the validation plan, the proposed containment strategy will require long term management following completion of the redevelopment.

The LTEMP is required to document the following elements:

- A statement of the objectives of the LTEMP – i.e., to ensure continued suitability of the site following remediation.
- Identification of residual environmental contamination issues at the site that require ongoing management/monitoring to meet the LTEMP objectives, including the type of contamination and location within the site (including a survey plan prepared by a registered surveyor).
- Documentation of environmental management measures which have been implemented to address the identified environmental issues at the site.
- Description of management controls to limit the exposure of site users to known areas of contamination to acceptable levels.
- Description of responsibilities for implementing various elements of the provisions contained in the LTEMP.
- Timeframes for implementing the various control/monitoring, etc. elements outlined in the LTEMP.
- Environmental monitoring and reporting requirements (if required) for the future management of environmental impact underlying the site including:
 - Appropriate monitoring locations and depth within and down-gradient of any residual contamination;

- Relevant assessment criteria to be used in evaluating monitoring results;
 - Frequency of monitoring and reporting;
 - Process for reviewing monitoring data and how decisions will be made regarding the ongoing management strategy; and
 - The length of time for which monitoring is expected to continue.
- Health and safety requirements for particular activities;
- A program of review and audits;
- The provisions in the LTEMP are feasible (i.e., able to be implemented) and able to be legally enforceable (i.e., a mechanism exists, such as development consent conditions, to give the plan a basis in law); and
- The relevant consent authority is satisfied that the inclusion of a development consent condition relating to the implementation of the LTEMP is acceptable.
- Corrective action procedures to be implemented where LTEMP assessment criteria are breached.

9. 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 with 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 **Sections 10** and **11**.

9.1 Unexpected Finds Protocol

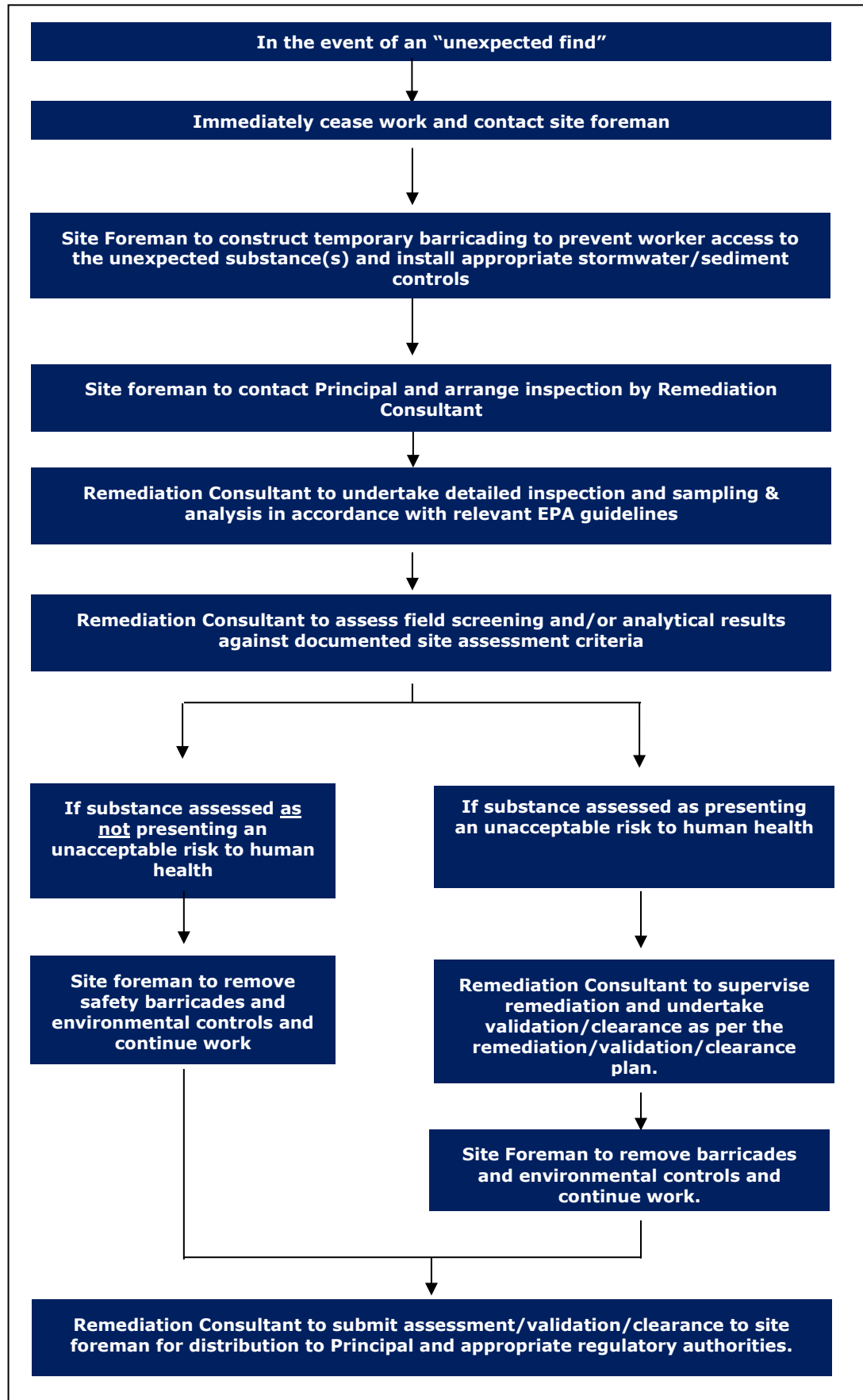
It is acknowledged that previous investigations of the site have been undertaken to assess the identified contaminants of potential concern in selected parts of the site. However, data gaps have been identified that are proposed to be investigated during the remedial works program, ground conditions 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 (presented in **Appendix B** for use on-site):

- >10 m² of ACM fragments encountered in one location (visible) outside the extent of known asbestos impacted fill materials;
- Friable ACM such as lagging (visible) encountered outside of the extent of known asbestos impacted fill materials;
- bottles / containers of chemicals (visible);
- construction / demolition waste (visible);
- ash and/or slag contaminated soils / fill materials (visible);
- petroleum contaminated soils (odorous, staining / discolouration visible) beyond the identified impact, or at levels that prevent off-site disposal without treatment; and
- volatile organic compound contaminated soils (odorous).

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 in **Flowchart 10.1** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use on-site, should be posted in the Site Office and referred to during the site specific induction by the Contractor.

Flowchart 10.1 – Unexpected Finds Protocol



9.2 Contingency Scenarios

9.2.1 Remedial Strategy Constraints

In the event that the proposed remedial works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed, the following actions will be considered to ensure, firstly, the safety and health of people and the environment and, secondly, that the overall project objectives are achieved:

- Reassessment of remedial and validation options for AF/FA contaminated soils; and
- Continued controlled excavation of potential impacted soils.

9.2.2 Containment of Asbestos Contaminated Soils

Given the known distribution of asbestos impacted and contaminated fill across the site, any observed or detected asbestos contaminated soils outside of the area of known or suspected distribution will constitute an unexpected find to be managed under the procedure detailed in **Section 8.1**. Alternate containment locations and arrangements may require assessment, such as beneath open space / landscaped areas or other structures.

If asbestos impacted soils cannot be capped due to timing, staging or volume constraints, then off-site disposal, as detailed in **Table 6.1**, is considered a suitable alternative for a contingency plan.

9.2.3 Material Storage Breach

In the event any stockpiled or capped materials escape (or have the potential to escape), then the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and any improvements implemented. Given the current approach is to contain only asbestos-impacted material, which is immobile in the subsurface, a breach of containment is considered unlikely.

9.2.4 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, patients and staff members relating to environmental emissions including:

- Dust emissions arising from asbestos contaminated soil excavation, material handling, transport, placement and capping; and
- Noise and vibration from excavation.

Monitoring of environmental emissions shall be undertaken as detailed in **Section 10.9** 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
- Increasing environmental controls including covering and/or wetting down soils which are generating dust.

9.2.5 Lack of Available Space

The proposed friable asbestos remedial works have the potential to be hindered by available temporary storage space for excavated materials while the containment cell is constructed.

In the event that temporary storage of excavated materials becomes difficult, works should cease until an appropriate management plan can be developed to appropriately manage and store excavated materials safely until the containment cell is constructed.

9.2.6 Severe Weather

Weather will be monitored on a daily basis via checking an internet based weather service provider. Should severe weather be forecast, especially strong winds, works will stop until safe to re-commence. All site management controls will be implemented to the extent practicable as outlined in **Section 10** prior to any severe weather events.

9.2.7 Odours from Works

Based on the nature of the identified contaminants, off-site odour complaints are considered unlikely. Where complaints occur, the following will be undertaken:

- Installation of an odour screening / masking system at the remediation area boundaries; and/or
- Disturbance of soils during meteorologically favourable periods only; and/or
- The use of odour suppressant additives to water used to keep impact soils/ stockpiles moist; and or
- Covering of impacted soils.

10. Site Management Plan

The site management plan is largely based on the City of Wagga Wagga *Contaminated Land Policy* and other relevant policies and guidelines. This section contains procedures and requirements that are to be implemented as a minimum requirement during the remedial works at the site.

10.1 Hours of Operation

Wagga Wagga City Council permits remediation works to be conducted at the following times:

- Monday to Saturday: 7am to 5pm.
- Sunday and public holidays: No work permitted.

10.2 Soil and Water Management

An Erosion and Sediment Control Plan (ESCP) shall be prepared and submitted to City of Wagga Wagga Council for approval prior to remediation works commencing onsite. The ESCP shall be developed with regard to the requirements detailed in Council's Soil and Water Management Policy and Council's Engineering Guidelines and Technical Specifications (refer to City of Wagga Wagga Council *Contaminated Land Policy*).

Sediment control structures shall be provided to prevent sediment entering drainage systems particularly where surfaces are exposed or where soil is stockpiled.

All erosion and sediment control measures must be maintained in a functional condition throughout the remediation works.

10.3 Stockpile Management

All materials stockpiled onsite will be managed by the Contractor. The following procedures will be implemented by the Contractor:

- No stockpiles of soil or other materials shall be placed on footpaths or nature strips unless prior Council approval has been obtained;
- All stockpiles of soil or other materials shall be placed away from drainage lines gutters or stormwater pits or inlets;
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered (where practical);
- All stockpiles of chemically contaminated soil shall be stored in a secure area and be covered if remaining more than 24 hours (where practical); and
- All stockpiles of asbestos contaminated soils shall be kept damp and covered to minimise potential fibre release, and if left for more than 24 hours, be stored in a secure area (where practical).
- Bunding of stockpiled contaminated materials shall be installed to prevent migration of contaminants into drainage/stormwater.

10.4 Site Access

All vehicle access to the site shall be stabilised to prevent the tracking of sediment onto the roads and footpaths. All materials must be removed from the roadway on a daily or as required basis. Soil washings from wheels shall be collected and disposed of in a manner that does not pollute waters. Any personnel, equipment, plant or vehicles that enter an asbestos works zone must be appropriately decontaminated prior to exiting.

10.5 Excavation Pump-out

Any excavation pump out water shall be sampled by the consultant for analysis for total suspended solid concentrations, turbidity, pH and the identified contaminants of concern prior to release to stormwater with permission from Council, sewer (only if trade waste permit obtained) or licensed liquid waste Contractor.

Excavation pump out from trenches is not anticipated with the general remediation works given the general remedial plan of minimising ground disturbance and groundwater anticipated as being at a depth greater than 6 m bgs. Pump out following accumulation of surface water is the most likely scenario for water disposal.

10.6 Landscaping / Rehabilitation

All exposed soils shall be progressively stabilised and revegetated or resealed on the completion of remedial works.

10.7 Noise

Remediation work shall not give rise to 'offensive noise' as defined in the *Protection of the Environment Operations* (POEO) Act 1997. All equipment and machinery associated with the remediation work shall be operated by the Contractor in accordance with the POEO Act 1997 and its *Noise Control Regulations 2000*.

The remediation works shall comply with the NSW EPA's *Environmental Noise Control Manual* for the control of noise from construction sites which specifies that:

- For a cumulative period of up to 4 weeks, the noise level as measured by the LA10 (15 minute) emitted by the works to specific residences should not exceed the background noise level, LA 90 (15 minute), by more than 20dB(A).

It is assumed that noise monitoring will already be being undertaken as part of the Stage 3 redevelopment works.

All machinery and equipment used on site will be in good working order and with the fitted with appropriate silencers when necessary.

10.8 Vibration

The use of plant and machinery by the Contractor shall not cause vibrations to be felt or capable to be measured at any premises.

10.9 Air Quality

During remedial works, dust emissions and any odours will be confined within the site boundary. This will be assessed by a program of air monitoring undertaken by the consultant for all remediation works and implemented by air emission controls as required by the Contractor. Air monitoring requirements are summarised in this section. General procedures to be considered as a minimum by the Contractor to reduce levels of airborne dusts / fibres and odours are discussed in **Sections 10.9.1 and 10.9.2**.

10.9.1 Airborne Asbestos Fibre Monitoring

Airborne asbestos fibre monitoring will be conducted by a Licensed Asbestos Assessor (LAA, as per SafeWork NSW requirements) in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres – 2nd Edition* [NOHSC 3002:2005]. The LAA shall undertake airborne asbestos fibres monitoring at a minimum of six static locations daily during

remediation works that will disturb asbestos impacted or contaminated materials. Monitoring locations will include site perimeter locations and downwind locations of proposed work areas.

Air filters shall be analysed by a NATA accredited laboratory and results shall be required to be below 0.01 fibres/mL.

If respirable asbestos fibres are confirmed and present between 0.01 and 0.02 fibres/ml, the following controls must be implemented by the remediation contractor, in accordance with SWA 2016a:

- Review control measures;
- Investigate the cause; and
- Implement controls to eliminate or minimise exposure and prevent further release.

If respirable asbestos fibres are confirmed and present above 0.02 fibres/mL, the following controls must be implemented by the licensed asbestos removalist, in accordance with SWA 2011:

- Stop work;
- Notify SafeWork NSW by phone, then by fax or written statement that work has ceased;
- Investigate the cause;
- Implement controls to eliminate or minimise exposure and prevent further release; and
- Do not recommence removal work until further air monitoring is conducted and fibre levels are detected below 0.01 fibres/ml.

A daily report air monitoring report will be prepared documenting the previous/same days airborne asbestos fibre air monitoring results. This report will be made available to all relevant stakeholders and site workers.

10.9.2 Dust Control

During the remedial works, as necessary, excavation areas will be wetted down using a water spray to minimise the potential for dust to be generated by the Contractor. A wetting or bonding agent may be used to further bind the soil to minimise asbestos fibre release.

All asbestos impacted soils must be wetted (but not flooded) prior to and during excavation and movement of the soils. To control dust in significant areas of exposed asbestos contaminated fill, industrial misting fans, placed at the outer extents of remedial/excavation areas, must be utilised by the Contractor.

Meteorological conditions will be monitored by the Remediation Consultant and Contractor. Remedial work will be stopped or modified where meteorological conditions are adverse (i.e., dry conditions and strong winds towards sensitive receptors).

Plant and vehicles should limit their speed when working within asbestos exclusion zones and only traverse wetted haul roads. Only essential vehicles are permitted to traverse the asbestos exclusion zone.

10.9.3 Odour / Volatile Emissions Control

No odours should be detectable at the site boundary and volatile emissions of other potentially volatile substances shall be controlled. Appropriate actions will be taken by the Contractor to reduce the odours, which may include: increasing the amount of covering of excavations / stockpiles; mist sprays; odour suppressants; and maintenance of equipment.

Records of volatile emissions and odours shall be kept by the Contractor. Equipment and machinery will be adequately maintained to minimise exhaust emissions. No materials shall be burnt on the site

10.9.4 Staging of Asbestos Disturbance Works

Where practicable, asbestos disturbance works will be conducted exclusively (i.e., with no other dust generating earthworks occurring simultaneously) with the application of a marker layer/s as soon as practicable subsequent to site levels being achieved.

The objective of this is to separate all potential asbestos and non-asbestos dust generating activities so appropriate levels of control can be implemented for each type of activity.

10.10 Transport of Material Offsite

Trucks will be loaded in designated areas. The Contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

The Contractor shall also log truck movements and approximate volume, via registration number and consignment number (where applicable), into and out of the site.

All appropriate road rules shall be observed and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

Plant and vehicles should limit their speed when working within asbestos exclusion zones and only traverse wetted haul roads.

10.11 Hazardous Materials

Hazardous and / or intractable wastes arising from the remediation work shall be removed and disposed of in accordance with the requirements of NSW EPA, SafeWork NSW and the relevant regulations by the Contractor.

In particular, any hazardous wastes will be transported by a NSW EPA licensed transporter.

10.12 Disposal of Contaminated Soil

All soils will be classified, managed and disposed in accordance with the *Waste Classification Guidelines* (EPA 2014). Documentary evidence for all soil disposal shall be kept for inclusion in the Validation Report/s.

It is required under the *Protection of the Environment Operations (Waste) Regulations 2014* (POEO Reg 2014) to record the movement of all loads of more than 100 kg of asbestos waste or more than 10 m² of asbestos sheeting. Each load will be assigned a unique consignment code to allow NSW EPA to monitor their movement from site of generation to disposal.

In addition, the *proximity principle*, under POEO Reg 2014, makes it an offence to transport waste generated in NSW by motor vehicle for disposal more than 150 kilometres from the place of generation, unless the waste is transported to one of the two nearest lawfully disposal facilities to the place of generation.

10.13 Imported Fill

Any materials imported on site by the Contractor to re-establish ground levels or to be applied as a capping layer must be validated, environmentally suitable material (i.e. VENM, ENM or other, as described in **Section 9.2.5**). Additionally, the imported fill should also be compatible with required geotechnical constraints and the existing soils characteristic for site drainage purposes.

10.14 Groundwater

It is anticipated no dewatering will be required for the remediation works, given the depth to groundwater is anticipated to be greater than 6 m. If dewatering is required as part of the remediation works, a licence shall be applied for from the Office of Water for approval to extract groundwater. Additional local requirements may also apply given the groundwater in this area is identified by the Wagga Wagga LEP 2010 as being a sensitive natural water resource.

10.15 Site Signage and Contact Numbers

A sign/s shall be displayed adjacent to the site access point/s throughout the duration of the works with the contact details of the Contractor and project manager as provided and maintained by the Contractor.

10.16 Site Security

The remedial areas shall be secured against unauthorised access by means of an appropriate fence or barricade by the Contractor. All persons working in asbestos remedial areas must be inducted, have undertaken required training and don appropriate PPE. The access gates will be locked at all times when remedial works are not occurring.

10.17 Community Consultation

The client will be responsible for any community consultation that may be required in relation to the remediation works.

11. Health and Safety Management Plan

11.1 Overview

This health and safety plan contains procedures and requirements that are to be implemented as a minimum during the remediation works.

The objectives of the health and safety plan are:

- To apply standard procedures that reduce risks to acceptable levels resulting from the remedial works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards and mandatory safety practices and procedures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

This health and safety plan does not provide safety information specific to construction and other demolition or excavation activities carried out by contractors, such as the safe operation, maintenance and inspection of plant, etc. Contractors will be required to prepare their own Safe Work Method Statements for their work activities. All parties working on the site shall comply with all applicable Health and Safety legislation, regulations, codes and guidelines.

11.2 Responsibilities

Remediation Contractor

The Remediation Contractor is responsible for ensuring that the work is carried out in accordance with the health and safety plan. This will include:

- Ensuring a copy of the health and safety plan is available at the site during the remediation/validation activities;
- Confirming individuals are competent in performing allotted tasks;
- Liaison with the contractor representatives, as appropriate, regarding safety matters; and
- Investigation and reporting of incidents and accidents.

Other Members of the Site Workforce

Every individual worker is responsible for conducting their allocated tasks in a safe manner and in accordance with their training and experience. They must give due consideration to the safety of all others in their proximity and cooperate in matters of health and safety. All workers must leave their work areas in such a condition that the location will not be hazardous to others at any time.

11.3 Hazards

The known or potential hazards associated with the remedial work activities are listed below:

- inhalation hazards associated with the presence of asbestos.

- physical hazards, including:
 - work in or near excavations;
 - operating machinery;
 - heat stress and UV exposure;
 - underground or overhead services;
 - manual handling;
 - fauna; and
 - noise.

In the event of the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated, or of any new hazard that could potentially cause serious harm to personnel or the environment, work will be suspended until the client, Remediation Contractor and Remediation Consultant have been notified and appropriate instructions have been provided to field personnel.

11.3.1 Inhalation Hazards

The main inhalation hazards from the remediation/validation works are consequent of the presence of asbestos. Measures are required to be put in place to prevent/ minimise the generation of airborne fibres. These have been described in the environmental controls for the works. Where there is a potential for airborne emissions to be generated, PPE shall be required to be worn to prevent potential exposure, as described in **Section 9.4**.

11.3.2 Physical Hazards

Operating Machinery

Heavy plant and equipment operating in the vicinity of field personnel presents a risk of physical injury. Personnel should be cognisant of their position in relation to operating machinery at all times.

Never walk behind or to the side of any operating equipment without the operator's knowledge. Do not assume that the operator knows your position. Personnel should stay at least 1 m from the operational area of heavy equipment and should not stand directly below any load or piece of equipment (e.g. excavators).

All persons onsite are to wear high-visibility upper body clothing at all times.

Work In or Near Excavations

No deep excavations are anticipated for the remedial works. All excavations greater than 1.5m in depth shall be shored, sloped or otherwise constructed so as to minimise the potential for collapse.

Cuts and Abrasions

The manual work associated with the remediation works may give rise to the risk of cuts and abrasions to personnel working in the area. As well as the direct consequences of any cut or abrasion, such injuries can lead to the possibility of exposure to contaminants through the wound as well as diseases such as tetanus. To minimise the risk of direct or indirect injury, personnel will wear the personal protective equipment (PPE) described in **Section 9.3**.

Heat Stress and UV Exposure

Site personnel may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the type of work and the time of year.

In addition to heat stress, overexposure to UV radiation in sunlight can result in sunburn to exposed skin. The use of a high protection sunscreen (SPF30+ or greater) on all exposed skin is recommended. Sunscreen should be applied at least 20 minutes prior to the commencement of work and re-applied at least every two hours or more frequently if perspiring.

Hats (including hard hats in specified areas) will also provide additional sun protection during the peak (i.e. 10:00 am to 3:00 PM) sun period. Sunglasses should be worn (where appropriate) to protect eyes from effects of UV exposure.

Underground Services

There is the potential for underground services (electricity, natural gas lines, water, telephone, sewer, and stormwater) to be present beneath the work area. The Contractor shall ensure that appropriate procedures will be taken to minimise the risk associated with excavation near services.

Aboveground Electrical Hazards

All electrical plant and equipment must comply with the requirements of Australian Standard AS 3000. Hand held portable tools shall comply with AS/NZS 3160 "*hand-held portable electric tools*" and shall be double insulated. Cord connected portable hand lamps shall comply with AS/NZS 3118. A Residual Current Device (RCD) shall protect plug-in portable equipment, which is connected to a supply above Extra Low Voltage - 12-24volts (including equipment supplied from a generator or welding set). RCD protection shall be provided during maintenance of portable electrical equipment at all times while the equipment is connected to a power supply above Extra Low Voltage, irrespective of whether power is switched ON or OFF. RCD's shall comply with AS 3190 and shall be type II units, rated to trip at or below 30 milliamps within 40 milliseconds.

No excavator, drill rig or crane may work within 6 m of overhead distribution power lines.

Manual Handling

When lifting or handling heavy objects, use correct lifting techniques, bending the knees not the back. If the item to be lifted is too heavy or awkward for one person to lift, seek assistance from other company employees or use mechanical help.

Fauna

The remedial works are within an area of land with trees and grasses, and it is likely that there will be potentially hazardous invertebrate and vertebrate fauna, including but not limited to snakes, lizards, birds, spiders, bees, wasps and ants. Long sleeve shirts, pants and boots should be worn at all times on the site. If snakes are identified on the site during remedial works, an appropriate snake removal service should be contacted to relocate the animal away from the work area.

11.4 Personal Protective Equipment (PPE)

11.4.1 General Site Works PPE

All workers who may come into direct contact with contaminated soil will wear the following personal protective equipment:

- High visibility long sleeved collared shirt;
- Long pants;

- Heavy duty outer gloves (e.g. leather) where there is a risk of cuts or abrasions, otherwise PVC outer gloves if in direct contact with contaminated soil;
- Steel capped boots;
- Safety glasses;
- High visibility vest or jacket (not required if shirt is high-visibility); and
- Hard hat when working near mechanical plant.

11.4.2 PPE for Asbestos Removal Works

During any asbestos removal/management works, excavation, transport or placement asbestos impacted materials, the following items of PPE are required in addition to any standard PPE required for the specific task, and applies for any ground workers within the asbestos work zone:

- Disposable coveralls must be worn (Type 5, Category 3 or better);
- Disposable gloves – non disposable gloves must be cleaned within the decontamination unit in accordance with SWA (2016b);
- P2 class respirator or higher – non disposable respirators must be cleaned in the decontamination unit in accordance with SWA (2016b); and
- Laceless steel capped rubber soled work shoes or gumboots.

Plant operators undertaking sub-surface intrusive works must close cabin doors and windows and set air conditioning to re circulate when operating within the asbestos work zone or wear PPE as listed above.

Further information on PPE requirements for asbestos removal works is provided in SWA (2016b).

The contractor shall supply and keep in good order, two complete sets of protective clothing and respirators for authorised inspection personnel. These will remain the property of the contractor at the end of the contract.

Employees must receive instruction in the correct method of using the respirator and on the importance of correct facial fit and maintenance. No person with a beard shall be allowed within the asbestos work area except using an approved positive pressure continuous airflow hood.

It is further noted that, as part of the WorkCover permitting process, additional PPE may be required. If this occurs, then the above PPE requirements will be upgraded to reflect SafeWork NSW requirements.

11.4.3 Decontamination Procedures

The decontamination procedures specified below will be followed whenever personnel, plant or equipment leave the site.

Personnel

The following steps should be taken to ensure personnel do not leave the site with potentially contaminated clothing:

- Wash boots in clean water;
- Remove outer gloves and store for reuse;
- Remove overalls and store for reuse (during the day) or place in the skip for the asbestos wastes for disposal;

- Remove respirator and goggles (if used) and store clean for reuse or decontamination, as appropriate; and
- Thoroughly wash hands and face.

If any part of a worker's body comes into direct contact with any potentially contaminated material, the affected part(s) should be immediately washed with clean water.

Vehicle, Plant and Equipment

All equipment, including personal protective equipment, will be washed or otherwise cleaned to ensure that contaminated soil, water or dust is removed before it leaves the site. All plant and equipment will have their outer bodies thoroughly cleaned of soil and sediment before moving off the site.

11.5 Emergency Response

The remediation contractor will be responsible for preparing an emergency response plan, which will provide details on appropriate action and evacuation procedures in the event of an emergency.

In the event of an emergency arising on the site, appropriate action should be taken. Site evacuation procedures should be followed, as necessary.

In the event of an accident:

- evaluate the seriousness of the injury, and contact emergency services, if necessary;
- provide first aid, as appropriate;
- if working within a Decontamination Zone and it is safe to do so, evacuate the injured person via the Decontamination Zone; and
- make the area as safe as possible without jeopardising safety.

If a serious accident occurs, do not disturb the scene, except to make safe and prevent further injury or damage, and keep all unauthorised people out, and report all accidents to the Project Manager and relevant emergency services and authorities.

12. Regulatory Approvals / Licensing

12.1 State Environmental Planning Policy No. 55 – Remediation of Land (SEPP55)

In accordance with SEPP 55, the proposed remediation works are considered Category 2 remediation works that do not require consent. The land is not affected by any of the listed classifications under an Environmental planning instrument, however, the hospital site is listed by the Department of Health on the Section 170 Register and part of the site is identified as a local item under Schedule 5, Part 1 of Wagga Wagga Local Environmental Plan 2010. The proposed remediation works are not located in areas that have any heritage features that are required to be retained. The remediation will occur following demolition works of the Old Hospital Building, Robinson House, Physiotherapy Building and Hydrotherapy Pool which are authorised under separate approvals.

Further, although the site lies within an area under the current LEP identified as a Sensitive Area for Groundwater, the LEP only requires consent for certain developments in this area, which does not include remediation works. It is noted the remedial works described herein are unlikely to involve any interaction with groundwater.

SEPP 55 still requires that notice must be provided to the Local Government Authority (City of Wagga Wagga) at least 30 days prior to the commencement of remedial works. A notice complying with the requirements of Clause 16(3) of SEPP55 should be prepared. Notice of completion of remediation works must also be provided within 30 days after completion of the work, consistent with clauses 17(2 & 3) and 18.

12.2 Protection of the Environment Operations Act 1997

The proposed remediation/validation activities are not required to be licensed under the *Protection of the Environment Operation Act 1997* since the works do not involve:

- treatment otherwise than by incineration and storage of more than 30 000 cubic metres of contaminated soil originating exclusively from the site, or
- disturbance of more than an aggregate area of 3 hectares of contaminated soil originating exclusively from the site.

12.3 Protection of The Environment Operations (Waste) Regulation 2014

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the site will not require to be licensed.

Section 42 of the Regulation stipulates special transportation, reporting, re-use and recycling requirements relating to asbestos waste and must be complied with regardless whether the activity is licensed.

The requirements for the transportation of asbestos waste include:

- bonded asbestos material must be securely packaged at all times,
- friable asbestos material must be kept in a sealed container,
- asbestos-contaminated soils must be wetted down,
- all asbestos waste must be transported in a covered, leak-proof vehicle.

The transporter of asbestos waste must cause the following information to be given to the EPA prior to the transportation of asbestos waste loads:

- source site details including address, name and contact details;

- date of proposed transportation commencement;
- name, address and contact details of disposal site; and
- approximate weight of each class of asbestos in each load.

The transporter of asbestos waste must ensure the following information is given to the disposal site before or at delivery:

- unique consignment code issued by EPA in relation to that load; and
- any other information specified in the Asbestos and Waste Tyres Guidelines.

The requirements relating to the off-site disposal of asbestos waste are as follows:

- asbestos waste in any form must be disposed of only at a landfill site that may lawfully receive the waste;
- when asbestos waste is delivered to a landfill site, the occupier of the landfill site must be informed by the person delivering the waste that the waste contains asbestos;
- when unloading and disposing of asbestos waste at a landfill site, the waste must be unloaded and disposed of in such a manner as to prevent the generation of dust or the stirring up of dust;
- asbestos waste disposed of at a landfill site must be covered with virgin excavated natural material or other material as approved in the facility's Environment Protection Licence; and
- Section 48 of the Regulation requires that wastes are stored in an environmentally safe manner. It also stipulates that vehicles used to transport waste must be covered when loaded.

12.4 Waste Classification Guidelines (EPA 2014)

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with this guideline.

12.5 Asbestos Removal Regulations and Code of Practice

The removal and disposal of asbestos will be managed in accordance with the Work Health and Safety Act (2011) and Work Health and Safety Regulation (2017), *How to Manage and Control Asbestos in the Workplace: Code of Practice* (SWA 2011a), *How to Safely Remove Asbestos: Code of Practice* (SWA 2011b), *Managing Asbestos in or on Soil* (WorkCover 2014) and the NSW EPA Waste Classification Guidelines 2014.

Excavation and removal of friable asbestos contaminated soils are required to be conducted by a Class A licensed contractor. Excavation, onsite remediation and offsite removal of bonded ACM only contaminated soils are to be conducted by the same Class A licensed contractor.

Before starting any affected works, the appointed contractor is required to obtain a site-specific permit approving the proposed friable asbestos works from SafeWork NSW. 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.

13. Conclusions

Overall, it is considered that the proposed actions outlined in this RAP including the completion of the data gap assessment conform to the requirements of the *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (NSW EPA 2017) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws, policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and the limitations in **Section 14**, it is concluded that the identified contamination at the site can be remediated / managed in such a way to be appropriately protective of human health and the environment, such that the site can be made suitable for the ongoing land use as a hospital.

14. Limitations

This report has been prepared for use by the client who has 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 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.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

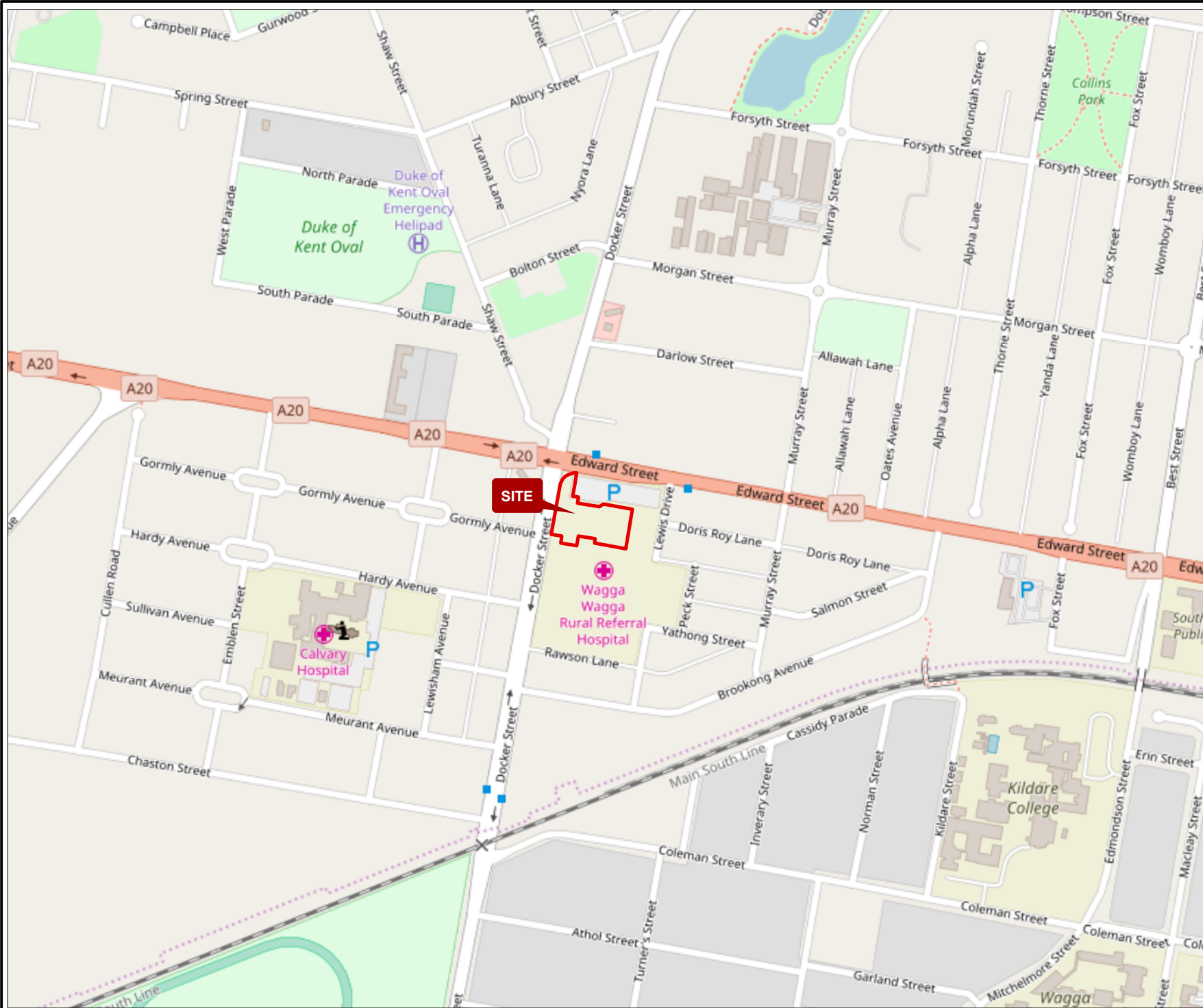
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, 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, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:
 Approximate Stage 3 Boundary



Job No: 52480

Client: Health Infrastructure

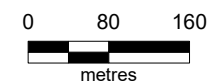
Version: R01 Rev A

Date: 28-Feb-2018

Drawn By: AV

Checked By: MS

Scale 1:7,500



Coor. Sys. GDA 1994 MGA Zone 55

**Sturt Highway & Dock Street
 Wagga Wagga, NSW**

SITE LOCATION

FIGURE 1



Legend:

 Approximate Stage 3 Boundary



Job No: 52480

Client: Health Infrastructure

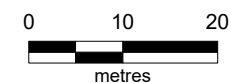
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Date: 28-Feb-2018

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Scale 1:800



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Wagga Wagga, NSW**

SITE LAYOUT

FIGURE 2



Legend:

- Approximate Stage 3 Boundary
- Hand Auger Sample Location (JBS&G 2017a)
- + Hand Auger Sample Location (JBS&G 2017b)
- Access Hatches Sample Location (JBS&G 2017b)



Job No: 52480

Client: Health Infrastructure

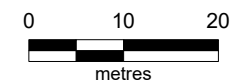
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Wagga Wagga, NSW**

**PREVIOUS ENVIROMENTAL
INVESTIGATION
SAMPLE LOCATIONS**

FIGURE 3



Legend:

- Approximate Stage 3 Boundary
- Data Gap Assessment Area



Job No: 52480

Client: Health Infrastructure

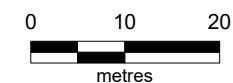
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DATA GAP ASSESSMENT AREAS

FIGURE 4



Legend:

- Approximate Stage 3 Boundary
- Lead & B(a)P Remediation Area



Job No: 52480

Client: Health Infrastructure

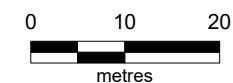
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Wagga Wagga, NSW**

**LEAD & B(a)P REMEDIATION
AREA**

FIGURE 5



Legend:

- Approximate Stage 3 Boundary
- Friable Asbestos Remediation Area



Job No: 52480

Client: Health Infrastructure

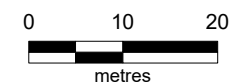
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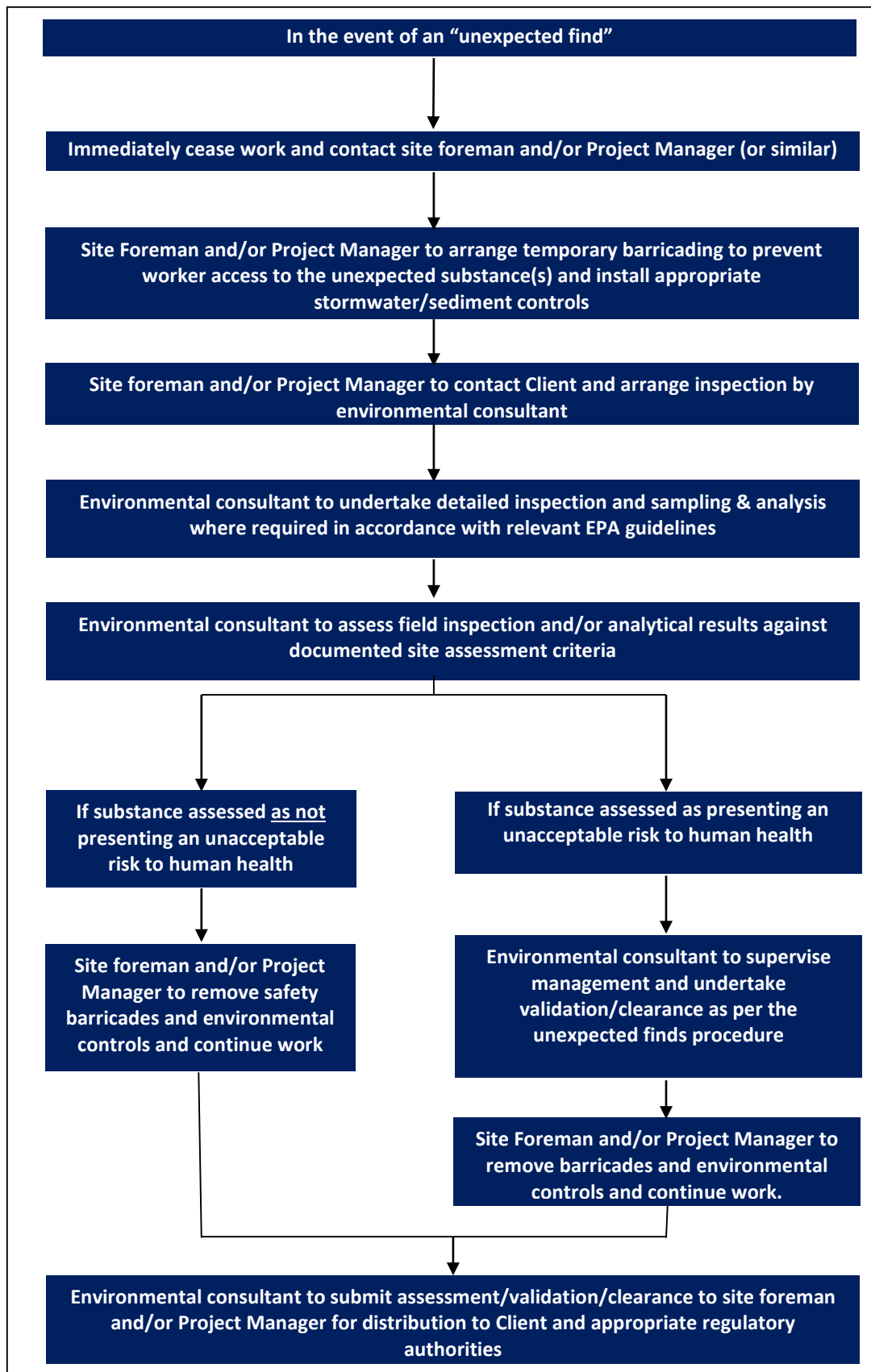
**Sturt Highway & Docker Street
Wagga Wagga, NSW**

**FRIABLE ASBESTOS
REMEDIAION AREAS**

FIGURE 6

Appendix A: Unexpected Finds Protocol

Unexpected Finds Protocol Flowchart




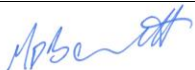


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Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
A	Michael Samuel	Matthew Bennett	Matthew Bennett	Draft for Client Review	2/03/2018
0	Michael Samuel	Matthew Bennett	Matthew Bennett		6/03/2018
1	Michael Samuel	Matthew Bennett	Matthew Bennett		29/03/2018
2	Michael Samuel	Matthew Bennett	Matthew Bennett		4/04/2018
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