



ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

HEALTH INFRASTRUCTURE

ON

REMEDIATION ACTION PLAN

FOR

**NEPEAN HOSPITAL & INTEGRATED AMBULATORY
SERVICES REDEVELOPMENT – SSSA**

AT

**NEPEAN HOSPITAL, DERBY STREET, KINGSWOOD,
NSW**

6 APRIL 2018

REF: E29845KDrpt-RAP-2.3rev



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EXECUTIVE SUMMARY

Health Infrastructure ('the client') commissioned Environmental Investigation Services (EIS) to prepare a Remediation Action Plan (RAP) for the proposed Nepean Hospital and Integrated Ambulatory Services Redevelopment – SSDA at Nepean Hospital, Derby Street, Kingswood, NSW ('the site'). The site location is shown on Figure 1 and the RAP is applicable to the site area shown on Figure 3.

This report has been prepared to support a State Significant Development (SSD) Application for the proposed Nepean Hospital and Integrated Ambulatory Services Redevelopment at Nepean Hospital.

This RAP provides a methodology to address the identified contamination and validate that the site is suitable for the proposed development (from a contamination viewpoint). EIS note that the proposed development area has increased since the preparation of the Preliminary Stage 2 ESA. Additional Pre-remediation Assessments are required for the additional site area and to quantify the Asbestos Containing Material (ACM) impacted fill material at the site. The results of the Pre-remediation Assessment may require an amendment to this RAP.

The objectives of the RAP are to:

- Provide details on additional investigations required at the site prior to proceeding with remediation works;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

The Pre-remediation Assessment should be undertaken once the existing site buildings have been demolished and prior to excavation works. The Pre-remediation Assessment can be undertaken in stages if required. The pre-remediation investigation objectives are to:

- Quantify and further assess the horizontal and vertical extent of ACM within fill material within Area A and Area B by undertaking a DSI for ACM; and
- Assess the potential for Contaminants of potential Concern (CoPC) in the additional site development area (Area B) proposed to the south-east of the Stage 2 ESA investigation area.

The most viable option for remediation of the ACM contaminated fill material is the excavation and off-site disposal to an appropriate facility (Option 3). Significant excavations are required for the proposed development. The proposed cut works may remove the entire fill material from some areas of the site. The material used for fill works can be sourced from a non-ACM impacted area. Alternatively, the ACM contaminated fill material can be capped and contained (Option 4) and an Environmental Management Plan (EMP) prepared for the ongoing management of the ACM contaminated soil.

EIS are of the opinion that the site can be made suitable for the proposed development provided this RAP prepared for the proposed development is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

TABLE OF CONTENTS

1	INTRODUCTION	1
	1.1 Proposed Development Details	1
	1.2 Remediation Goal, Aims and Objectives	2
	1.3 Scope of Work	2
2	SITE INFORMATION	4
	2.1 Site Identification and Regional Setting	4
	2.2 Site Location and Regional Setting	4
	2.3 Topography	4
	2.4 Site Inspection	5
	2.5 Surrounding Land Use	6
	2.6 Summary of Geology and Hydrogeology	6
	2.7 Acid Sulfate Soil Risk and Planning	7
	2.8 Summary of Site History	8
	2.9 Summary of Soil Results	8
	2.10 Summary of Soil Waste Classification for Off-site Disposal	9
	2.11 Summary Groundwater Results	9
	2.12 Conceptual Site Model (Site Characterisation)	11
3	REMEDIATION EXTENT	12
4	PRE-REMEDIATION ASSESSMENT	13
	4.1 Area A	13
	4.2 Area B	13
5	REMEDIATION OPTIONS	15
	5.1 Soil Remediation	15
	5.2 Site Specific Remediation Options	16
6	REMEDIATION DETAILS	19
	6.1 Sequence of Works	19
	6.2 Remediation of Asbestos Contaminated Fill	19
	6.3 Inspection Requirements	23
	6.4 Remediation Documentation	23
	6.5 Soil Disposal - Volume and Disposal Analysis	24
	6.6 Environmental Management Plan (EMP)	24
7	VALIDATION PLAN	25
	7.1 Validation Sampling and Documentation	25
	7.2 Validation Assessment Criteria and Data Assessment	28
	7.3 Validation Report	28
	7.4 Data Quality	29
8	CONTINGENCY PLAN	30
10	CONCLUSION	36
	10.1 Remediation Category	36
	10.2 Regulatory Requirements	37
11	LIMITATIONS	38

List of In-Text Tables

Important Information About The Site Assessment Report

REPORT FIGURES:

Figure 1: Site Location Plan

Figure 2: Sample Location and Site Contamination Data Plan

Figure 3: Site Pre-remediation Assessment Area Plan

Figure 4 and 5: Capping Specification Plan

ABBREVIATIONS

Ambient Background Concentrations	ABC
Added Contaminant Limits	ACL
Asbestos Containing Material	ACM
Australian Drinking Water Guidelines	ADWG
Area of Environmental Concern	AEC
Australian Height Datum	AHD
Acid Sulfate Soil	ASS
Above Ground Storage Tank	AST
Below Ground Level	BGL
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Cation Exchange Capacity	CEC
Contaminated Land Management	CLM
Contaminants of Potential Concern	COPC
Construction Management Plan	CMP
Chain of Custody	COC
Conceptual Site Model	CSM
Data Quality Indicator	DQI
Data Quality Objective	DQO
Detailed Site Investigation	DSI
Ecological Assessment Criteria	EAC
Ecological Investigation Levels	EILs
Ecological Screening Level	ESL
Environmental Management Plan	EMP
Excavated Natural Material	ENM
Environmental Protection Agency	EPA
Environmental Site Assessment	ESA
Ecological Screening Level	ESL
General Approvals of Immobilisation	GAI
General Solid Waste	GSW
Health Investigation Level	HILs
Health Screening Level	HSLs
International Organisation of Standardisation	ISO
Lab Control Spike	LCS
Light Non-Aqueous Phase Liquid	LNAPL
Local Government Authority	LGA
Map Grid of Australia	MGA
Metres Below Ground Level	MBGL
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCP
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Potential Contaminants of Concern	PCC
Photo-ionisation Detector	PID
Practical Quantitation Limit	PQL
Preliminary Environmental Site Assessment	PESA
Personal Protective Equipment	PPE
Quality Assurance	QA
Quality Control	QC

ABBREVIATIONS

Remediation Action Plan	RAP
Remediation Concept Plan	RCP
Relative Percentage Difference	RPD
Restricted Solid Waste	RSW
Site Assessment Criteria	SAC
Sampling, Analysis and Quality Plan	SAQP
Site Audit Statement	SAS
Site Audit Report	SAR
Specific Contamination Concentration	SCC
Standard Penetration Test	SPT
Semi-Volatile Organic Compounds	sVOC
Standard Operating Practice	SOP
Standard Water Level	SWL
Standard Sampling Procedure	SSP
Trip Blank	TB
Toxicity Characteristic Leaching Procedure	TCLP
Total Recoverable Hydrocarbons	TRH
Trip Spike	TS
Upper Confidence Limit	UCL
United States Environmental Protection Agency	USEPA
Underground Storage Tank	UST
Virgin Excavated Natural Material	VENM
Volatile Organic Compounds	VOC
Volatile Organic Chlorinated Compound	VOCC
Workplace, Health and Safety	WHS

1 INTRODUCTION

Health Infrastructure ('the client') commissioned Environmental Investigation Services (EIS)¹ to prepare a Remediation Action Plan (RAP) for the proposed Nepean Hospital and Integrated Ambulatory Services Redevelopment –SSDA at Nepean Hospital, Derby Street, Kingswood, NSW ('the site'). The site location is shown on Figure 1 and the RAP is applicable to the site area shown on Figure 3.

This report has been prepared to support a State Significant Development (SSD) Application for the proposed Nepean Hospital and Integrated Ambulatory Services Redevelopment at Nepean Hospital.

EIS have previously completed a Preliminary Environmental Site Assessment (PESA)² at the site, concurrently with a geotechnical investigation undertaken by JK Geotechnics³. The results of the geotechnical investigation were reported separately (Ref: 29845Lrpt, dated 20 February 2017). The PESA included an assessment of the wider site area including the proposed subject development area. EIS have also undertaken a Preliminary Stage 2 ESA⁴ at the site. A brief summary of the works undertaken and results of the previous EIS assessments are provided in Section 2 of this report.

This RAP provides a methodology to address the identified contamination and validate that the site is suitable for the proposed development (from a contamination viewpoint). EIS note that the proposed development area has increased since the preparation of the Preliminary Stage 2 ESA. Additional Pre-remediation Assessments are required for the additional site area and to quantify the ACM impacted fill material. The results of the Pre-remediation Assessment may require an amendment to this RAP.

1.1 Proposed Development Details

EIS understand that significant redevelopment works are proposed at Nepean Hospital. The proposed Nepean Hospital and Integrated Ambulatory Services Redevelopment includes the demolition of the existing single storey building in the central section of the site and the existing child care centre in the east section of the site. The new buildings comprise a fourteen-storey main tower building. New hardstand areas are proposed including internal roads and pavements. Landscaped gardens and courtyards are also proposed within the development area.

EIS have been provided with current (at the time of reporting) cut and fill plans for the proposed development. Cut excavations are proposed to a maximum of approximately 8.0m below the existing ground levels, with filling proposed to approximately 2m above the existing ground levels. The plans indicate that approximately 40,000m³ of excess material will remain as a result of the cut and fill excavation works.

¹ Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

² EIS Report Reference E29845KPrpt, dated 24 February 2017 (referred to as the EIS PESA)

³ Geotechnical consulting division of J&K

⁴ EIS Report Reference E29845KDrpt2.3rev4, dated 6 April 2018 (referred to as the EIS Preliminary Stage 2 ESA)

1.2 Remediation Goal, Aims and Objectives

The goal of the remediation is to render the site suitable and confirm the suitability of the site for the proposed development from a contamination viewpoint.

The primary aim of the remediation is to remove the source(s) of contamination in order to reduce any risks posed to the identified receptors by the contaminants to an acceptable level.

The objectives of the RAP are to:

- Provide details on additional investigations required at the site prior to proceeding with remediation works;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

1.3 Scope of Work

The RAP was prepared generally in accordance with an EIS proposal (Ref: EP46044KD) of 30 October 2017 and written acceptance from the client.

The scope of work included the following:

- Review the PESA and Preliminary Stage 2 ESA;
- Identification of potential remediation options;
- Outline the remediation procedures;
- Outline the validation sampling and analysis plan for the remediation work; and
- Preparation of the RAP report.

The report was prepared with reference to regulations/guidelines outlined in the table below. Individual guidelines are also referenced within the text of the report.

Table 1-1: Guidelines

Guidelines/Regulations
Contaminated Land Management Amendment Act (2008 ⁵)
State Environmental Planning Policy No.55 – Remediation of Land (1998 ⁶)

⁵ NSW Government Legislation, (2008), *Contaminated Land Management Amendment Act*. (referred to as CLM Amendment Act 2008)

⁶ NSW Government, (1998), *State Environmental Planning Policy No. 55 – Remediation of Land*. (referred to as SEPP55)

Guidelines/Regulations

Guidelines for Consultants Reporting on Contaminated Sites (2011⁷)

Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017⁸)

National Environmental Protection (Assessment of Site Contamination) Amendment Measure (2013⁹)

Guidelines for the Assessment Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009¹⁰)

⁷ NSW Office of Environment and Heritage (OEH), (2011), *Guidelines for Consultants Reporting on Contaminated Sites*. (referred to as Reporting Guidelines 2011)

⁸ NSW EPA, (2017), *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

⁹ National Environment Protection Council (NEPC), (2013), *National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)*. (referred to as NEPM 2013)

¹⁰ Western Australian Department of Health (WADoH), (2009), *Guidelines for the Assessment Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (Western Australia Asbestos Guidelines 2009)

2 SITE INFORMATION

2.1 Site Identification and Regional Setting

Table 2-1: Site Identification

Site Address:	35-65 Derby Street, Kingswood, NSW (also known as 256A Great Western Highway)
Lot & Deposited Plan:	Part of Lot 1 DP1114090
Current Land Use:	Hospital
Proposed Land Use:	Unchanged
Local Government Authority (LGA):	Penrith
Current Zoning:	SP2 (Health Services Facilities) (Penrith Local Environmental Plan 2010)
Former Proposed Development Area Investigated Under The EIS Preliminary Stage 2 ESA (m ²):	19,250
Total Revised Proposed Development Area (m ²):	25,300
RL (AHD in m) (approx.):	50-53
Geographical Location (decimal degrees) (approx.):	Latitude: -33.759171 Longitude: 150.714559

2.2 Site Location and Regional Setting

The site is located to the west of Somerset Street and approximately 100m to the south of the intersection with Great Western Highway. Barber Avenue is located immediately to the north-west of the site. The site is located within the central/east section of Nepean Hospital.

The regional setting is characterised by commercial and low to medium density residential land uses with some commercial/industrial uses to the northern side of the great Western Highway.

2.3 Topography

The regional and site topography is gently undulating. The site appears to be located on the side of a minor hill slope that appeared to fall to the south-west.

2.4 Site Inspection

A walkover inspection of the site was undertaken by EIS on 16 August 2017 for the Preliminary Stage 2 ESA. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of the existing building was not undertaken. A summary of inspection observations relevant to the current proposed development are outlined in the following subsections:

2.4.1 Buildings, Structures and Roads

At the time of the site inspection a number of single to two storey hospital associated buildings were located in the central and north-west section of the site. The buildings in the north-west section of the site generally appeared to be occupied for hospital maintenance and associated use. The buildings in the east section of the central section of the site appeared to be occupied for hospital related services, including potential short-term patient accommodation.

An on grade asphaltic concrete car park was located in the central/east section of the site. A number of concrete pedestrian pathways traverse the site linking to the car park and hospital buildings.

2.4.2 Visible or Olfactory Indicators of Contamination

Two fragment of fibre cement were identified at the ground surface in the central section of the site (see samples identified as “MDF2” and “BH134-S” on Figure 2). The fragments were in reasonable condition and could not be crushed, broken or compressed using hand pressure.

There were no other visible or olfactory indicators of contamination observed during the site walkover.

2.4.3 Drainage

Surface metal grate drains were located across the site and primarily in the asphaltic concrete car park area located in the central/east section of the site. The surface water at the site is expected to flow to the north-east of the site, before discharging to the stormwater system to the east at Somerset Street.

2.4.4 Presence of Drums/Chemicals, Waste and Fill Material

As identified in EIS PESA 2017 and EIS Preliminary Stage 2 ESA a potential diesel UST was identified within the hospital grounds. The potential UST was located approximately 100m to the south-west of the west section of the site and is shown in Figure 2. As reported in the EIS Preliminary Stage 2 ESA the UST is not considered to represent a potential risk to the development associated site receptors.

The site appeared to have been filled, this was particularly evident in the west section of the site.

2.4.5 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds.

2.4.6 Landscaped Areas and Visible Signs of Plant Stress

Grassed and landscaped areas containing various native and non-native trees and shrubs were observed throughout the site. There were no obvious indicators of widespread plant stress or tree dieback observed during the inspection.

2.5 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – Nepean Private Hospital, an on-grade hardstand car park associated with the hospital. The cancer care hospital building/facility was located further to the north of the car park;
- South – Nepean Hospital, including a multistorey car park. Residential and commercial landuse were evident to the south of the hospital beyond Derby Street;
- East – A child care centre was located to the east of the site. Residential landuse was evident to the east of Somerset Street; and
- West – Nepean Hospital, including the main hospital building, a multistorey car park.

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.6 Summary of Geology and Hydrogeology

Regional geological maps reviewed for the EIS assessments indicated that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

The EIS PESA included soil sampling from three boreholes drilled for the JK Geotechnical investigation. The EIS Preliminary Stage 2 ESA included soil sampling from seventeen locations. The sampling locations are shown in Figure 2.

Fill material was encountered at the surface in all boreholes and extended to depths of approximately 0.1m below ground level (mbgl) to 2.0mbgl. BH133 to BH135, BH137, BH138 and BH141 were terminated in the fill at depths of between approximately 0.3mbgl and 0.5mbgl. EIS note that these sampling locations were drilled with a hand auger. The fill typically comprised: silty clay and silty sand.

The fill contained inclusions of: ironstone and igneous gravels; building rubble (brick, concrete, plastic, metal and fibre cement fragments) and ash.

Natural silty clay was encountered in BH131, BH132, BH136, BH142 to BH145, BH201 and BH202.

The EIS Preliminary Stage 2 ESA included groundwater sampling from four monitoring wells (MW131, MW140, MW143 and MW12).

SWL measured in the monitoring wells installed at the site ranged from 1.35m (MW12) to 3.67m (MW140). Groundwater (RLs) calculated on these measurements ranged from 47.01m to 49.60m (Australian Height Datum – AHD). Based on cut and fill plans recently supplied to EIS, the groundwater RLs indicate that excavation for the proposed development may intercept groundwater. The development proposal does not include extraction or use of groundwater.

As part of the EIS Preliminary Stage 2 ESA, a contour plot was prepared for the groundwater levels using Surfer v11.0 (Surface Mapping Program). The contour plot indicated that groundwater generally flows towards the north-east.

2.7 Acid Sulfate Soil Risk and Planning

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

Based on the scope of review of available information, the risk posed by ASS are considered to be negligible due to the following:

- The ASS risk map indicates that the site is not located within an ASS risk area;
- The geological map for the site indicates the site is underlain by Bringelly Shale;
- The borehole drilled by JK Geotechnics and EIS indicated a residual soil profile over shale and/or sandstone bedrock. ASS is not usually associated with residual soil profiles or in sandstone or shale bedrock; and
- The site is located at approximately RL 50.0m AHD with excavations to extend to a minimum elevation of approximately 43.0m AHD. ASS are not usually associated with soil horizons above 5m AHD; and
- The proposed development is not expected to lower the water table below 1m AHD on adjacent land.

Based on this information, preparation of an Acid Sulfate Soil Management Plan (ASMP) is not considered necessary for the proposed development.

2.8 Summary of Site History

The EIS PESA included a review of historical information from various sources including information presented in previous reports by Golder Associates for the wider site area (i.e. Nepean Hospital site). A summary of relevant site history information is provided below:

- Historical aerial photographs indicated that some cultivation activities (eg. market gardens) may have occurred at the hospital in the early to mid-1900s;
- A search of WorkCover NSW records (now SafeWork NSW) was included in the Golder Associates report. The records identified a number of dangerous goods stores/depots within the hospital. The records suggested that two separate USTs were previously decommissioned from areas within the hospital grounds.

2.9 Summary of Soil Results

The EIS PESA and Preliminary Stage 2 ESA included soil sampling and the analysis of samples from the locations shown on Figure 2. The sample spacing was limited due to access constraints, location of the existing hospital buildings and the scope of the JK Geotechnics investigation, therefore the sample distribution was generally irregular.

Soil samples were analysed for a common suite of contaminants including heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.

Soil analysis results were compared to various Site Assessment Criteria (SAC), including the Health Investigation Level (HIL) – C ‘public open space, secondary schools, foot paths (includes hospitals)’ and Health Screening Levels (HSL) - D ‘commercial/industrial’ criteria based on NEPM (2013).

All soil results were below the HSL-D criteria for ‘commercial/Industrial’. EIS have subsequently assessed the soil results to also be less than the HSL-A/B criteria for ‘low and high density residential landuse’.

Asbestos was not detected in the soil samples analysed for the investigation. However, asbestos was detected in the following samples:

- Fibre cement fragment sample MDF2 obtained from the surface in the central/west section of the site;
- Fibre cement fragment sample BH134-S obtained from the surface in the central/west section of the site adjacent to borehole BH134; and
- Fibre cement fragment sample BH135 (0-0.3m) obtained from the fill material at borehole sampling location BH135.

The ACM contamination data is shown in Figure 2.

During sampling the ACM was assessed to be in good condition and could not be broken/crushed by hand pressure. Hence the material was assessed to be 'non-friable' based on field information.

EIS were of the opinion that the ACM contamination posed a moderate risk to the receptors (site workers/future site users) and therefore recommended the preparation of a RAP.

2.10 Summary of Soil Waste Classification for Off-site Disposal

A waste classification assessment in accordance with the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014¹¹) was undertaken as part of the EIS Preliminary Stage 2 ESA. Based on the results the fill material at the site has been classified as **General Solid Waste (non-putrescible) containing Special Waste (asbestos)**. The landfill should be contacted to obtain the required approvals prior to commencement of excavation. Additionally, the transport of asbestos materials must be registered with the NSW EPA WasteLocate system¹². The natural clay and shale bedrock has been classified as Virgin Excavated Natural Material (VENEM), however, the VENM classification must be confirmed following the removal of the overlying asbestos contaminated fill material.

2.11 Summary Groundwater Results

The EIS Preliminary Stage 2 ESA included groundwater sampling and the analysis of samples from the groundwater monitoring well locations shown on Figure 2. Groundwater samples were analysed for a common suite of contaminants including heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs and pH.

Groundwater analysis results were compared to various SAC, including the freshwater trigger values presented in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000¹³) and the HSL-D criteria for 'commercial/Industrial' based on NEPM (2013).

All groundwater results were below the HSL-D criteria for 'commercial/Industrial'. EIS have subsequently assessed the groundwater results to also be less than the HSL-A/B criteria for 'low and high density residential landuse'.

Elevated concentrations heavy metals including cadmium, copper, nickel and zinc were encountered in the groundwater samples above the ANZECC 2000 SAC. The groundwater contamination data is shown in Figure 2.

¹¹ NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. (referred to as Waste Classification Guidelines 2014)

¹² <https://wastelocate.epa.nsw.gov.au/> visited on 5 October 2017.

¹³ ANZECC, (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. (referred to as ANZECC 2000)

As reported in the EIS Preliminary Stage 2 ESA, EIS were of the opinion that the heavy metals in the groundwater pose a very low risk to the receptors and groundwater remediation was not required.

2.12 Conceptual Site Model (Site Characterisation)

The CSM is based on information presented in the EIS Preliminary Stage 2 ESA.

Table 2-2: CSM

Contaminant source(s) and affected media	<p>ACM was detected at the surface and within the fill material at the site.</p> <p>The source of the ACM is considered likely to be associated with the importation of fill material onto the site, or possibly the demolition of former buildings at the site. EIS note that fill material contained building demolition rubble including brick, tile, concrete and metal fragments.</p> <p>The ACM is expected to be confined to the fill soil at the site.</p>
Receptor identification	Human receptors include: future site workers; visitors and maintenance workers.
Exposure pathways	<p>The potential transport of asbestos fibres is associated with the disturbance of asbestos contaminated soils and release of fibres into the atmosphere. This is likely to occur during excavation works.</p> <p>A number of studies have found that soils effectively filter out asbestos fibres and retain them within the soil matrix. The studies concluded that there is no significant migration of asbestos fibres, either through soil or groundwater.</p>
Evaluation of data gaps	<p>The following data gaps have been identified:</p> <ul style="list-style-type: none"> • The area beneath the existing building in the central and north-west sections of the site were not accessible at the time of the investigation; • The vertical and horizontal extent of fill material at the site has not been fully assessed.; and • The proposed development area has been moved to the east, increased in area to the south-east and therefore requires further assessment. <p>The above data gaps have been considered in this RAP. The data gaps are to be further assessed prior to proceeding with remediation.</p>

3 REMEDIATION EXTENT

The EIS Preliminary Stage 2 ESA identified that remediation was primarily required as a result of the detection of ACM within the fill soil and on the surface in the north-west section of the site. EIS note that the assessment of ACM for the Preliminary Stage 2 ESA was generally undertaken as a Preliminary Site Investigation (PSI) for ACM in accordance with the Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013). Therefore, the entire horizontal and vertical extent of fill material was assumed to be impacted by ACM. Remediation of the entire development area for ACM represents a significant cost and may not be environmentally sustainable as a result of the likely excavation and off-site disposal of the ACM impacted fill material. Further opportunity exists to better assess and quantify the horizontal and vertical extent of the ACM impacted fill material by undertaking a Detailed Site Investigation (DSI) for ACM in accordance with the Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013).

The ACM was generally encountered in the north-west section of the site. The source of the ACM was considered likely to be associated with the importation of fill material onto the site, or possibly the demolition of former buildings at the site. EIS note that fill material in this area of the site contained building demolition rubble including brick, tile, concrete and metal fragments. No building rubble or ACM was identified in the fill material in the east section of the site beneath the existing on grade asphaltic car park.

Based on the above, general site observations and the Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013), the DSI for ACM should be undertaken in the west section of the site. This area has been identified by EIS as Area A and is shown in Figure 3. Area A also includes additional development areas not previously assessed by EIS as part of the Preliminary Stage ESA investigation.

The proposed development area has been significantly increased to the east and south-east of the EIS Preliminary Stage ESA investigation area. EIS understand that the existing child care centre is to be demolished. The additional site area has been identified by EIS as Area B and is shown in Figure 3.

A Pre-remediation Assessment of the site Area A and Area B is required prior to proceeding with site remediation works. The scope of the pre-remediation assessment is discussed in Section 4.

4 **PRE-REMEDATION ASSESSMENT**

The Pre-remediation Assessment should be undertaken once the existing site buildings have been demolished and prior to excavation works. The Pre-remediation Assessment can be undertaken in stages if required.

The pre-remediation investigation objectives are to:

- Quantify and further assess the horizontal and vertical of ACM within fill material within Area A and Area B by undertaking a DSI for ACM; and
- Assess the potential for CoPC in the additional site development area (Area B) proposed to the south-east of the Stage 2 ESA investigation area.

The results of the Pre-remediation Assessment may require an amendment to this RAP, should remediation details not be captured in this document.

4.1 **Area A**

The Pre-remediation Assessment Area A is approximately 6,960m² in area. The Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013) recommended sampling from a minimum of thirty-four (34) evenly spaced sampling points for this site of this area.

The pre-remediation investigation of Area A will include the following:

- Excavation of forty-four test pits using an excavator;
- Fill soil sampling will be undertaken from the thirty-four (34) testpits in accordance with the Western Australian Asbestos Guidelines (2009) (i.e. sieving of soil through a 7mm x 7mm sieve, weighing of ACM and obtaining bulk soil samples (approximately 10L) and 500ml soil samples);
- Selected fill soil samples will be analysed for asbestos at a NATA Accredited laboratory for asbestos (WA 500ml method) should ACM be observed in the testpit;
- The soil laboratory results and ACM field data are to be assessed against the Validation Site Assessment criteria detailed in **Section 7.1**; and
- A report will be issued presenting the results of the pre-remediation investigation of Area A.

Alternatively, if a pre-remediation assessment is not undertaken, remediation Area A can be assumed to be impacted by ACM and the cap and contain approached remediation methodology outlined in Section 6.2.3 implemented.

4.2 **Area B**

The Pre-remediation Assessment Area B is approximately 6,840m² in area. The NSW EPA Contaminated Sites Sampling Design Guidelines (1995¹⁴) recommend sampling from a minimum of seventeen (17) evenly spaced sampling points for a site of this area. The Western Australian Asbestos Guidelines 2009

¹⁴ NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines*. (referred to as EPA Sampling Design Guidelines 1995)

(endorsed in NEPM 2013) recommended sampling from a minimum of thirty-four (34) evenly spaced sampling points for this site of this area.

The pre-remediation investigation of Area B will include the following:

- Excavation of thirty-four test pits using an excavator;
- Fill soil sampling will be undertaken from the thirty-four (34) testpits in accordance with the Western Australian Asbestos Guidelines (2009) (i.e. sieving of soil through a 7mm x 7mm sieve, weighing of ACM and obtaining bulk soil samples (approximately 10L) and 500ml soil samples);
- Seventeen (17) of the thirty-four (34) sampling locations will be utilised for fill and natural soil sampling for other potential CoPC;
- Fill and natural soil samples are to be analysed at a NATA Accredited laboratory for the following contaminants: heavy metals, PAHs, TRH, BTEXN and asbestos (only fill soil samples will be analysed for asbestos (500ml));
- Analysis of field Quality Assurance/Quality Control (QA/QC) samples as detailed in **Section 7.4**;
- The soil laboratory results and ACM field data are to be assessed against the Validation Site Assessment criteria detailed in **Section 7.1**;
- A pre-remediation investigation of Area B is to include a Waste Classification Assessment in accordance with the NSW EPA Waste Classification Guidelines 2014; and
- A report will be issued presenting the results of the pre-remediation investigation of Area B.

5 REMEDIATION OPTIONS

ACM has been identified as the primary CoPC for remediation purposes at this stage. Therefore, this RAP considers remediation options generally applicable to ACM only.

5.1 Soil Remediation

The NSW EPA follows the ANZECC/NHMRC Guidelines for the Assessment and Management of Contaminated Sites (1992) published hierarchy for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

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

The Site Auditor Guidelines 2017 provide the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

5.2 Site Specific Remediation Options

The tables below summarise the site specific remediation options:

Table 5-1: Site Specific Remediation Options

Option	Discussion	Applicability
<p><u>Option 1</u> On-site treatment of contaminated soil</p>	<p>On-site treatment provides a mechanism to reuse the processed material and in some instances, to avoid the need for large scale earthworks. Some of the treatment options for soil contamination include:</p> <p><u>Physical Removal of Bonded Asbestos Materials:</u> Fill impacted by non-friable asbestos containing materials (such as fibre cement) can be treated on-site via picking. This would require the treatment of all fill in batches.</p> <p><u>Bio-remediation:</u> Addition of oxygen and nutrient compounds to accelerate the natural process of organic compound decay within the environment. Soils require excavation and stockpiling prior to treatment. Not suitable for all contaminants.</p> <p><u>Soil Washing:</u> Soil is stripped of contaminants via a leaching process and the concentrated contaminated liquid product retained for disposal or additional treatment.</p> <p><u>Air Sparging and Extraction:</u> Air is forced through the contaminated soil to volatilise organic contaminants. The air is then extracted and captured for treatment leaving reduced contaminant concentrations within the sub-strata.</p> <p><u>Thermal Desorption:</u> Contaminated soils are heated within an incinerator to volatilise or combust the contaminants. Contaminants are either broken down to water and carbon dioxide or alternatively trapped within an air filtration system.</p>	<p>Physical removal of non-friable ACM via hand picking may be a viable option for treating fill impacted by non-friable ACM. However, this remediation option would be extremely time consuming and may delay the proposed construction date of the development. Should the above option be preferred, an addendum RAP would need to be prepared.</p> <p>The remaining soil remediation options are not suitable for ACM.</p>

Option	Discussion	Applicability
	<p>Licenses are necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during the incineration process.</p>	
<p><u>Option 2</u> Off-site treatment of contaminated soil</p>	<p>Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility.</p> <p>This option provides for a relatively short program of on-site works, however there may be some delays if the material is to be returned to the site following treatment.</p> <p>The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works.</p>	<p>Not applicable/viable for this project.</p>
<p><u>Option 3</u> Removal of contaminated material to an appropriate facility and reinstatement with clean material</p>	<p>Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a NSW EPA licensed landfill.</p> <p>The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.</p>	<p>A viable option for this project and the preferred option for remediation/management as all the ACM and potential ACM will be removed from the site.</p> <p>EIS note that significant costs will be incurred as a result of the excavation of all fill material at the site, transport and disposal of ACM contaminated material off-site to NSW EPA licensed facilities.</p> <p>These costs may be reduced by undertaking a Detailed Site Investigation (DSI) for ACM in accordance with the Western Australian Asbestos Guidelines 2009 guidelines (endorsed by NEPM 2013). The DSI will assess if asbestos hot spot areas can be estimated for remediation purposes.</p>

Option	Discussion	Applicability
<p><u>Option 4</u> Consolidation and isolation of impacted soil by cap and containment</p>	<p>This would include the placement of an impermeable barrier such as concrete, or a warning barrier and non-contaminated soil material, over the existing ground surface to isolate the contaminated material and thereby reduce the health risk to future site users.</p> <p>This action may also reduce the transport of contamination via surface water movement, dust generation and potentially groundwater infiltration, however, environmental issues would need to be evaluated.</p> <p>Such an option should only be considered where other preferred approaches from the NSW EPA hierarchy are not applicable. The capping and/or containment must be appropriate for the specific contaminants of concern.</p> <p>An ongoing environmental management plan (EMP) would be required and site identification documentation, possibly including the S.149 council planning certificate and/or the land title, would be modified to note the presence of the contamination. This may impact upon development approval conditions and limit the future potential land value.</p>	<p>A viable option for this project and a suitable remediation/management option for ACM at this site. The benefits of the cap and containment remediation/management option include:</p> <ul style="list-style-type: none"> • Reduced time and excavations on site decrease the risk of exposure of air bore asbestos fibres; and • No additional costs for disposal of contaminated soil to NSW EPA licensed facilities provided there is sufficient area to retain the ACM contaminated material on site. <p>However, it should be noted that the capping of contamination will require the preparation of a long term EMP for the site.</p> <p>The extent of ACM contaminated fill material requiring capping is to be further assessed by undertaking a Detailed Site Investigation (DSI) for ACM in accordance with the Western Australian Asbestos Guidelines 2009 guidelines (endorsed by NEPM 2013). The DSI will assess if asbestos hot spot areas can be estimated for remediation purposes.</p> <p>Alternatively, if a pre-remediation assessment is not undertaken, remediation Area A can be assumed to be impacted by ACM and the cap and contain approached remediation methodology outlined in Section 6.2.3 implemented.</p>

6 **REMEDICATION DETAILS**

6.1 **Sequence of Works**

Prior to commencement of remediation work, the site management plan for remediation works (see Section 9) should be reviewed and implemented by the remediation contractor. In summary, the sequence of works is likely to include the following:

- 1) Demolition of existing building/site structures, including removal of the concrete floor slabs;
- 2) Undertake the Pre-remediation Assessment investigation works detailed in Section 4; and
- 3) Undertake remediation and validation as per the RAP.

Prior to the commencement of remediation, geotechnical advice should be sought with regards to the stability of any proposed excavations and adjacent structures/features. Geotechnical advice should also be sought regarding the requirements of any backfill material used for the reinstatement (temporary or otherwise) of the remediation area.

6.2 **Remediation of Asbestos Contaminated Fill**

6.2.1 **Rationale for Selection of Remedial Strategy**

The most viable option for remediation of the ACM contaminated fill material is the excavation and off-site disposal to an appropriate facility (Option 3). Significant excavations are required for the proposed development. The proposed cut works may remove the entire fill material from some areas of the site. The material used for fill works can be sourced from a non-ACM impacted area. Alternatively, the ACM contaminated fill material can be capped and contained (Option 4) and an EMP prepared for the ongoing management of the ACM contaminated soil. The associated remediation details for Option 3 and Option 4 are summarised below.

6.2.2 **Remediation Details (off-site disposal of fill)**

The specific remediation details for remediation of fill are described in the table below:

Table 6-1: Remediation Details (off-site disposal of fill)

Step	Procedure
1.	<u>Engage the Validation Consultant:</u> Prior to commencement of any works, a suitably qualified contaminated land consultant should be engaged as the validation consultant. The validation consultant should be provided with a copy of this RAP. Based on the current data a licenced removal contractor (Class B) should be engaged for the fill removal process. An asbestos removal control plan should be prepared by the removal contractor and provided to the validation consultant prior to proceeding with the remediation works.
2.	<u>Personal Protective Equipment (PPE) and Work Health and Safety (WHS):</u>

Step	Procedure
	<p>Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation includes the following:</p> <ul style="list-style-type: none"> • Disposable gloves; • Eye protection; and • Hard hat, covered clothing and steel toed boots. <p>Reference should be made to the asbestos removal control plan (to be prepared by the removal contractor) for additional asbestos related PPE requirements.</p>
3.	<p><u>Address Stability Issues:</u> Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the excavation (as required).</p>
4.	<p><u>Removal of fill:</u> Remediation of the site will be undertaken as follows:</p> <ul style="list-style-type: none"> • Submit an application to dispose of the fill (in accordance with the assigned waste classification) to a licensed landfill and obtain authorisation to dispose; • The fill is impacted with asbestos. Prior to the off-site transport the material must be registered with the NSW EPA WasteLocate tracking system to comply with the legislation in regards to transporting/movement of asbestos waste; • The contaminated fill should be excavated down to the final surface levels for construction or to the underlying natural soils; • Load the fill onto trucks and dispose in accordance with the assigned waste classification. The receiving licenced landfill facility will also need to be registered with the NSW EPA WasteLocate system in order to receive asbestos impacted waste; • Following removal of the contaminated fill/soil, the excavation should be inspected to confirm there are no obvious indicators of contamination such as stained or odorous soil, or residual underground infrastructure. Any unexpected conditions should be considered in the validation sampling program which should be adjusted accordingly; • The remediation area is to be validated in accordance with Section 7.1; and • All documents including landfill docket etc. should be retained and forwarded to the validation consultant for inclusion into the validation report.

6.2.3 Remediation Details (cap and containment)

The specific remediation details for remediation of fill are described in the table below:

Table 6-2: Remediation Details (cap and containment)

Step	Procedure
1.	<p><u>Engage the Validation Consultant:</u> Prior to commencement of any works, a suitably qualified contaminated land consultant should be engaged as the validation consultant. The validation consultant should be provided with a copy of</p>

Step	Procedure
	<p>this RAP. Based on the current data a licenced removal contractor (Class B) should be engaged for the fill removal process. An asbestos removal control plan should be prepared by the removal contractor and provided to the validation consultant prior to proceeding with the remediation works.</p>
2.	<p><u>Personal Protective Equipment (PPE) and Work Health and Safety (WHS):</u> Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation includes the following:</p> <ul style="list-style-type: none"> • Disposable gloves; • Eye protection; and • Hard hat, covered clothing and steel toed boots. <p>Reference should be made to the asbestos removal control plan (to be prepared by the removal contractor) for additional asbestos related PPE requirements.</p>
2.	<p><u>Site Preparation:</u> Clear the site of all pavements, compact bricks, cobbles, boulders and other large objects.</p>
3.	<p><u>Address Stability Issues:</u> Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the excavation (as required).</p>
4.	<p><u>Removal of fill:</u> Should cut works be required prior to construction of the cap, the following should be undertaken:</p> <ul style="list-style-type: none"> • Submit an application to dispose of the fill (in accordance with the assigned waste classification) to a licensed landfill and obtain authorisation to dispose; • The fill is impacted with asbestos. Prior to the off-site transport the material must be registered with the NSW EPA WasteLocate tracking system to comply with the legislation in regards to transporting/movement of asbestos waste; • The contaminated fill should be excavated down to the final surface levels for construction or to the underlying natural soils; • Load the fill onto trucks and dispose in accordance with the assigned waste classification. The receiving licenced landfill facility will also need to be registered with the NSW EPA WasteLocate system in order to receive asbestos impacted waste; • Following removal of the contaminated fill/soil, the excavation should be inspected to confirm there are no obvious indicators of contamination such as stained or odorous soil, or residual underground infrastructure; and • All documents including landfill dockets etc. should be retained and forwarded to the validation consultant for inclusion into the validation report.
5.	<p><u>Capping of Fill remaining in Built Areas:</u> The fill material remaining in the remediation areas is assumed to be contaminated and should be capped to limit exposure.</p>

Step	Procedure
	<p>Alternatively, a quantification of the asbestos concentration in soil in the remediation area can be attempted by in accordance with the Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013). This may demonstrate that only specific areas require remediation.</p> <p>The proposed building floor slab and concrete pavements can act as a suitable capping layer over the contaminated fill in built/hardstand areas. A visual marker layer (eg. orange or yellow geo-fabric/bidim) or similar product with long term durability should be placed beneath the slab/pavement as shown on the attached Figure 4.</p> <p>The imported materials (e.g. road base, builders sand etc) to be placed beneath the built hardstand areas should be placed over the visual marker layer as shown on the attached Figure 4. This material will act as a capping layer and should meet the importation criteria outlined in Section 7.1. The material should be checked prior to importation onto the site.</p> <p>Services in built areas should be placed above the visual marker as shown on the attached Figure 5. Service trenches should be backfilled with VENM.</p> <p>The remediation contractor should arrange for a survey of the area prior to placement of the visual marker layer. A final survey should be undertaken of the area after the placement of the building floor slabs and concrete pavements. The survey data should be issued to the environmental consultant for inclusions in the validation report.</p>
6.	<p><u>Capping of Fill remaining in Landscaped Areas:</u></p> <p>The fill material remaining in landscaped areas (see attached Figure 4) is contaminated and should be capped to limit exposure.</p> <p>Alternatively, a quantification of the asbestos concentration in soil in the remediation area can be attempted by in accordance with the Western Australian Asbestos Guidelines 2009 (endorsed in NEPM 2013). This may demonstrate that only specific areas require remediation.</p> <p>In landscaped areas, a geo-grid such as TriAx (TX150 or TX160) or similar product with long term durability should be placed over the underlying fill material. A visual marker layer (eg. orange or yellow geo-fabric/bidim) should be placed over the geo-grid as shown on the attached Figure 4. The geo-grid will act as a physical barrier which will limit exposure to the underlying fill.</p> <p>The topsoil/VENM imported for landscaping should be placed over the geo-grid and visual marker layer as shown on the attached Figure 4. This material will act as a capping layer and should meet the importation criteria outlined in Section 7.1. The material should be checked prior to importation onto the site. Topsoil/ VENM coverage of approximately 0.2m is required in landscaped areas and 0.5m coverage for localised planted shrubs and trees.</p> <p>Services in the landscaped areas should be placed above the visual marker as shown on the attached Figure 5.</p>

Step	Procedure
	The remediation contractor should arrange for a survey of the area prior to placement of the visual geo-grid and/or marker layer. A final survey should be undertaken of the area after the placement of the topsoil which will form the capping layer. The survey data should be issued to the environmental consultant for inclusion in the validation report.
7.	<u>Post Construction Environmental Management Plan (EMP):</u> An EMP should be prepared for the long term management of the containment area.
8.	<u>Public Notification of EMP:</u> The EMP will require notification as a condition on the Site Audit Statement and appropriate public notification established under Section 149(2) of the EP&AA Act 1979 or a covenant registered on the title to land under Section 88B of the Conveyancing Act.

6.3 Inspection Requirements

An environmental consultant who is a member of the Australian Contaminated Land Consultants Association (ACLCA¹⁵) should be present during the remediation works to assess the excavation and provide advice on the removal of any impacted soil.

During excavation of the fill material, environmental personnel should be available to make site visits as required to inspect unexpected conditions and manage any issues associated with removal of the fill material. Following remediation, validation inspections will be undertaken and samples obtained as described in this plan.

The site should be inspected by a qualified environmental consultant prior to and after the installation of geo-grid and marker membrane in the areas to be capped.

6.4 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Soil disposal docket (and docket for disposal of asbestos containing materials where relevant);
- Imported materials information;
- Photographs of remediation works;
- Asbestos removal documentation, including licences, removal control plans and air monitoring results (where relevant); and
- Waste tracking documentation.

¹⁵ <http://www.aclca.org.au/>

Adequate documentation of waste tracking (excavation, stockpiling, classification, transport and disposal) should be retained by the remediation contractor and forwarded to EIS for inclusion in the final validation report.

Copies of the above documentation must be forwarded to the validation consultant on completion of the remediation for inclusion in the final validation report.

6.5 Soil Disposal - Volume and Disposal Analysis

A soil volume analysis should be undertaken on completion of the works and reconciled with the quantities shown on the soil disposal docket. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)¹⁶ should also be undertaken to confirm whether or not each facility is appropriately licensed to receive the waste.

6.6 Environmental Management Plan (EMP)

Part of the site validation process associated with the cap and contain remediation approach includes the preparation of an EMP, which is to be completed following the site remediation works. An appropriate public notification of the EMP will be established under Section 149(2) of the Environmental Planning and Assessment Act (1979)¹⁷ or a covenant registered on the title to land under Section 88B of the Conveyancing Act (1919)¹⁸.

¹⁶ NSW Government, (1997)). *Protection of Environment Operations Act*. (referred to as POEO Act 1997)

¹⁷ NSW Government, (1979), *Environmental Planning and Assessment Act*. (referred to as EPAA 1979)

¹⁸ NSW Government, (1919), *Conveyancing Act*. (referred to as Conveyancing Act)

7 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 7.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on site observations made during remediation.

Site observations will also be used as a validation tool to assess the extent of site contamination in light of the data gaps. In particular visual and olfactory indicators such as ACM, petroleum odours and staining should be recorded.

7.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site.

Table 7-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
<i>Remediation of Fill (following off-site disposal and achievement of final site levels)</i>			
Remediation area	20m grid (one sample per 400m ²), with additional samples targeting any potentially impacted areas identified during the visual/olfactory assessment. Sampling may not be required where capping is proposed. However, the surface should be free of visible ACM. The excavation walls are likely to be retained and inaccessible for sampling. In the event soils are exposed on the walls, samples should be collected at a rate of one sample per 20m lineal	Analysis to target contaminant of concern (Asbestos) 500ml soil samples to be analysed for asbestos. Bulk visual screening to be undertaken using 7mm sieve or examined against high contrast background (eg. blue tarpaulin).	Observations of fill removal and ACM fragments to be recorded. Photographs to be taken. Disposal dockets to be retained. Asbestos assessor to provide a surface clearance of the natural soil surface following removal of all the fill material.

Aspect	Sampling	Analysis	Observations and Documentation
	(minimum of one sample per wall), with sampling targeting distinct fill profiles based on field observations.		
Imported Materials – relevant to all site works			
Imported VENM backfill	Minimum of three samples per source	<p>Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPP, PCBs and asbestos.</p> <p>Additional analysis may be required depending on site history.</p>	<p>VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate).</p> <p>Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.</p>
Imported engineering materials such as recycled aggregate, road base etc	Minimum of three samples per source/material type.	Heavy metals (as above), TRHs, BTEX, PAHs, OCP/OPP, PCBs and asbestos.	<p>Documentation required to confirm material has been classified with reference to a relevant exemption and is fit for purpose on site.</p> <p>Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.</p> <p>Dockets for imported material to be provided.</p>
Imported engineering materials comprising only natural quarried products such as blue metal etc	At the validation consultant’s discretion based on supplier documentation.	At the validation consultant’s discretion based on supplier documentation.	<p>Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. quarried product).</p> <p>Review of quarry POEO licence.</p> <p>Material to be inspected upon importation to confirm it is free</p>

Aspect	Sampling	Analysis	Observations and Documentation
			<p>of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation.</p> <p>Dockets for imported material to be provided.</p>
Imported landscaping materials	Minimum of three samples per source/material type.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCPs, OPPs, PCBs and asbestos.	<p>Documentation required to confirm material has been produced under an appropriate standard and is fit for purpose on site.</p> <p>Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.</p> <p>Dockets for imported material to be provided.</p>

7.2 Validation Assessment Criteria and Data Assessment

The VAC to be adopted for the validation assessment are outlined in the table below:

Table 7-2: VAC

Validation Aspect	Criteria
Waste classification (soil disposal)	In accordance with the procedures and criteria outlined in the NSW EPA Waste Classification Guideline.
Soil validation	<p><u>Area A VAC</u></p> <ul style="list-style-type: none"> • Free of surface ACM; • ACM quantification results to be less than the HSL-C criteria (0.02%); and • AF/FA (0.001%). <p><u>Area B VAC</u></p> <ul style="list-style-type: none"> • Asbestos: <ul style="list-style-type: none"> ➤ Free of surface ACM; ➤ ACM quantification results to be less than the HSL-C criteria (0.02%); and ➤ AF/FA (0.001%). • Other CoPC: <ul style="list-style-type: none"> ➤ The HIL-C criteria for ‘public open space, secondary schools, foot paths (includes hospitals)’; and ➤ The HSL-A/B criteria for ‘high density residential’ for hydrocarbons.
Imported materials	<p>Heavy metal concentrations are to be less than the most conservative Added Contaminant Limit (ACL) concentrations for a commercial/industrial exposure setting presented in Schedule B1 of NPEM (2013). Organic compounds to be less than the laboratory PQLs and asbestos to be absent. Results for VENM and other imported materials will need to be consistent with expectations for those materials.</p> <p>Aesthetics: soils to be free of staining and odours.</p>

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the consultant and undertaken in accordance with the NEPM (2013).

7.3 Validation Report

As part of the validation process, a site validation report will be prepared by the environmental/validation consultant. The report will outline the remediation work undertaken at the site and any deviations to the remediation strategy. The report will summarise the results of the validation assessment and will be prepared in accordance with the Reporting Guidelines 2011. The report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

7.4 Data Quality

Where applicable QA/QC samples should be obtained during the validation and analysed for the contaminants of concern. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes, trip blanks and rinsate samples.

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report.

DQOs should be established for the validation with regards to the seven-step process outlined in the Site Auditor Guidelines 2017 and with reference to USEPA documents Data Quality Objectives Processes for Hazardous Waste Site Investigations (2000) and Guidance on Systematic Planning Using the Data Quality Objectives Process (2006). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

8 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risk that may affect the success of the remediation is an unexpected find. A contingency plan for unexpected finds is outlined below, in conjunction with a selection of other contingencies that may apply to this project.

8.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: buried ash and domestic waste, USTs, potential friable asbestos in soil, and odorous or stained soils.

The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the client should be contacted immediately;
- Temporary barricades should be erected to isolate the area from access to the public and workers;
- The client should engage a qualified environmental consultant to attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination;
- In the event remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an addendum RAP prepared;
- An additional sampling and analytical rationale should be established by the consultant and should be implemented with reference to the relevant guideline documents; and
- Appropriate validation sampling should be undertaken and the results should be included in the validation report.

8.2 Continual Soil Validation Failure

In the event of a soil validation failure when validating fill removal, the excavation should be extended in the direction of the failure (in consultation with the validation consultant) and the area re-validated. Alternatively, the cap and contain approach for remediation can be adopted.

8.3 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in Section 6, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

8.4 Disposal of Hazardous Waste

Material classed as 'Hazardous Waste' under the Waste Classification Guidelines (2014) may require further assessment and stabilisation prior to off-site disposal. Disposal approval may also be required from the NSW EPA and EPA licensed landfill facility. The presence of Hazardous Waste may result in significant delays and additional cost to the project.

9 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should contact the local consent authority (council or certifier) for specific site management requirements for the overall development of the site.

9.1 Interim Site Management

The site is in use and no interim site management measures are considered necessary at this stage. The presence of non-friable ACM is not considered to pose a significant risk in the context of the existing site layout and site use given that development/remediation is expected to commence in the near future.

9.2 Asbestos Controls and Licencing Requirements

Non-friable ACM has been identified at the site, an Asbestos Management Plan should be prepared for the proposed earthworks. The following requirements should be met for the asbestos remediation works:

- A suitably licenced asbestos removalist should be engaged to undertake the excavation/removal works associated. The licensed contractor is to prepare an Asbestos Removal Control Plan for this aspect of the site works;
- SafeWork NSW are to be notified prior to excavation works (minimum 5 business days), if deemed necessary by the licenced asbestos removalist;
- All personnel and contractors must be informed of site conditions, asbestos work areas and any exclusion zones;
- Air monitoring should be undertaken on a daily basis during any asbestos remediation works and all readings are to be below the detection limit of 0.01 fibres per millilitre;
- Asbestos clearance certificate/s should be provided by a SafeWork NSW licensed asbestos assessor. EIS note that validation sampling is required; and
- The site is managed in accordance with this plan and the general requirements of SafeWork NSW and strategies outlined in the relevant regulations, guidelines, codes and standards.

9.3 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised below.

Table 8-1: Project Contacts

Task	Company	Contact Details
Project Manager	CBRE	-
Remediation Contractor	To be appointed	-

Task	Company	Contact Details
Environmental Consultant	EIS (at the time of the RAP preparation)	9888 5000
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

9.4 Security

Prior to the commencement of site works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation work. All excavations should be clearly marked and secured to reduce the risk to site personnel from injury by falling into open excavations.

9.5 Timing and Sequencing of Remediation Works

The remediation works should be treated as a priority. In the event that remedial works are undertaken in conjunction with the development, all remediation areas should be clearly marked and delineated.

9.6 Site Soil and Water Management Plan

The contractor should prepare a detailed soil and water management plan prior to the commencement of site works. Silt fences should be used to control the surface water runoff at all appropriate locations of the site. Reference should be made to the consent conditions for more details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

9.7 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)¹⁹ should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by Council (refer to consent documents).

¹⁹ Australian Standard, (2002). AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

9.8 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Concrete surfaces brushed or washed to remove dust;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the site; and
- The expanse of cleared land should be kept to a minimum to achieve a clean and economical working environment.

If stockpiles are to remain on-site or an excavation remains open for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles

removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines.

9.9 Air Monitoring

At this stage, EIS has assessed the asbestos to be non-friable. Requirements for air monitoring should be considered by the asbestos removal contractor for any asbestos-related works. This should take in account the results of the Pre-remediation Assessments.

9.10 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act;
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. tarpaulins or builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours;
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures as outlined in NEPM:
 - reduce the exposed surface of the odorous materials;
 - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
 - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

9.11 Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. Gloves and dust masks should be worn when working on remediation activities (additional asbestos-related PPE may also be required for asbestos remediation work). Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

9.12 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. This should, as a minimum, include measures to recycle and re-use natural excavated material wherever possible.

9.13 Incident Management Contingency

The environmental consultant engaged to undertake the validation assessment should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly if any incident occurs on site, the environmental consultant should be advised to assess potential impacts on site contamination conditions and the remediation/validation timetable.

9.14 Hours of Operation

Hours of operation should be between those approved by Council under the development approval process. Reference should also be made to any specific conditions imposed by other consent authority/regulatory bodies.

10 CONCLUSION

EIS are of the opinion that the site can be made suitable for the proposed development provided this RAP is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority.

10.1 Remediation Category

Site remediation can fall under the following two categories outlined in SEPP55:

Table 10-1: Remediation Category

Category	Details
Category 1	<p>Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55:</p> <p>A designated development;</p> <ul style="list-style-type: none"> • Carried out on land declared to be a critical habitat; • Development for which another SEPP or REP requires a development consent; or • Carried out in an area or zone classified as: <ul style="list-style-type: none"> ➤ Coastal Protection; ➤ Conservation or heritage conservation; ➤ Habitat protection, or habitat or wildlife corridor; ➤ Environmental protection; ➤ Escarpment, escarpment protection or preservation; ➤ Floodway or wetland; ➤ Nature reserve, scenic area or scenic protection; etc. • Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc. <p>Approval is required from the consent authority for Category 1 remediation work.</p>
Category 2	<p>Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works, however the consent authority should be given 30 days' notice prior to commencement of works.</p>

The project manager and/or planner should assess whether the remediation is considered to be Category 1 or Category 2 under the SSD assessment.

10.2 Regulatory Requirements

The regulatory requirements applicable for the site are outlined in the following table:

Table 10-2: Regulatory Requirement

Guideline	Applicability
Duty to Report Contamination (2015) ²⁰	At this stage, EIS consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed following review of the Pre-Remediation Assessment and validation results.
POEO Act 1997	<p>Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.</p> <p>Appropriate waste tracking is required for all relevant waste that is disposed off-site. Asbestos waste must be tracked using WasteLocate.</p>
WHS Code of Practice 2016 ²¹	Sites with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (i.e. bonded or friable asbestos works).

²⁰ NSW EPA, (2015). *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997*. (referred to as Duty to Report Contamination 2015)

²¹ Safe Work Australia, (2016). *Code of Practice – How to Manage and Control Asbestos in the Workplace*.

11 **LIMITATIONS**

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or land use. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

LIST OF IN-TEXT TABLES

Table 1-1: Guidelines	2
Table 2-1: Site Identification	4
Table 2-2: CSM	11
Table 5-1: Site Specific Remediation Options	16
Table 6-1: Remediation Details (off-site disposal of fill)	19
Table 6-2: Remediation Details (cap and containment)	20
Table 7-1: Validation Requirements	25
Table 7-2: VAC	28
Table 8-1: Project Contacts	31
Table 10-1: Remediation Category	36
Table 10-2: Regulatory Requirement	37

IMPORTANT INFORMATION ABOUT THIS REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors:

This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions:

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data:

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations:

Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals:

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report:

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely:

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.