Appendix P Site Auditor's Letter

Prepared by Ramboll Environ Australia

January 2016

Prepared for
Health Infrastructure
Prepared by
Ramboll Environ Australia
Date
January 2016
Project Number
AS121870
Audit Number
MP 72

INTERIM ADVICE LETTER

REVIEW OF RAP MULTI STOREY CAR PARK - WESTMEAD HOSPITAL REDEVELOPMENT

RAMBOLL ENVIRON

21 January 2015

Health Infrastructure
C/- Matt Ellis and Frank Princi (PricewaterhouseCoopers)
PO Box 1060
North Sydney NSW 2059

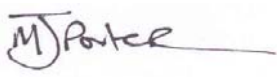
Dear Matt and Frank,

INTERIM ADVICE LETTER – REVIEW OF RAP MULTI STOREY CAR PARK - WESTMEAD HOSPITAL REDEVELOPMENT

As a NSW EPA Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an audit in relation to the subject site. This initial review has been undertaken to determine if the site can be made suitable for the proposed use.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8100 if you have any questions.

Yours faithfully,
Ramboll Environ Australia Pty Ltd



Melissa Porter

EPA Accredited Site Auditor 0803

Ramboll Environ Australia
Level 3, 100 Pacific Highway
PO Box 560
North Sydney NSW 2060

T +61 2 9954 8100
F +61 2 9954 8150
www.ramboll-environ.com

Ref AS121870

Ramboll Environ Australia Pty Ltd
ACN 095 437 442
ABN 49 095 437 442

CONTENTS

LIST OF TABLES

APPENDICES

LIST OF ABBREVIATIONS

Measures

%	per cent
µg/L	Micrograms per Litre
µg/m^3	Micrograms per Cubic Metre
ha	Hectare
km	Kilometres
m	Metre
mAHD	Metres Australian Height Datum
mbgl	Metres below ground level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
mg/m^3	Milligrams per Cubic Metre
mm	Millimetre
ng/L	Nanograms per Litre
ppm	Parts Per Million

General

ABC	Added Background Concentrations
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
ADHC	Ageing Disability and Home Care
AF	Asbestos Fines
AHD	Australian Height Datum
AST	Aboveground Storage Tank
ANZECC	Australian and New Zealand Environment and Conservation Council
bgl	Below Ground Level
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic Aromatic Hydrocarbons)
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
Council	Parramatta Council
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EMP	Environmental Management Plan
Envirolab	Envirolab Services Pty Ltd
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
FA	Fibrous Asbestos
GIL	Groundwater Investigation Level
HIL	Health Investigation Level
HSL	Health Screening Level
IAA	Interim Audit Advice
LEP	Local Environment Plan
LOR	Limit of Reporting
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
MSCP	Multi Storey Car Park
MTF	Material Tracking Form
MTS	Material Tracking Spreadsheet
NATA	National Association of Testing Authorities
nc	No Criteria used/adopted

ND	Not Detected
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NL	Not Limiting
n	Number of Samples
OCPs	Organochlorine Pesticides
OEH	Office of Environment and Heritage
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PARCC	Precision, Accuracy, Representativeness, Comparability and Completeness
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
pH	A measure of acidity, hydrogen ion activity
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SVOCs	Semi Volatile Organic Compounds
TEQ	Toxicity Equivalent Quotient
TPHs	Total Petroleum Hydrocarbons
TRHs	Total Recoverable Hydrocarbons
TV	Trigger Value
UST	Underground Storage Tank
VENM	virgin excavated natural material
VOCs	Volatile Organic Compounds
WHSP	Work Health and Safety Plan
WSLHD	Western Sydney Local Health District
-	On tables is "not calculated", "no criteria" or "not applicable"

1. INTRODUCTION

A site Audit is being conducted in relation to a portion of the Westmead Hospital Redevelopment referred to as the 'Multi Storey Car Park' (MSCP) and known in this letter report as 'the site' or 'MSCP'. The site comprises part of the Westmead Hospital campus and is located to the south of the Ageing Disability and Home Care (ADHC) lot.

This Interim Advice Letter (IAL) has been prepared to provide an initial independent review of the suitability and appropriateness of a Remediation Action Plan (RAP) for the site.

Interim advice was prepared in June and August 2015 on a separate Remedial Action Plan prepared for 'Stage 1 early works' that adjoins the site to the north-west as follows:

- Interim Advice Letter No. 1, Review of RAP Stage 1 Early Works – Westmead Hospital Redevelopment', July 2015, Ramboll Environ Australia Pty Ltd (Ramboll Environ).
- 'Interim Advice Letter No. 2, Review of RAP Stage 1 Early Works – Westmead Hospital Redevelopment', August 2015, Ramboll Environ Australia Pty Ltd (Ramboll Environ).[1]

Remediation and development works are currently underway over that site. It is anticipated that separate Site Audit Report will be prepared for the various stages of the Westmead Hospital Redevelopment.

Details of the Audit are:

Requested by:	Frank Princi on behalf of Health Infrastructure
Request/Commencement Date:	18 May 2015
Auditor:	Melissa Porter
Accreditation No.:	0803

The scope of the Audit included:

- Review of the following reports:
  - 'Investigation into the Presence of Inground Asbestos Waste at Westmead Hospital', dated August 1992, Environsciences Pty Ltd.
  - 'Report on Asbestos Contamination Assessment, Cnr Darcy Road and Institute Road, Westmead', dated December 2001, Douglas Partners Pty Ltd (DP) (DP, 2001).
  - 'Detailed Site Investigation, Proposed Car Park, Westmead Health Campus, Cnr Darcy and Institute Roads, Westmead', dated November 2013 (DP, 2013).
  - 'Westmead Car Park 7 Asbestos Quantification, Westmead Hospital, Westmead, NSW', draft (Rev A) dated 10 December 2014 (JBS&G, 2014).
  - 'Report on Site Investigation (Contamination), Westmead Hospital Redevelopment', draft dated February 2015 (and draft dated January 2015), DP (DP, 2015).
  - 'Westmead Hospital Redevelopment, Asbestos Quantification Assessment, Westmead NSW', 6 July 2015 (and draft dated 29 May 2015), JBS&G (JBS&G, 2015).
  - 'Health Infrastructure NSW, Westmead Hospital Redevelopment, Remedial Action Plan, Multi Storey Car Park, Westmead NSW', dated 20 January 2016 (and previous version dated 23 October 2015), JBS&G ("the RAP").
- Site visits, the most recent of which was undertaken on 12 January 2015.
- Discussions with Health Infrastructure's representatives, and with JBS&G who undertook the investigations and prepared the RAP.

Investigations by Environsciences and DP were completed prior to the Auditor's engagement and no discussion with these consultants was undertaken.

[1] IAL #2 was prepared to address a relatively minor boundary adjustment and staging within the Stage 1 early works area

2. SITE DETAILS

2.1 Location and Site Condition

The site location is shown on Attachments 1 and 2, Appendix A.

The site details are as follows:

Street address:	Corner of Hawkesbury Road and Darcy Road, Westmead, NSW 2145
Identifier:	Part Lot 100 in Deposited Plan 1119583
Local Government:	Parramatta City Council
Site Area:	Approximately 2.5 ha

Site boundaries are based on the extent of the MSCP redevelopment area and are not well defined in the field. A detailed site survey will be required in order to prepare the Site Audit Report (SAR) and SAS.

The site comprises four main areas; Car Park 6, Car Park 7, the Cooling towers and Institute Road (see Attachment 2, Appendix A). These are described in the RAP as follows:

- Car Park 6 comprises a multi storey car park with surrounding areas including landscaped gardens and an on-grade bitumen surface car park.
- Car Park 7 occupies the southern portion of the site and includes an on-grade car park surface with bitumen. Garden beds, located throughout the car park, are covered with mulch as required by an Asbestos Management Plan relating to the interim management of asbestos in this area enforced by the Western Sydney Local Health District.
- Institution Road extends along the north-western site boundary and is surfaced with bitumen.
- The Cooling Towers are located in the north-eastern section of the site within a wire mesh compound. A fill mound (fill depth 3m) is located to the east of the Cooling Towers and is covered in turf.

The RAP notes that there is an overlap between part of the site and Stage 1 early works area (see Attachment 2, Appendix A). The overlapping area is to be remediated and validated in accordance with the RAP prepared for Stage 1 Early Works. The final survey will confirm this and this area has been excluded from this IAL.

2.2 Zoning

The RAP reported that the current zoning of the site is SP2 (Health Service Facility).

2.3 Adjacent Uses

The land uses adjacent to the site include:

- North: the ADHC lot, including Redbank House and part of the Stage 1 early works development site.
- East: Hospital facilities including the Brain Injury Unit, Vivarium, Child Care Centre and Westmead Children's Hospital.
- South: Hospital facilities including the main hospital building heading towards Hawkesbury Road.
- West: Hospital facilities including the College of Dental Therapy, Mon's and Darcy Roads.

The land uses adjacent to the wider Westmead Hospital and ADHC include:

- North: Toongabbie Creek (industrial estate further beyond)
- East: Parramatta River (Cumberland Hospital and residential properties further beyond)
- South/east: Hawkesbury Road (commercial and residential areas further beyond)
- West/south: Mon's and Darcy Roads (educational facilities and commercial areas further beyond).

2.4 Proposed Development

It is understood that the proposed development includes a multi storey car park and associated landscaping to the north. Additionally, the Cooling Towers in the north-east of the site will be removed. Car Park 6 is to remain in its current form, with no significant alterations.

The National Environmental Protection Council (NEPC) '*National Environmental Protection (Assessment of Site Contamination) Measure 1999*', as Amended 2013 (NEPM, 2013) states that the 'commercial/industrial land use scenario' is not applicable to a site used by more sensitive groups such as children and the elderly i.e. within hospitals and aged care facilities. For the purposes of this audit, the 'public recreational open space' and 'residential with minimal opportunities for soil access' land use scenarios are considered.

3. SITE HISTORY

Site history information was assessed in a number of reports prepared by JBS&G and DP. Sources of historical information included aerial photographs, NSW EPA records, Certificates of Title, heritage registers, WorkCover records, Council records and interviews with site personnel. The RAP provided a summary of the site history which has been summarised by the Auditor in Table 3.1.

Table 3.1: Site History

Date	Activity
1930s – 1950s	Agricultural, with no residential or industrial development apparent.
1950s – 1970	Parramatta Showground / Westmead Speedway were evident on the larger Westmead Hospital Lot in the 1951 aerial photograph.
1970 – 1974	Construction begins on Westmead Hospital on the site of the former Parramatta Showground / Westmead Speedway.
1974 - 2002	Completion of Westmead Hospital in 1978.
2002 - 2015	Continued use as part of Westmead Hospital. In 2010, the site is understood to have been listed as Parramatta Showground on Old Windsor Road, Westmead on the Regulation Project of James Hardie Contamination Legacy. The site was not inspected by the EPA and the presence of visible asbestos, a summary of the survey, actions taken or recommended and the site owner were recorded as 'not available'. The results of a follow up inspection were recorded that the site was confirmed as having been redeveloped.

Additional historical information reported by Envirosciences, DP and JBS&G indicated that three known USTs and four ASTs were identified in the areas adjacent to the site. Based on the Auditor's review of the available information, the USTs are located approximately 30m and 60m from the site and are expected to be cross-gradient and down-gradient considering the topography and groundwater flow direction. On this basis, the Auditor is of the opinion that the potential for the identified USTs to impact the site is relatively low.

The site history indicates that fill and waste from James Hardie (i.e. waste generated during the manufacture of asbestos containing products) was placed prior to/during the development of the Showground/Speedway in 1951. Following demolition of the showground it is possible that demolition waste was buried on-site and initial filling may also remain.

The Auditor considers that the site history is broadly understood. Uncertainties associated with the filling history have been compensated for during the previous investigations and the remaining data gaps have been considered appropriately within the RAP (as discussed further in Section 10).

4. CONTAMINANTS OF CONCERN

DP and JBS&G identified various areas/sources of contamination and contaminants of concern based on site observations and historical information. The Auditor has outlined the potential contaminants based on a review of this information (Table 4.1 below).

Table 4.1: Contaminants of Concern

Area	Activity	Potential Contaminants
Former market gardens	Agriculture/horticulture	Heavy metals, pesticides
Filled areas	Historical filling, waste burial, including hospital waste	Unknown, could include heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs), phenols and asbestos
Former building areas	Demolition of buildings	Asbestos, lead, PCBs
USTs and ASTs (off-site)	Fuel storage	Metals, TPH, BTEX, PAHs

The analyte lists used in the investigations generally covered the contaminants of concern, although some variation between investigations was noted depending on the objectives. The Auditor considers that the analyte lists used by DP and JBS&G adequately reflects the site history and condition.

5. STRATIGRAPHY AND HYDROGEOLOGY

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The site is underlain by two geological formations: shale and sandstone. The areas underlain by sandstone were reportedly in the north of the site.

The investigations identified fill across the site, typically either at the ground surface or below bitumen pavement. Fill depths ranged from approximately 0.3m to 2m (average depth 1m) and comprised silty gravely clay and sandy clay with various inclusions of gravels, demolition rubble (clay pipes, brick, concrete etc), charcoal/ash, and various forms of asbestos including fibre cement/asbestos containing material (ACM) and fibrous asbestos (FA).

Natural silty clay, clay or weathered shale/clay soils were encountered beneath the fill. The majority of the investigation locations were terminated in the natural soil, although some locations extended deeper into the underlying sandstone and/or shale bedrock. The depth to bedrock was typically >3m, although shallower bedrock was encountered in some areas. Some test pits excavated by JBS&G for asbestos quantification were terminated in fill at targeted depths of 0.5m below ground level (mbgl).

The RAP reported that there is a low probability of acid sulfate soils being present at the site within alluvial, creek and river sediment adjacent to Toongabbie Creek. Management of potential acid sulfate soil is not proposed.

5.2 Hydrogeology

Groundwater was assessed by installation of four wells screened in clay and bedrock up to 11.5mbgl.

The standing water levels reported during the investigations ranged from approximately 3.5-4.5mbgl. The groundwater flow direction was anticipated to be towards Toongabbie, consistent with local topography.

The RAP reported that one registered bore was located within 2km of the site. The well was located within the ADHC property and was registered for industrial purposes. The licence was reportedly cancelled.

In the Auditor's opinion that subsurface conditions have been adequately characterised to enable the preparation of a RAP. Data gaps have been identified and addressed appropriately in the RAP, as discussed in Section 10.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The DP (2001) investigation included soil sampling in the Car Park 7 area and analysis of samples for the presence of asbestos (qualitative). This information has been considered by the Auditor in drawing conclusions for the site, however a detailed quality assurance and quality control (QA/QC) evaluation of the DP (2001) data has not been undertaken due to the age of the report and the detailed quantitative data collected more recently.

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The data sources are summarised in Table 6.1 and the Auditor's assessment follows in Tables 6.2 and 6.3.

The evaluation has primarily focussed on data points applicable to the site. However, as some of this data was collected during collection of larger datasets, comments also relate to the data set as a whole, in some instances.

Table 6.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
DP (2013)	Soil and groundwater investigation of the Car Park 7 area	Metals, TPH/BTEX, OCPs, PAHs, PCBs, phenol, asbestos, clay content, cation exchange capacity (CEC), pH and total organic carbon (TOC)
JBS&G (2014)	Soil investigation (asbestos quantification) of Car Park 7 area	Asbestos (quantification)
DP (2015)	Soil and groundwater investigation of ADHC lot and central portion of the Westmead Hospital campus (includes some areas beyond site boundary)	Metals, TPH/BTEX, OCPs, OPPs, PAHs, PCBs, phenol, asbestos. Groundwater was also analysed for volatile organic compounds (VOCs).
JBS&G (2015)	Soil investigation (asbestos quantification) (includes some areas beyond site boundary)	Asbestos (quantification).

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	**Auditor's Opinion**
Data Quality Objectives (DQO) JBS&G and DP defined specific DQOs in accordance with the seven step process outlined in DEC (2006).	These are considered appropriate for the investigations conducted.
Sampling pattern and locations Soil investigation locations were spaced to gain coverage of the majority of the site, with the exception of the areas beneath the building and Car Park 6 footprints where access was limited. The sampling pattern predominantly included grid-based locations. Groundwater investigation locations were positioned for site coverage as no on-site point sources of groundwater contamination were identified. Additional wells are located outside the site boundaries and those results have also been considered.	The sampling locations and pattern are considered appropriate given the history of the site and given that further validation and remedial works are proposed (see Section 10). A groundwater well was not positioned in the north-eastern section. DP (2015) included sampling results from additional wells in nearby off-site areas. Results from these nearby locations are discussed in Section 9.
Sampling density With the exception of the areas occupied by buildings and the multi storey Car Park 6, the overall soil sampling density of the combined JBS&G and DP investigations met the minimum sampling density specified in the EPA (1995) *Sampling Design Guidelines*. An increased sampling density for asbestos quantification (two times the EPA 1995 density) was reportedly implemented to meet the requirements of Western Australian Department of Health (2009) *Guidelines for the Assessment and Management of Asbestos-Contaminated Soils in Western Australia*. A total of four groundwater wells were installed at the site.	The overall sampling density is considered to be appropriate. Sampling densities reported for the JBS&G (2015) investigation were based on larger areas than the site applicable to this audit. This may have resulted in a slightly lower density for asbestos quantification. However, this is not considered significant in the context of the proposed remedial strategy. Additional sampling is proposed as part of the remediation/validation to address data gaps as discussed in Section 10.
Sample depths Soil samples were collected and analysed from a range of depths, including the fill and natural soil profiles. Sample locations were generally extended 0.3m to 1m beyond the depth of fill, with the exception of the JBS&G (2014) locations that had a nominal/target depth of 0.5m. Some asbestos quantification locations were terminated due to the presence of significant quantities of asbestos. Groundwater wells were reportedly installed to depths of approximately 8mbgl to 11.5mbgl.	This sampling strategy is considered to be appropriate and adequate to characterise the primary material types present on site.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	**Auditor's Opinion**
Well construction Monitoring wells were installed using solid flight augers and were constructed using 50mm diameter PVC, with filter packs around the slotted well intervals and bentonite plugs above the filter packs. The DP (2013) wells were screened across natural soils and shale bedrock. The DP (2015) well was screened in shale bedrock only. Screen lengths varied between 6m and 9m.	Screen intervals for the wells were relatively long which can cause dilution. The groundwater wells are considered appropriate to provide an initial indication of the contaminant conditions at the site. Further groundwater assessment is proposed in the event that gross soil contamination is identified during remediation/validation, as discussed in Section 10.
Sample collection method Soil samples were collected using a range of methods including augers and excavators. Samples for the JBS&G asbestos quantification investigations were collected from test pits (excavator) or from a backhoe fitted with an auger attachment (150mm to 450mm augers were used depending on the subsurface conditions). The use of augers was reportedly adopted by JBS&G due to health and safety concerns regarding the disturbance of asbestos contaminated soil. Groundwater wells were developed prior to sampling using either a pump or bailer. Samples were collected by DP (2013) using a peristaltic with dedicated tubing. The sampling methodology for the DP (2015) investigation (one well) was not provided.	Overall, in consideration of the contamination encountered, the sample collection methods are considered to be acceptable for remediation planning purposes.
Decontamination procedures Reusable sampling equipment was reportedly decontaminated using a water/detergent mixture and rinsed with fresh water. Disposable gloves were used during sampling activities. Re-usable equipment used during the JBS&G asbestos quantification assessments were decontaminated by wetting, brushing and wiping between sample locations.	Acceptable.
Sample handling and containers Soil samples were placed into glass jars and zip-lock bags. Groundwater samples were placed into prepared and preserved sampling bottles provided by the laboratories. Samples (except asbestos) were chilled during storage and subsequent transport to the labs.	Acceptable.
Chain of Custody (COC) Completed chain of custody forms were provided in the reports.	Acceptable.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	**Auditor's Opinion**
Detailed description of field screening protocols Descriptions of field screening protocols were provided, including detailed methods and calculations for the asbestos quantification assessments. A water quality meter was used during groundwater sampling to assess steady state conditions prior to sampling. Field screening for volatiles was undertaken using a PID during soil sampling by DP, with PID results reported as very low (typically <1ppm). Wells were gauged for the presence of light non-aqueous phase liquid (LNAPL) using an electronic dip meter.	Overall, the field screening protocols are considered to be acceptable.
Calibration of field equipment Calibration documentation of field equipment was not provided by DP.	Appropriate calibration documentation will be required during remediation/validation activities.
Sampling logs Borehole and test pit logs were provided in the various reports. Groundwater sampling field sheets were provided in DP (2015), however a field sheet was not provided for one well in DP (2013).	Overall, the sampling and field logs are considered to be acceptable.

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**Auditor's Opinion**
Field quality control samples Inter and intra-laboratory duplicate samples (rate of approximately 3-5%) and field blank samples were collected and analysed for the asbestos quantification assessments (JBS&G). Trip spikes, trip blanks and rinsate samples were collected by DP. However it was noted that field QA/QC samples were not collected for each day of the DP (2015) investigation. Inter and intra-laboratory duplicates for chemical analysis were typically analysed at a rate of 5-10%, although not all duplicates were analysed for all contaminants of concern. The Auditor notes that some of the QA/QC samples were collected as part of a larger dataset.	The absence of some QA/QC samples during the DP investigation appeared to occur on days where boreholes were extended and cored for geotechnical purposes. As these locations make up a small portion of the dataset, the lack of field QA/QC samples is not considered to be significant.
Field quality control results Approximately 20% of the duplicate results for the asbestos quantification assessments were not in agreement (when considering the asbestos quantification datasets as a whole). Where samples were not in agreement, JBS&G reported the highest result.	Overall, in the context of the dataset reported, the field quality control results are considered acceptable. The variability in asbestos detections in the QA/QC samples is considered to be indicative of the heterogeneous

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**Auditor's Opinion**
A groundwater equipment rinsate sample obtained during the DP (2015) investigation identified quantifiable concentrations of hydrocarbons. DP attributed this to potential cross contamination associated with the sampling container rather than insufficient decontamination. RPD exceedances were reported by DP for some duplicate analytes, however these were infrequent and minor. These exceedances did not adversely impact the overall dataset.	nature of the fill and the discrete nature of asbestos. The Auditor has considered the highest results for duplicate pairs when drawing conclusions for the site. Appropriate field QA/QC sampling and analysis will be required during the remediation/validation assessment as outlined in Section 10.
NATA registered laboratory and NATA endorsed methods DP used Envirolab as the primary laboratory and Eurofins/mgt as the secondary laboratory. This was vice versa for JBS&G. Laboratory certificates were NATA stamped.	Acceptable.
Analytical methods A list of analytical methods and brief method summaries based on USEPA and/or APHA methods (excluding asbestos) were included in the laboratory reports. These were in accordance with the NEPM. Asbestos identification was conducted using polarised light microscopy with dispersion staining by method AS4964-2004 "Method for the Qualitative Identification of Asbestos Bulk Samples". Eurofins/mgt calculated the concentrations of asbestos based on the methods outlined in the NEPM (2013), although the laboratory noted that these reported concentrations were not within the NATA accreditation.	The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use".
Holding times Review of the relevant COCs and laboratory certificates indicated that the holding times had been met. DP and JBS&G also reported that holding times have been met.	Acceptable.
Practical Quantitation Limits (PQLs) Soil PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern. Asbestos: The limit of detection for asbestos in soil was 0.01% w/w although the laboratories reported non-NATA results to 0.001% w/w. Not all PQLs for the groundwater assessment were sufficiently low.	Overall the soil PQLs are considered to be acceptable. In the absence of any other validated analytical method, the detection limit for asbestos is also considered acceptable. In the context of the groundwater results reported the discrepancies with the elevated groundwater PQLs do not materially affect the outcome of the audit. Further discussion regarding the

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**Auditor's Opinion**
	groundwater PQLs is provided in Section 10.
Laboratory quality control samples Laboratory quality control samples included duplicates, matrix and surrogate spikes, and laboratory control samples.	Acceptable.
Laboratory quality control results Minor laboratory QA/QC exceedances were reported for one laboratory duplicate and one trip spike in DP (2013). However DP indicated that the results did not significantly impact the quality of the results overall. DP (2015) reported that the laboratory QA/QC data was acceptable noting that blanks reported concentrations below the PQLs, spike recoveries were within the acceptable ranges adopted by the laboratories and there were no unacceptable duplicate RPD results.	The Auditor considers the laboratory QA/QC data to be acceptable noting that exceedances were infrequent and minor in the context of the overall dataset.
Data Quality Indicators (DQI) and Data Evaluation (precision, accuracy, representativeness, comparability and completeness - PARCC) The various JBS&G reports included pre-determined DQIs along with discussion of the DQIs and evaluation against the PARCC parameters. The JBS&G Data Gap Assessment concluded that "On the basis of the results of the field and laboratory QA/QC program, the soil and groundwater data are of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site". The JBS&G asbestos quantification assessment (May 2015) concluded that "On the basis of the field and laboratory QA/QC program, the soil data are of an acceptable quality upon which to draw conclusions regarding the nature and extent of asbestos impact on the site". The DP (2013) report included a discussion of the results in relation to established DQIs, however this did not include a discussion of the PARCC parameters. The DP (2015) investigation included DQIs within the sampling, analysis and quality plan (SAQP), although a direct assessment and discussion of the DQIs against each of the PARCC parameters was not undertaken. In relation to the inter and intra-laboratory duplicate analysis, DP concluded that a "… suitable field sampling methodology was adopted and that adequate laboratory precision was achieved" and that "the sampling technique was consistent and repeatable and therefore the results are useable and representative of the conditions encountered".	An assessment of the data quality with respect to the five category areas has been undertaken by the auditor and is summarised below.

In considering the data as a whole the Auditor concludes that:

- The primary laboratories provided sufficient information to conclude that data is of sufficient precision.
- The data is likely to be accurate.
- The data is likely to be representative.
- The data is not complete due to access limitations in the building and Car Park 6 footprints. However, the RAP provides suitable mechanisms to validate these areas during remediation (i.e. validate data gaps and implementation of an unexpected finds protocol).
- There is a high degree of confidence that data is comparable for each sampling and analytical event.
- Overall, the data is considered to be adequate for remediation planning, noting that validation sampling is proposed to address data gaps and an unexpected finds protocol is to be implemented during remediation and development.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed **soil** data provided by JBS&G and DP in reference to criteria from NEPM (2013).

Based on the proposed development as a hospital car park and associated landscaped areas, the Tier 1 (screening) criteria for 'residential with minimal opportunities for soil access' and 'public recreational open space' and an Urban Residential setting were referred to. The criteria considered were as follows:

- Human Health Assessment
  - Health Based Investigation Levels (HIL B and C).
  - Soil Health Screening Levels (HSL B and C) for Vapour Intrusion. Given the fill and natural soil, the assumed material type is clay with depth to source being < 1 m.
  - Asbestos Health Screening Levels (HSL B and C).
- Terrestrial Ecological Assessment
  - Ecological Screening Levels (ESL) assuming fine soil.
  - Ecological Investigation Levels (EIL) assuming fine soil. As an initial screen, the published range of added contaminant level (ACL) values in the NEPM (2013) and ambient background concentration (ABC) values for old suburbs/high traffic in Olszowy et al (1995) have been adopted.
- Aesthetics
  - The Auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013).
- Management limits
  - Management Limits (Residential/Open Space) assuming fine soil.

The Auditor has assessed the **groundwater** data provided in reference to Tier 1 (screening) criteria for 'low to high density residential' from the following:

- Human Health Assessment
  - Groundwater Health Screening Levels (HSL A and HSL B) for vapour intrusion (clay, 2 to <4 m)
- Ecological Assessment

– Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality'. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem at the point of use and 'trigger' further investigation. The fresh water level of protection was adopted.

Groundwater monitoring wells were screened across clay and bedrock (shale). The overlying soils were predominantly clay and were greater than 2m deep. The yield in the wells is low and as there is a reticulated water supply for the area, extraction and use of groundwater as a resource is unlikely. Therefore assessment of direct contact and consumption of groundwater is not required.

The chemical (non-asbestos) validation criteria proposed in the RAP are consistent with those adopted by the Auditor. Given the proposed capping works, environmental quality goals have been adopted in the RAP to ensure that asbestos in soil is adequately remediated. These are discussed further in Section 10.

8. EVALUATION OF SOIL ANALYTICAL RESULTS

8.1 Asbestos

Asbestos quantification sample locations are shown on Attachment 4, Appendix A. Investigations have identified widespread occurrence of asbestos in fill. Asbestos quantification identified elevated concentrations of ACM and/or AF/FA above the adopted Tier 1 screening criteria in approximately 70% of the samples analysed. The widespread presence of asbestos in fill is consistent with the site history.

In the Auditor's opinion, the fill includes a heterogeneous mixture of asbestos with no apparent pattern of occurrence or obvious stratification. ACM was not always observed/identified at those locations where AF/FA concentrations exceeded the screening criteria, therefore ACM is not necessarily a reliable indicator for AF/FA occurrence.

Remediation is proposed to manage the potential risks associated with the presence of asbestos at the site. The proposed remedial works has been assessed by the Auditor in Section 10. Additional investigation/validation work is also proposed beneath the buildings and Car Park 6 area to address the identified data gaps.

8.2 Chemical Data

Soil samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, phenols, pesticides and heavy metals. A summary of the data obtained during the previous DP (2013 and 2015) investigations is presented in the RAP. The results have been assessed against the environmental quality criteria. As only a relatively small proportion of the analysis was undertaken on natural soil samples, and considering the relatively low levels of contaminants encountered, both fill and natural soils have been assessed concurrently as outlined in Table 8.1.

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Arsenic	48	42	16	0	0
Cadmium	48	16	9.5	0	nc
Total Chromium	48	47	37	0	0
Copper	48	48	120	0	**1**
Lead	48	47	59	0	0

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)					
Analyte	**n**	**Detections**	**Maximum**	**n > Human Health Screening Criteria (NEPM, 2013)**	**n > Terrestrial Ecological Screening Criteria (NEPM, 2013)**
Mercury (inorganic)	48	4	0.2	0	nc
Nickel	48	47	100	0	**5**
Zinc	48	48	520	0	**3**
Phenols	35	0	<PQL	0	nc
PCBs	35	0	<PQL	0	nc
OCP	35	0	<PQL	0	0
OPP	11	0	<PQL	0	nc
TRH (C_6-C_{10} less BTEX)	48	0	<PQL	0	0
TRH (>C_{10}-C_{16} less naphthalene)	48	1	61	0	0
TRH (>C_{16} – C_{34})	48	2	190	nc	0
TRH (>C_{34} – C_{40})	48	0	<PQL	nc	0
Benzene	48	0	<PQL	0	0
Toluene	48	0	<PQL	0	0
Ethylbenzene	48	0	<PQL	0	0
Xylenes	48	0	<PQL	0	0
Total PAHs	48	12	6	0	nc
Benzo(a)pyrene TEQ	48	10	0.6	0	nc
Benzo(a)pyrene	48	10	0.4	nc	0
Naphthalene	48	0	<PQL	0	0

n number of samples
nc No criteria available/used
<PQL Less than the Practical Quantitation Limit

The borehole/test pit logs appended to the various JBS&G and DP reports did not identify the presence of staining and/or odours.

Elevated concentrations of chemical contaminants (other than asbestos, as discussed previously in Section 8.1) were not encountered above the human health (Tier 1) screening criteria.

The nickel concentration in five samples, zinc concentration in three samples and copper concentration in one sample exceeded the adopted ecological (Tier 1) screening criteria. All exceedances were in fill. No metal concentrations exceed the EILs calculated using the Cation Exchange Capacity (CEC) and soil pH data presented in the DP (2013) report. Considering the proposed cap across the site, including throughout the landscaped areas, the RAP indicates that the minor metals exceedances in fill do pose an ecological risk.

There were no indicators of gross chemical contamination from historical activities at the site. Due to the limited access in the eastern section of the site (Car Park 6 and Cooling Tower areas), additional investigation/validation works are proposed in the RAP, as discussed in Section 10.

9. EVALUATION OF GROUNDWATER ANALYTICAL RESULTS

Groundwater was investigated via the installation and sampling of four wells at the site. Well locations are shown on Attachment 3, Appendix A and include the following:

- BH02, BH04 and BH10 (DP, 2013).
- BH12 (DP, 2015).

The recorded water levels ranged from approximately 3.5-4.5mbgl. Field water quality data indicated that the groundwater was slightly acidic (typically pH 6.1-6.3) with oxidising conditions present. The groundwater was saline, with electrical conductivity (EC) of 15-23mS/cm.

Groundwater samples were analysed for heavy metals, PAHs, TPH, BTEX, PCBs, Phenols and OCPs. The BH12 sample was also analysed for OPPs, VOCs and ammonia. The analytical results, for the four wells, are summarised below in Table 9.1.

Table 9.1: Evaluation of Groundwater Analytical Results (µg/L)

Analyte	n	Detections	Maximum	n > Ecological TVs (ANZECC 2000)	n > Human Health Screening Criteria (NEPM 2013)
Arsenic	4	2	2	0	nc
Cadmium	4	4	1.4	**3**	nc
Chromium (total)	4	3	4	**3**	nc
Copper	4	3	2	**3**	nc
Lead	4	0	<PQL	0	nc
Mercury	4	0	<PQL	0	nc
Nickel	4	4	94	**4**	nc
Zinc	4	4	110	**4**	nc
Naphthalene	4	1	3	0	0
Anthracene	4	0	<PQL	0	nc
Phenanthrene	4	1	0.1	0	nc
Fluoranthene	4	0	<PQL	0	nc
Benzo(a)pyrene	4	0	<PQL	0	nc
Benzene	4	0	<PQL	0	0
Toluene	4	0	<PQL	0	NL
Ethylbenzene	4	1	4	0	NL
Xylenes	4	1	54	0	NL
TPH (C_6-C_{10} less BTEX) – F1	4	1	190	nc	NL
TPH (>C_{10}-C_{16} less naphthalene) – F2	4	1	97	nc	NL
Ammonia	1	1	380	0	nc
Other VOCs/SVOCs	1	1[1]	4	0	nc
PCBs	4	0	<PQL	0	nc
Phenol	4	0	<PQL	0	nc

Table 9.1: Evaluation of Groundwater Analytical Results (µg/L)					
Analyte	**n**	**Detections**	**Maximum**	**n > Ecological TVs (ANZECC 2000)**	**n > Human Health Screening Criteria (NEPM 2013)**
OCPs	4	0	<PQL	0	nc
OPPs	1	0	<PQL	0	nc

n number of samples
nc No criteria available/used
NL Not Limiting
<PQL Less than the Practical Quantitation Limit
1 The detection was for chloroform

Concentrations of metals (copper, cadmium, chromium, nickel and zinc) exceeded the TVs in most wells and were fairly consistent across the well network. JBS&G/DP considered the metals to be typical of a built up urban environment in the Ashfield Shale and Hawkesbury Sandstone geological setting. Given that relatively low concentrations of metals were reported in fill, and metals concentrations in groundwater are relatively consistent in up-gradient and down-gradient wells, the Auditor considers that no further works are required to address metals in groundwater.

All hydrocarbon concentrations in groundwater were below the human health (Tier 1) screening criteria. Hydrocarbons were encountered below the human health and ecological screening criteria in groundwater sampled from one well (BH10) in the western extent of the site. The source of the hydrocarbons at this location has not been confirmed. DP (2013) conclude that the hydrocarbon detections were probably from an off-site source based on the following lines of evidence:

- Quantifiable concentrations of TPH/BTEX and naphthalene were not identified in soil samples analysed from BH10, or from the surrounding investigation locations.
- The inferred groundwater flow direction is to the north (towards Toongabbie Creek) which suggests that groundwater at BH10 has migrated from the Darcy Road area (i.e. off-site).

The Auditor notes that a UST has been identified approximately 60m to the north of BH10 (in the Stage 1 area), however, this UST is unlikely to impact groundwater at the site as it is located down gradient.

Considering the relatively low concentrations of hydrocarbons encountered in groundwater at BH10, the presence of relatively deep clay soil (~5mbgl) and the groundwater level (~3.9mbgl), the Auditor is of the opinion that the potential risk from hydrocarbons in groundwater at BH10 is relatively low. The RAP (Section 10) provides a suitable procedure to address unexpected finds during the proposed remediation works in this area.

Two USTs were identified in nearby off-site areas beyond the north-eastern site boundary. The USTs are located approximately 30m to the east of the site and are considered to be cross-gradient based on the anticipated groundwater flow direction and topography. Groundwater in the vicinity of the USTs was investigated by DP (2015) via the installation of two monitoring wells. This groundwater data was assessed by the Auditor and documented in the Stage 1 IAL. Minor hydrocarbon impacts were identified in the off-site wells, however the potential for hydrocarbons to migrate onto the site via groundwater (at significant concentrations) is considered to be relatively low.

Chloroform was identified in BH12 at a concentration of 4µg/L. There is no Tier 1 screening criterion for this compound, however it is noted that the concentration marginally exceeds the Australian Drinking Water Guideline value of 3µg/L. The Auditor is of the opinion that the

chloroform is probably associated with the potable water introduced into BH12 during the bedrock coring process, rather than with an on-site source of contamination. Chloroform is a common by-product of the chlorination/disinfection process for drinking water.

Although the PQLs for some contaminants were not sufficiently low (e.g. some PCBs, pesticides, PAHs), the groundwater data for these potential contaminants are considered suitable for screening purposes. The site history and soil contamination data suggested that the potential for these contaminants to be present at significant concentrations in groundwater is relatively low.

Remediation and/or further validation of groundwater at the site is not proposed in the RAP unless gross soil contamination is identified as an unexpected find, or during the data gap validation (see Section 10).

10. EVALUATION OF REMEDIATION

Fill across the site is contaminated with asbestos. A cap and contain strategy has been proposed to ensure that direct contact with the fill, following development, is limited to those works undertaken in accordance with a long term environmental management plan (EMP).

If the balance of spoil to be generated during the installation of services, the RAP allows for some movement and placement of the material into containment cells or disposal off-site, also subject to the EMP.

Based on the investigations previously completed by DP and JBS&G, the elements that require remediation are summarised in Table 10.1. The Auditor has undertaken a review of the remedial lateral extent and proposed capping details to confirm that the remedial strategy is realistic and achievable over the long-term. The proposed validation works have been reviewed in Table 10.2.

Table 10.1: Remedial Works Proposed

Element	Remedial Works Proposed	Auditors Comments
All asbestos contaminated soil (known extent shown on Attachment 5, Appendix A)	*Cap and contain and implementation of a long term EMP.* Remedial extent includes fill across the entire site. Minimum capping thickness proposed as follows overlying a marker layer: 0.3m – turfed. 0.5m - shallow landscaping (native grasses and small shrubs). 0.6m - new tree zones vertically and laterally. MSCP/hardstand: Permanent concrete slab or asphalt surfaced pavement underlain by a marker layer and implementation of an EMP. 0.15m - below depth of services placed under Road Reserve (including concrete footpaths and road pavement). Marker Layer: brightly coloured and durable. Specifications provided in the RAP.	An arborist report should be provided that confirms that the roots of the proposed trees (other than deep tap roots) are unlikely to penetrate the maker layer. Landscape plans and species proposed were not provided in the RAP. Adequate where the systems and long term EMP ensure retention of the cap and procedures where any breaches are required. The cut and fill balance was not discussed and the capacity of the cells is not clear. This should be determined prior to implementation of the RAP. The contingency of off-site disposal is considered adequate. The Marker layer will not be placed beneath the Car Park 6 floor slab where no

Table 10.1: Remedial Works Proposed		
Element	**Remedial Works Proposed**	**Auditors Comments**
	The RAP notes that the vertical extent will have consideration of specific design options such as service trenches, roads and other design options.	development works are currently proposed.
Characterisation	*Data gap validation.* RAP presents a plan to confirm that areas not previously investigated due to access constraints have not been adversely affected by contamination. The data gap areas are shown on Attachment 5 (Appendix A) and include the Car Park 6 area and Cooling Towers. 1 per 20m grid for a range of contaminants including 10L and 500 ml samples for asbestos analysis.	Adequate. An appropriate rationale should be presented if groundwater assessment of these areas is not undertaken.

Table 10.2: Validation Works Proposed		
Element	**Remedial Works Proposed**	**Auditors Comments**
Characterisation		
Car Park 6 and Cooling Tower areas	Lateral: 1 per 20 m grid for a range of contaminants including 10L and 500 ml samples for asbestos analysis. Samples would target areas of concern.	Adequate where UFP is successfully implemented.
Validation		
On-Site Material – Capping Layer	1 per 70 m^3 (inclusive of historical samples).	On-site fill not suitable for re-use based on existing data.
Imported VENM	Minimum 5 samples per source.	Sample density should be commensurate with documentation, observations made at the source site and during delivery.
Imported ENM	As per ENM exemption 2014.	Sample density should be commensurate with documentation, observations made at the source site and during delivery.
Imported Growing Media	Not discussed.	Sample density should be commensurate with documentation, observations made at the source site and during delivery.
Recycled/Recovered products	As per relevant exemption plus analysis for asbestos (500 mL).	Sample density should be commensurate with documentation,

Table 10.2: Validation Works Proposed		
Element	**Remedial Works Proposed**	**Auditors Comments**
		observations made at the source site and during delivery.
Residual Soil below Stockpiles	1 per 10 m grid for asbestos and relevant contaminants.	Adequate where there are good visual observations and over-excavation into the underlying material.
Marker layer / Capping layer	Visual inspection, photos, survey.	Adequate.
Proposed QA/QC – Sampling	RAP provides a discussion of DQIs. Field QA/QC includes inter and intra-laboratory duplicates at a rate of 5%, and a trip spike (targeting volatiles) per sampling event.	Trip blanks and rinsate samples are also required during relevant sampling activities.
Proposed QA/QC – Laboratory	Laboratory QA/QC is discussed in the DQIs and includes surrogate and matrix spikes, laboratory blanks and duplicates (except for asbestos).	Adequate assuming laboratory QA/QC is in accordance with relevant NATA requirements

The RAP notes that physical observations, including visual, olfactory and PID screening results would be considered for the selection of samples.

The Auditor has assessed the RAP by comparison with the checklist included in OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The RAP was found to address the required information, as detailed in Table 10.3, below.

Table 10.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Comments**
Remedial Goal	'Removal of unacceptable risks to human health and the environment from the identified asbestos contaminated fill at the site, such that the site is suitable for the proposed uses'. In the Auditor's opinion, this goal is considered appropriate. Remediation principles also aim to minimise disturbance of asbestos impacted fill and off-site disposal of asbestos impacted fill.
Discussion of the extent of remediation required.	The remedial extent was discussed within the RAP (See Table 10.1 above).
Remedial Options	Remedial options were assessed and included on-site treatment, offsite treatment, offsite disposal and consolidation and isolation under a capping layer. The Auditor considers that an adequate range of options were considered.
Selected Preferred Option	Preferred option was discussed within the RAP and included cap and contain, and management of the site via an EMP.

Table 10.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Comments**
Rationale	Minimise disturbance of fill characterised by asbestos as excavation likely to cause a greater adverse effect to human health than if the impacted soils remain in-situ. The Auditor considers the rationale presented by JBS&G to be suitable given the volume and extent of fill impacted with asbestos.
Interim Site Management Plan (before remediation)	It is understood that the assessment and due diligence works are being undertaken in conjunction with an Asbestos Management Plan (AMP). It is understood that the site is currently managed by the Western Sydney Local Health District (WSLHD). The interim measures in place are understood to be an AMP, asbestos checklist, asbestos registers, Ground Disturbance Procedure, site inductions, asbestos awareness training and ongoing air monitoring. Once development works begin, interim capping will comprise a marker layer and either a minimum of 0.3 m of capping or concrete slab. These separation layers will be validated by the Remediation Consultant and a survey plan prepared.
Material Tracking Plan	*Applies:* All material other than test pitting/assessment works (includes imported, re-used, contaminated fill and waste to be exported off-site). *Documentation*: Material Tracking Forms (MTF) and electronic Material Tracking Spreadsheet (MTS). *Key Elements*: Nature, depth and location of source and placement and purpose of placement, mass balance. *Process:* Contractor to ensure MTF completed daily and handed to Remediation Consultant (resolve discrepancies) and provide to Principal (ideally within 2 days). The Auditor notes that documentation relating to imported material should be valid and thorough, inspections of the source, gate trucks, tipping point and placement location, adequate sampling density and QA/QC. With those comments in mind, the process outlined should provide a documentation trail to enable the source and end-point to be identified.
Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S	The RAP indicates that the operational phase site management plan is largely based on Council's contaminated land policy. The Auditor notes that the operational phase site management plan is applicable for the proposed works. Preparation of a Construction Environmental Management Plan (CEMP) is proposed (Section 11 of the RAP) which would aim to address these items in further detail.
Contingency Plan if Selected Remedial Strategy Fails	The contingency plan includes a number of options to deal with potential scenarios, including failure to meet the remedial objectives. These include re-assessment of the remedial and validation options for AF/FA contaminated soils, and continued

Table 10.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Comments**
	controlled excavation of potential impacted soils. The Auditor considers these to be adequate. The contingency plan needs to also consider the potential planning implications in the event that additional asbestos is identified during the data gap investigation (i.e. if the total volume of "contaminated" material exceeds 30,000m^3).
Contingency Plans to Respond to site Incidents.	The Auditor notes that the RAP provides management and contingency plans to respond to incidents (including unexpected finds as discussed below) that are directly applicable for the proposed works.
Unexpected Finds	An unexpected finds protocol and a program of sampling to address data gaps, are included in the RAP to address soil and groundwater underlying current buildings and structures. RAP provides a list and a visual flow chart to be enlarged and posted in the Site Office and referred to during the site specific induction by the Contractor. The RAP notes that unexpected finds between sampling points or in data gap areas (i.e. Car Park 6 and Cooling Towers) include: >10m^2 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 and other waste; and petroleum or solvent/VOC impacted soil. The Auditor notes that the Environmental Consultant should be present during removal of concrete slabs and an adequate screening should be undertaken including the use of a PID as outlined in the RAP. The Auditor notes that a good conceptual model in consideration of the previous data will be required to support decisions resulting from an unexpected find. The remediation and validation required is dependent on the nature of the find. The Auditor considers the procedure for unexpected finds to be adequate.
Remediation Schedule and Hours of Operation	Not specified in the RAP.
Licence and Approvals	Regulatory requirements are listed in the RAP, which include waste disposal, dewatering, asbestos remediation and licence requirements. The RAP states that the proposed remediation works are considered to be classified as 'Category 2' Remediation Works – i.e., not requiring consent. The RAP states that "the total volume of known contaminated material to be stored below the marker and capping layer is anticipated to be less than 30 000 m^3. The total area of the site is approximately 2.5 ha, therefore less than 3 aggregate hectares of

Table 10.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Comments**
	contaminated material will be disturbed during the remedial process'. JBS&Gs definition and calculation for the volume of 'contaminated' soil as defined by the CLM Act are based on site specific human health criteria derived for asbestos by JBS&G. The Auditor considers that all fill requires management due to the potential for asbestos to exceed asbestos criteria specified in NEPM (2013). Health Infrastructure should seek legal and planning advice regarding whether the site is considered 'designated development' based on the likely volume of material that is 'contaminated soil' and is required to be 'stored' as per the EP&A Act and POEO Act (and associated regulations).
Contacts/Community Relations/	Contacts not provided but will be displayed on signs located adjacent to the site access throughout the remediation program. Direct community consultation will be undertaken. The Westmead Hospital Redevelopment Project has a dedicated communications team and RAP outlines some key notification requirements.
Long-term engineering security of works Long-term integrity of the cap i.e. risk of the erection of structures on the capped area Long-term minimisation of the potential for leachate formation and/or volatilisation and/or off-site migration.	Asbestos is not volatile or leachable and is considered suitable to be retained on-site. The proposed development should be finalised in consideration of the required capping works to ensure the long-term integrity of the cap. The security of the works will be maintained through implementation of the EMP. As the EMP will need to be implemented by WSLHD, I will ultimately need their written agreement to implement the EMP and confirm how the EMP will be integrated into their systems. JBS&G note that the WSLHD who manage the hospital campus, are 'considered to have effective institutional management controls….. which minimise the risk of containment failure'.
Long term site management plan	RAP provides an indication of the key components to be included in the long term environmental management plan (LTEMP). The Auditor considers this adequate at this stage.
Work Health and Safety (WHS)	The RAP requires that the contractors prepare a Work Health and Safety Management Plan (WHSP) prior to the commencement of remediation. See interim measures.
Are the Council in agreement with the EMP?	The consent authority and Council must agree to the presence of the EMP. Agreement should be obtained as soon as practical and the correspondence provided. It will be recommended in the Site Audit Statement that a copy of the SAR/SAS is given to Council and recorded on the S149. To make the EMP more accessible, I anticipate that it will be included as an Appendix to the Site Audit Report.

In the Auditors' opinion, the proposed remediation works should be able to ensure that the site is suitable for the proposed land uses through implementation of the cap and contain strategy. Successful validation will be required to confirm this.

11. CONCLUSIONS AND RECOMMENDATIONS

JBS&G conclude that subject to the successful implementation of the measures described in the RAP and their recommendations "the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment, such that the site can be made suitable for the proposed hospital use"

Based on the information presented in the JBS&G and DP reports, the Auditor is of the opinion that the site can be made suitable for the proposed hospital development subject to suitable implementation of the RAP. Confirmation that the site is suitable will rely on successful validation of the remedial works. The Auditor has been engaged to prepare a SAR and SAS on the completion of remedial works and review of the validation documentation.

12. OTHER RELEVANT INFORMATION

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a SAR or SAS.
- At completion of the remediation and validation I will provide a SAS and supporting documentation.
- This interim advice will be documented in the SAR.

APPENDIX A
ATTACHMENTS

Attachment 1 – Site Location
Attachment 2 – Site Layout
Attachment 3 – Soil and Groundwater Sample Locations (DP, 2013 and 2015)
Attachment 4 – Asbestos Quantification Locations (JBS&G, 2014 and 2015)
Attachment 5 – Remedial Extent and Data Gaps
Attachment 6 – Indicative Cap and Contain Cross Section