REPORT TO

LORETO NORMANHURST C/- ALLEN JACK + COTTIER

ON

REMEDIATION ACTION PLAN (RAP)

FOR

PROPOSED STAGE 1 WORKS AREA

AT

LORETO NORMANHURST GIRLS SCHOOL, 91-93 PENNANT HILLS ROAD, NORMANHURST, NSW

Date: 29 May 2019
Ref: E31772KLrpt6-RAP

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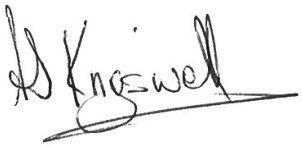

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Executive Summary

Allen Jack + Cottier, acting on behalf of Loreto Normanhurst ('the client') commissioned Environmental Investigation Services (EIS)[1] to prepare a Remediation Action Plan (RAP) for the proposed Stage 1 Works at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW. The site location is shown on Figure 1 and the RAP is applicable to 'the site' boundaries as shown on Figure 2.

EIS have previously undertaken a *Detailed Site Investigation (DSI)* at the site (EIS Ref: E31772KLrpt5[2]). The findings of the EIS DSI 2019 report are summarised in Section 2.

From the information provided by the client, EIS understands the Stage 1 Works area will be undertaken in three sections. These are as follows:

- Stage 1A – Includes the construction of a new boarding house located on the eastern boundary of the school. It is proposed that the new building will comprise four levels including two partial basement levels. The building will be cut into the existing batters to the north and east elevations to create the two partial basement levels for car parking and common areas;
- Stage 1B – Includes the landscaping renovation of the Mary Ward Wing located in the centre of the northern section of the school. It is proposed that part of the existing building will be demolished and the area be developed as a landscape feature; and
- Stage 1C – Includes the garden plaza development located immediately to the east of the Mary Ward Wing. It is proposed the existing tennis courts will be demolished and the area will be developed as a garden plaza with a combination of landscaped garden beds and paved footpaths.

The goal of this RAP is to provide technical recommendations for remediation works, validation works and unexpected finds protocols during the development works.

The objectives of the RAP are to:

- Provide a methodology to manage contamination, 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 contaminants of concern are the Polycyclic Aromatic Hydrocarbons (PAHs) and Total Recoverable Hydrocarbons (TRH) identified within the fill material in the vicinity of BH2, BH105 and BH106 during the previous assessments, and bonded asbestos containing material (ACM) in the form of one fibre cement fragment (FCF) identified on the surface of the site.

This RAP outlines the following procedures:

- Remediation of the PAH impacted fill area;
- Remediation of bonded ACM; and
- Validation sampling and clearance inspections to ensure remediation has been successful.

EIS are of the opinion that the site can be made suitable for the proposed Stage 1 Works Area 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.

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

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

[2] Titled *"Report to Allen Jack + Cottier on Detailed Site Investigation for Proposed Stage 1 Works Area at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW"* referred to as EIS DSI 2019 Report

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Abbreviations

Asbestos Fines/Fibrous Asbestos	AF/FA
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
Benzo(a)pyrene Toxicity Equivalent Factor	BaP TEQ
Bureau of Meteorology	BOM
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Cation Exchange Capacity	CEC
Contaminated Land Management	CLM
Contaminant(s) of Potential Concern	CoPC
Chain of Custody	COC
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Data Quality Objective	DQO
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Health Investigation Level	HILs
Hardness Modified Trigger Values	HMTV
Health Screening Level	HSLs
International Organisation of Standardisation	ISO
Lab Control Spike	LCS
Light Non-Aqueous Phase Liquid	LNAPL
Map Grid of Australia	MGA
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCP
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Potential ASS	PASS
Polychlorinated Biphenyls	PCBs
Photo-ionisation Detector	PID
Protection of the Environment Operations	POEO
Practical Quantitation Limit	PQL
Quality Assurance	QA
Quality Control	QC
Remediation Action Plan	RAP
Relative Percentage Difference	RPD

Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Site Specific Assessment	**SSA**
Source, Pathway, Receptor	**SPR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
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**
World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Allen Jack + Cottier, acting on behalf of Loreto Normanhurst ('the client') commissioned Environmental Investigation Services (EIS)[3] to prepare a Remediation Action Plan (RAP) for the proposed Stage 1 Works at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW. The site location is shown on Figure 1 and the RAP is applicable to 'the site' boundaries as shown on Figure 2.

EIS have previously undertaken a *Detailed Site Investigation (DSI)* at the site (EIS Ref: E31772KLrpt5)[4]. The findings of the EIS DSI 2019 report are summarised in Section 2.

EIS are currently in a transitional phase of re-branding and will commence trading as JK Environments in 2019. JK Environments, like EIS, will function as the environmental division of Jeffery and Katauskas Pty Ltd and will continue to operate alongside JK Geotechnics.

1.1 Proposed Development Details

From the information provided by the client, EIS understands the Stage 1 Works area (i.e. the site) will be undertaken in three sections. These are as follows:

- Stage 1A – Includes the construction of a new boarding house located on the eastern boundary of the school. It is proposed that the new building will comprise four levels including two partial basement levels. The building will be cut into the existing batters to the north and east elevations to create the two partial basement levels for car parking and common areas;
- Stage 1B – Includes the landscaping renovation of the Mary Ward Wing located in the centre of the northern section of the school. It is proposed that part of the existing building will be demolished and the area be developed as a landscape feature; and
- Stage 1C – Includes the garden plaza development located immediately to the east of the Mary Ward Wing. It is proposed the existing tennis courts will be demolished and the area will be developed as a garden plaza with a combination of landscaped garden beds and paved footpaths.

1.2 Goals, Aims and Objectives

The goal of this RAP is to provide technical recommendations for remediation works, validation works and unexpected finds protocols during the development works.

The objectives of the RAP are to:

- Provide a methodology to manage contamination, 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.

[3] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[4] Titled *"Report to Allen Jack + Cottier on Detailed Site Investigation for Proposed Stage 1 Works Area at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW"* referred to as EIS DSI 2019 Report

1.3 Scope of Work

The plan was prepared in accordance with an EIS proposal (Ref: EP49119PL) of 18 May 2019 and written acceptance from the client of 20 March 2019. The scope of work included:

- Review of relevant reports prepared by EIS;
- Preparation of a draft report for client review; and
- Preparation of a final report.

The scope of work was undertaken with reference to the regulations and guidelines outlined in the table below. Individual guidelines are also referenced within the text of the report.

Table 1-1: Guidelines

Guidelines/Regulations/Documents
Contaminated Land Management Act (1997)[5]
State Environmental Planning Policy No.55 – Remediation of Land (1998)[6]
Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)[7]
Guidelines for Consultants Reporting on Contaminated Sites (2011)[8]
Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[9]
National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)[10]

[5] Contaminated Land Management Act 1997 (NSW). (referred to as CLM Act 1997)

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

[7] Department of Urban Affairs and Planning, and Environment Protection Authority, (1998). *Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land*. (SEPP55 Planning Guidelines)

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

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

[10] National Environment Protection Council, (2013). *National Environmental Protection (Assessment of Site Contamination) Amendment Measure 1999* (as amended 2013). (referred to as NEPM 2013)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Current Site Owner:	Trustees of the Loreto Property Association
Site Address:	91-93 Pennant Hills Road, Normanhurst, NSW
Lot & Deposited Plan:	Part of Lot 3 in DP1217496 Part of Lots 16, 20, 21 and 22 in DP6612 Part of Lot 1 in DP809066
Current Land Use:	School
Proposed Land Use:	School
Local Government Authority (LGA):	Hornsby Shire Council
Current Zoning:	R2 – Low Density Residential
Site Area (m^2):	13,200m^2
Geographical Location (decimal degrees) (approx.):	Latitude: -33.726726 Longitude: 151.098743
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2
Contamination Data Plan:	Figure 3

2.2 Site Location and Regional Setting

The site is located in a predominantly residential area of Normanhurst. The site is bounded by Pennant Hills Road to the north, Mount Pleasant Avenue to the east and south and Osborn Road to the west.

2.3 Topography

The regional topography is characterised by an east facing hillside that falls towards Mount Pleasant Avenue. The site is located towards the mid-slope of the hillside and has a gentle slope towards the east and north-east at approximately 2° to 3°. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.

2.4 EIS Site Inspection (2019)

A walkover inspection of the site was undertaken by EIS on 27 March 2019. The inspection was limited to accessible areas of the site grounds and immediate surrounds. An internal inspection of buildings was not undertaken. A summary of the other inspection findings are outlined in the following subsections:

2.4.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the majority of the Stage 1 Works area was occupied by school buildings, paved driveways and footpaths, landscaped areas and a tennis court. The wider site was occupied by school associated buildings including covered outdoor learning areas (COLAs). The southern section of the school was occupied by a recreational area that included car parking, playing fields and bushland. The boarding houses located at the north-east section of the school appeared to have been former residential buildings converted for school use.

2.4.2 Buildings, Structures and Roads

The north-eastern section of the school consisted of the main boarding house and the central section contained classrooms, amenities and administration offices. The buildings were mostly of brick construction with potential asbestos containing fibre cement sheeting noted on the external areas of the buildings. All buildings and structures appeared in good condition.

2.4.3 Boundary Conditions, Soil Stability and Erosion

The school was bounded by metal security fencing along most boundaries with the exception to the east of the boarding house which was bounded by a small brick retaining wall. There were no visible signs of erosion or soil instability along the school boundaries.

2.4.4 Visible or Olfactory Indicators of Contamination

A fibre cement fragment (FCF) was encountered on the ground surface within the Stage 1 Works adjacent to the Loreto Community House. The fragment was sampled and identified as AMF1 in this report.

2.4.5 Presence of Drums/Chemicals, Waste and Fill Material

The maintenance yard located in the northern area of the school housed minor quantities of various chemicals and fuel for general maintenance of the school grounds. The yard appeared properly contained and the chemicals stored correctly with no direct pathway to reach bare soil or grass.

The playing fields and tennis courts located centrally in the school ground appeared to have been historically cut and filled to achieve existing levels.

2.4.6 Drainage and Services

Stormwater pits were located across the low-level areas of the school and were assumed to be connected to the local stormwater system. The surface run-off was assumed to follow the general gradient of the site towards the south and east.

2.4.7 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.

2.4.8 Landscaped Areas and Visible Signs of Plant Stress

Various raised garden beds, grassed areas and ground-level garden beds were identified across the school grounds. The vegetation present included large (>10m) native trees, exotic and native grasses and exotic shrubs. No visible signs of plant stress or dieback was noted during the site inspection.

2.5 Surrounding Land Use

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

- North – Cumberland Highway and Normanhurst Public School;
- South – Mount Pleasant Avenue and an aged care facility;
- East – Mount Pleasant Avenue and residential properties;
- West – Osborn Road and residential properties.

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

2.6 Previous Investigation (EIS DSI 2019)

EIS have previously undertaken a *Detailed Site Investigation (DSI)* at the site (EIS Ref: E31772KLrpt5, dated 24 May 2019). The EIS DSI 2019 report identified elevations of carcinogenic PAHs and total PAHs above the human-health based SAC in the fill material. Elevated concentrations of TRH (C16-C34) (F3), benzo(a)pyrene (B(a)P) and zinc were encountered above the ecological based SAC. Minor elevations of some metals in groundwater were identified above the ecological SAC, however these were considered to be consistent with regional/background groundwater conditions. One fibre cement fragment (FCF) collected from the surface of the site (AMF1) was found to contain chrysotile asbestos.

Based on the Tier 1 risk assessment, the concentrations of carcinogenic PAHs and total PAHs above the human-health based SAC were considered to pose a low to negligible risk to existing site users. Potential ecological related risks exist in relation to TRH (F3), B(a)P and zinc within the fill soil are considered low.

Based on the findings of the assessment, EIS are of the opinion that the site can be made suitable for the proposed development, however a remediation action plan (RAP) will be required to outline the remediation necessary to make the site suitable for the proposed development. The RAP will outline the methodology for remediation of the contaminated fill soil and validation of the excavation on the completion of remedial works.

2.7 Summary of Geology and Hydrogeology

2.7.1 Regional Geology

Regional geological information presented in the Lotsearch report (attached in the appendices) indicated that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

2.7.2 EIS DSI 2019 Report

Boreholes drilled at the site for the EIS DSI 2019 Report generally encountered asphaltic concrete pavement at the surface in several boreholes to a maximum depth of 0.16m Below Ground Level (BGL), underlain by fill in all boreholes that extended to depths of approximately 0.1m to 1.7m. This was underlain by natural silty clay to depths of between 0.7mBGL and 2.7mBGL (excluding several boreholes where fill was encountered overlying bedrock). Weathered siltstone bedrock was encountered in several deeper boreholes to the termination of these boreholes at depths ranging from 1.0mBGL to 6.0mBGL.

2.7.3 Acid Sulfate Soil Risk

A review of the acid sulfate soil (ASS) risk map prepared by Department of Land and Water Conservation (1997)[11] indicated that the site is not located within a risk area.

ASS information presented in the Lotsearch report (attached in the appendices) indicated that a Class 5 area is located directly to the south of the site. EIS do not consider this to represent a potential ASS risk during the proposed development works.

2.7.4 Hydrogeology

Hydrogeological information presented in the Lotsearch report indicated the regional aquifer includes porous, extensive aquifers of low to moderate productivity. There were 10 registered bores within 2km of the site. The nearest registered bore was 234m from the site and was used for recreational purposes, the majority of bores were used for monitoring purposes.

The information reviewed for the EIS DSI 2019 Report indicated that the subsurface conditions at the site are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for

[11] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)*

viable groundwater abstraction and use of groundwater under these conditions is considered to be low. Use of groundwater is not proposed as part of the development.

2.7.5 Receiving Water Bodies

Surface water bodies were not identified in the immediate vicinity of the site. The closest surface water body is Coups Creek located approximately 354m to the east of the site. Due to the distance from the site, this creek is not considered to be a potential receptor.

2.8 Summary of Site History

The EIS DSI 2019 report included a full site history assessment comprising a review of a Lotsearch Pty Ltd Environmental Risk and Planning Report, historical aerial photographs, historical land titles, SafeWork dangerous goods records, Section 10.7 (2) & (5) certificates and statutory notices by the NSW EPA. From this information, the site history can be summarised as follows:

- Land titles indicated the majority of the site consisted of vacant grassed land in the southern portion and residential properties in the northern portion prior to 1933;
- The site was purchased by The Loreto Property Association in 1933;
- The site has been operational as Loreto Normanhurst School since 1933 to the present day with construction and various additions to the school buildings during this time.

3 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) and the review of site history information. Reference should also be made to the figures attached in the appendices.

3.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC identified in the previous investigation are presented in the following table:

Table 3-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site has been historically filled to achieve the existing levels. The previous investigation identified fill to depths ranging from 0.1mBGL to 1.7mBGL. The soil laboratory analysis results demonstrated that concentrations of heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), benzene, toluene, ethylbenzene and xylene (BTEX), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and AF/FA asbestos were below the SAC and not of concern. TRH and PAHs above the SAC for human health and ecological receptors was identified at three locations in fill (BH2, BH105 and BH106).	Petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs) and polycyclic aromatic hydrocarbons (PAHs).
Hazardous Building Material – One bonded fibre cement fragment (FCF) containing asbestos was identified on the surface of the site. This may be present as a result of former building and demolition activities. This material may also be present in the existing buildings/ structures on site. No asbestos material or asbestos fines were identified within the fill material as part of the asbestos quantification sampling and analysis.	Asbestos (bonded)

3.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 3-2: CSM

Potential mechanism for contamination	Potential mechanisms for contamination include: • Fill material – importation of impacted material, 'top-down' impacts (e.g. placement of fill, leaching from surficial material etc.), or sub-surface release (e.g. impacts from buried material); and • Hazardous Building Materials - 'top-down' (e.g. demolition resulting in surficial impacts in unpaved areas).
Affected media	Fill soil has been identified as the affected media. The previous assessment identified elevated PAH and TRH concentrations above the SAC in the fill material. The presence of ash and slag within the fill profile indicates this is the source of contamination.
Receptor identification	Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users. Ecological receptors include terrestrial organisms and plants within unpaved areas.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into the proposed basement and/or building; and • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas.

3.3 Assessment of Data Gaps

Additional sampling conducted around BH2 did not properly characterise the horizontal extent of the contamination within the fill material. However, as the proposed development in this area (the boarding house) involves bulk excavation of soil for the construction of two basement levels that will be cut into the existing hillside, it is assumed the material will be removed from site. Therefore this will be confirmed via remediation and validation process outlined in the RAP.

4 REMEDIATION EXTENT

A discussion of the anticipated extent of remediation based on the current data is provided below. Reference should also be made to the attached Figure 4.

4.1 Fill Material (PAHs)

The defined extent of remediation required of the PAH contaminated fill material in the vicinity of BH2, BH105 and BH106 at this stage is uncertain. However, no PAH impacts were identified in nearby fill samples from boreholes BH102, BH103, BH104 and BH107. The existing building to the east could indicate the use of different fill material beneath the building and therefore this has been used as the arbitrary eastern boundary of the remediation extent.

The nominated extent of remediation required (outlined in the attached Figure 4) is arbitrary at this stage and has been defined using available data and initially aims to reduce the proposed extent/volume of fill soil disposal during remediation.

EIS note that it may be prudent to undertake additional sampling around BH2, BH105 and BH106 prior to commencing remediation works in an attempt to define the extent of PAH contamination in this area. However, the final extent will be confirmed during the validation process following remediation.

4.2 Hazardous Building material (Bonded ACM)

Based on the available data, the extent of remediation is anticipated to cover the surface of the entire Stage 1 Works site area. Detailed asbestos quantification sampling and analysis did not identify any sub-surface fill material impacts at the site. However localised surface impacts should be expected in various locations across the site, either beneath existing buildings/infrastructure or vegetation. The extent of each remediation area should be defined at each location in the event that ACM is identified during the proposed development works.

An outline of remediation management requirements is included in Section 7.

5 REMEDIATION OPTIONS

5.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013. 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; or

if the above are not practicable:

3) Consolidation and isolation of the soil on-site by containment with a properly designed barrier;
4) Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5) Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

- The above hierarchy items (1 to 5 inclusive) have been referred to as Option 1, Option 2 etc. herein.

5.2 Consideration of Remediation Options

The tables below discusses a range of remediation options:

Table 5-1: Consideration of Remediation Options

Option	Discussion	Applicability
Option 1 On-site treatment of contaminated soil	Various on-site treatment technologies exist such as bio-remediation, air sparging and soil vapour extraction, and thermal desorption. With regards to bonded asbestos containing material (ACM), the only relevant on-site treatment option would include the physical removal of bonded ACM via picking. This would include a systematic process whereby the impacted surface is inspected and ACM fragments are physically removed by hand.	Physical removal of bonded ACM via hand picking is a viable approach. Bioremediation of hydrocarbon impacted soils associated with the remediation areas may be possible, however this option is unlikely to be applicable (or viable) for this site.
Option 2 Off-site treatment of contaminated soil	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. 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 and regulatory requirements would need to be carefully considered. 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.	Not applicable for this project considering the limited volumes of material potentially to be remediated, the limitations associated with treatment technologies, and the regulatory implications.
Option 3 Capping and containment of contaminated soils	This would include the placement of a warning layer (such as geo-grid or geofabric) and pavement over the surface of the contaminated soil to isolate the material and thereby reduce the health risk to future site users.	Not the preferred option for this project, considering the requirement for extensive excavation of the site for the proposed development. This option would require notation of the site on various planning and site identification documentation.

Option	Discussion	Applicability
	The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing Environmental Management Plan (EMP) would be required and site identification documentation, including the Section 10.7 Council planning certificate (or other appropriate notification mechanism), would be modified to note the presence of the contamination/EMP in the event that contamination remains at concentrations that exceed the Validation Assessment Criteria (VAC). This may impact upon development approval conditions, place restrictions on the use of the land and limit the future potential land value.	
Option 4 Removal of contaminated material to an appropriate facility and reinstatement with clean material	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to an appropriately licensed facility. 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.	Removal is considered the most viable option for this project considering the proposed development involves extensive excavation in the area where the contamination has been identified.

6 REMEDIATION DETAILS

6.1 Sequence of Works

Prior to commencement of any site preparation or remediation work, a suitably qualified contaminated land consultant[12] should be engaged as the validation consultant to validate the implementation of the RAP. The site management plan for remediation works (see Section 9) should be reviewed and implemented by the remediation contractor. Subsequently, remediation can occur within the nominated remediation areas.

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 areas.

6.2 Remediation of the PAH Impacted Fill

6.2.1 Rationale for Selection of Remedial Strategy

The most viable option for remediation of the PAH impacted fill soil is removal and disposal off-site to an appropriate facility (Option 4).

6.2.2 Remediation Details

The specific remediation details for the PAH impacted fill are described below:

Table 6-1: Remediation Details – PAH Impacted Fill

Step	Procedure
1.	Establish Remediation Area: Prior to commencement, the remediation area should be marked out as outlined in Section 4.1 using appropriate methods (i.e. pegs/marking paint). If additional sampling is undertaken prior to remediation, the extent should be defined as per the results of this additional sampling.
2.	Address Stability Issues and Underground Services: Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the excavation (as required). Stability issues should be addressed to the satisfaction of a qualified geotechnical engineer.
3.	Waste Classification: As waste classification report should be prepared for the waste in accordance with the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)[13]. The excavated fill material should be disposed of to a landfill that is licensed by the NSW EPA to accept the waste stream outlined in the

[12] EIS recommend that the consultancy engaged for the work be a member of the Australian Contaminated Land Consultants Associated (ACLCA), and/or the individual managing the works (and writing the validation report) be certified under one of the NSW EPA endorsed certified practitioner schemes

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

Step	Procedure
	waste classification report. The landfill should be contacted to obtain the required approvals prior to commencement of excavation.
4.	Personal Protective Equipment (PPE) and Work Health and Safety (WHS): Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation includes the following: • Disposable gloves; • P2 dust mask; • Eye protection; and • Hard hat, covered clothing and steel toed boots.
5.	Removal of fill soil: Remediation of the fill soil will be undertaken as follows: • The extent of the contamination should be established and the area is to be marked out using appropriate methods (pegs/marking paint); • Excavate the fill soil to the full extent of remediation under the guidance of the validation consultant; • Load the fill onto trucks and dispose to licensed facility in accordance with the assigned waste classification; • Validate the excavation in accordance with Section 7; and • Reinstate the area (if required) to an appropriate level using clean material. Preferably this material should be sourced from the site, in an area that falls outside the identified remediation area/s.

6.3 Remediation of Bonded ACM

6.3.1 Rationale for Selection of Remedial Strategy

The most viable option for remediation of the bonded ACM on the surface is on-site treatment by physical removal of the material by hand (Option 1). The remediation strategy is based on the assumption that only minor quantities (<10m^2) of bonded ACM require removal.

6.3.2 Remediation Details

The specific remediation details for the bonded ACM are described below:

Table 6-2: Remediation Details – Bonded ACM

Step	Procedure
1.	Establish Remediation Area: Prior to commencement, the remediation area should be marked out as outlined in Section 4.2 using appropriate methods (i.e. pegs/marking paint).
2.	PPE and WHS: Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation includes the following: • Disposable gloves; • P2 dust mask; • Eye protection; and • Hard hat, covered clothing and steel toed boots.
3.	Removal of the Bonded ACM: Following the establishment of the remediation area, removal of the bonded ACM will be undertaken as follows: • The remediation area should be marked out as outlined in Section 4.2; • A systematic walkover and inspection of the remediation should be undertaken by a Class B licensed asbestos removalist/remediation contractor under observation by the validation consultant; • All visible fragments of fibre cement/ACM should be picked from the surface and placed in a plastic asbestos waste bag. The bag should be sealed upon completion of remediation, 'double bagged' and placed in a nominated storage container; • All bagged fibre cement /ACM should be disposed of to an appropriately licensed facility; • Following completion of the surface pick, a visual clearance certificate should be obtained from a suitably qualified hygienist or NSW Licensed Asbestos Assessor. • Subject to a successful surface pick and clearance, all documents including disposal dockets, photographs and licenses should be retained and forwarded to the client for inclusion into the validation report to be prepared by the validation consultant.

6.4 Remediation Documentation

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

- Waste classification and waste tracking documentation;
- Soil disposal dockets (and dockets for disposal of asbestos containing materials where relevant)
- Asbestos removal documentation, including licenses, removal control plans and air monitoring results;
- Imported materials information; and

- Photographs of remediation works.

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 Waste Volume and Disposal Assessment

A soil volume analysis should be undertaken on completion of the works and reconciled with the quantities shown on the soil disposal dockets. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)[14] should also be undertaken to confirm whether or not each facility is appropriately licensed to receive the waste.

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

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 particular visual and olfactory indicators such as 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
Remediation of PAH Impacted Fill Area			
PAH Impacted Fill Area – excavation base	One surficial soil sample per 25m^2 to be collected from the base of the excavation area.	TRH/BTEX and PAHs	Samples to be screened using PID Observations of staining and odour to be recorded Photographs to be taken
PAH Impacted Fill Area – excavation walls	One sample per excavation wall (or per 10 lineal metre) and per vertical metre. Sampling to target obvious indicators of contamination and changes in soil profile.	TRH/BTEX and PAHs	Samples to be screened using PID Observations of staining and odour to be recorded Photographs to be taken
Groundwater (if encountered in excavation)	One 'grab' sample to be collected using a bailer.	TRH/BTEX (other contaminants have been excluded as volatile compounds pose the greatest risk in the context of the proposed site use).	Observations of sheen and odour to be recorded.

Aspect	Sampling	Analysis	Observations and Documentation
Remediation of Bonded ACM Area/s			
Bonded ACM Area/s	-	-	Visual walkover inspection of the ground surface for bonded ACM fragments. Observations of exclusions and/or obstructions recorded. Clearance certificate to be issued by a NSW Licensed Asbestos Assessor. Photographs to be taken
Imported Materials – relevant to all site works			
Imported VENM backfill	Minimum of three samples per source	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPP, PCBs and asbestos. Additional analysis may be required depending on source site history.	VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate) confirming material meets the definition for VENM. Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.
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.	Documentation required to confirm material has been classified with reference to a relevant exemption. Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.

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.	Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. quarried product). Review of quarry POEO licence. Material to be inspected upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. Dockets for imported material to be provided.
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.	Documentation required to confirm material has been produced under an appropriate standard. Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.

7.2 Validation Assessment Criteria (VAC) 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 Part 1 of the Waste Classification Guidelines 2014.
Groundwater	VAC for volatile compounds in groundwater will be based on drinking water guidelines presented in Australian Drinking Water Guidelines (2011)[15] and the World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)[16]. The VAC for naphthalene will include the threshold value for tap water based on the USEPA Region 9 screening levels.
Imported materials	Heavy metal concentrations are to be less than the most conservative Added Contaminant Limit (ACL) concentrations for URPOS exposure setting presented in Schedule B1 of NPEM (2013). Organic compounds are 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. Aesthetics: soils to be free of staining and odours.

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 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).

[15] National Health and Medical Research Council (NHMRC), (2011). *National Water Quality Management Strategy, Australian Drinking Water Guidelines* (referred to as ADWG 2011)

[16] World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

7.4 Data Quality

Appropriate 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 (one spike, rinsate and blank per sampling event).

DQOs should be established and outlined in a Validation Sampling Analysis and Quality Plan prior to commencement. The DQOs are to be established with regards to the seven-step process outlined in NEPM (2013) which is based on the 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.

Data Quality Indicators (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 asbestos in soil, and odorous or stained hydrocarbon impacted soils outside those identified.

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;
- In the event potential asbestos material is encountered, a qualified occupational hygienist and/or asbestos consultant should be contacted (preferably the validation consultant will have an in-house hygienist or asbestos assessor);
- 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 order to allow for cap and containment of the material;
- In the event that remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an addendum to this RAP should be 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, the excavation should be extended in the direction of the failure (in consultation with the validation consultant and the client/client's representative) and the area re-validated. Costs associated with additional excavation and disposal should be assessed progressively and in the context of the CSM for the nature extent of contamination. Continuous failures may warrant consideration of alternative remediation techniques such as capping.

Should an alternative such as capping be required, the consent authority should be advised and consultation should occur between the validation consultant, the client and other stakeholders. An outline for the contingency remediation and validation actions for capping is provided in the following tables:

Table 8-1: Contingency Remedial Actions - Capping

Step	Procedure
1.	Establish Appropriate Controls (WHS and Earthworks) and Licenses: Prior to commencement, appropriate controls should be setup and licenses obtained as outlined in Steps 1 and 2 of Table 6-2.
2.	Establish Capping Area: The extent of the contamination (requiring capping) should be established and the area is to be marked out using appropriate methods (pegs/marking paint). The capping material/layer should cover the entire contamination area including an overlap of at least 1m from the edge of the contamination area to minimise the potential for the soil to be exposed or cross-contaminate the adjoining areas.
3.	Capping Material Placement: • Any visible contamination (FCF/ACM) should be picked and removed from the surface and a clearance certificate attained; • The soil should be compacted using an appropriate earthworks specification to meet the engineering requirements for the project. Advice should be sought from a suitably qualified geotechnical engineer as required; • The geo-fabric layer should be placed directly on top of the contaminated material and secured with soil nails; • Adjoining layers of geo-fabric should overlap by approximately 50cms; and • The pavement/building should be constructed as required. In the event that capping is proposed in areas where there is no hardstand/pavement, a minimum capping layer of 0.5m of clean soil is required as the cap.

Table 8-2: Contingency Validation Requirements - Capping

Aspect	Sampling	Analysis	Observations and Documentation
Capping			
Capping area prior to laying of capping material	-	Visual surface clearance inspection	Visual inspection of the surface for staining or other indicators of contamination (i.e. ACM). Location and scope of capping area to be confirmed by survey. Survey to confirm lateral extent and levels across the surface at the level of the geofabric.

Aspect	Sampling	Analysis	Observations and Documentation
After Capping			
Capping area prior to laying of capping material	-	Inspection	Inspection to confirm laying of geo-fabric and appropriate overlap. Inspection required and photographs to be taken to confirm construction of overlying pavement/slab, or landscaped areas. Survey required to demonstrate minimum 0.5m clean soil in unpaved areas.

An EMP would subsequently need to be prepared for the capped area and enforced using an appropriate mechanism.

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 7, 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 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 secure and is currently sealed, therefore interim management is not considered to be required.

9.2 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 9-1: Project Contacts

Task	Company	Contact Details
Project Manager / Site Owner	Loreto Normanhurst Girls School	9487 3488
Remediation Contractor	To be appointed	-
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

9.3 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.

9.4 Timing and Sequencing of Remediation Works

In general, all remedial works should be completed prior to the commencement of construction works for the proposed development. In the event that remedial works are undertaken in conjunction with the

development, all remediation areas should be clearly marked and covered with builder's plastic (or similar) in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

In the event of unexpected delays, builder's plastic (or similar) should be used to cover the remediation areas in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

9.5 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 development consent conditions for further 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.

9.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[17] 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).

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.

9.7 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;

[17] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

- 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.

9.8 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.

Disturbance of hydrocarbon contaminated soils associated with the USTs and separator pit may result in odorous conditions. 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:
  - 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.

9.9 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.

9.10 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management plan. A Waste Data File is also to be maintained to assist with addressing the requirements for assessing and tracking waste disposal under this RAP.

9.11 Incident Management Contingency

The validation consultant 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. Any new information that comes to light

that has the potential to alter the prior conclusions regarding site contamination should be notified to Council in accordance with Condition 103 of the development consent.

9.12 Dewatering

Dewatering is unlikely to be required to facilitate the remediation. Reference should be made to the development consent for specific details regarding temporary construction dewatering.

9.13 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 Stage 1 Works Area 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	Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55: A designated development; • 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: ➢ 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. Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed and determined either as part of the existing DA or as a new and separate DA. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development (Part 6 of EPAA Regulation 1994).
Category 2	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.

EIS understand that heritage items are located within the school grounds and a large portion of the school falls within the Significant Biodiversity (tree and vegetation preservation) Planning Area in the Hornsby Local Environmental Plan (LEP) 2013 the remediation work may fall under Category 1 remediation. This should be confirmed with the client's planning expert.

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)[18]	At this stage, EIS consider that there is no requirement to notify the NSW EPA regarding site contamination. This requirement should be reassessed following review of the validation results.
POEO Act 1997	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. Appropriate waste tracking is required for all relevant waste that is disposed off-site. Asbestos waste must be tracked using WasteLocate.
WHS Code of Practice (2016)	Sites with asbestos become a 'workplace' when work is carried out there and require an asbestos management plan. Appropriate SafeWork NSW notification (if required) is to be undertaken prior to any 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).

[18] 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)

11 LIMITATIONS

The following limitation apply to this assessment:

- 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 assessment; 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;
- The 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 landuse. 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.

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.

Appendix A: Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 29 DEC 2018.

This plan should be read in conjunction with the Environmental report.

Title: **SITE LOCATION PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 1

JKEnvironments

PLOT DATE: 24/05/2019 2:48:58 PM DWG FILE: S:\5 EIS\5C EIS JOBS\31000'S\E31772KL NORMANHURST\CAD\E31772KL_DS1.DWG

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 12 MAY 2019.

BH117(0.7)
BH116(1.7)
BH113(0.5)
BH115(1.0)
BH112(0.5)
BH114(0.2)
BH111(1.0)-MW111
BH108(0.4)
BH109(0.3)
BH110(>0.5)
BH3(0.2)
BH6(0.35)
BH107(0.5)
BH106(0.4)
BH2(1.2)
BH105(>0.6)
BH104(0.8)
BH5(0.2)
BH102(0.2)
BH103(0.1)
BH1(0.2)
BH4(0.0)
BH101(0.3)

OSBORN ROAD

MOUNT PLEASANT AVENUE

LEGEND

APPROXIMATE SITE BOUNDARY

BH (Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

APPROXIMATE OUTLINE OF PROPOSED BUILDING

0 12.5 25 37.5 50 62.5

SCALE 1:1250 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 2

JKEnvironments

PLOT DATE: 24/05/2019 2:49:57 PM DWG FILE: S:\5 EIS\5C EIS JOBS\31000\SIE31772KL NORMANHURST\CAD\E31772KL_DSI.DWG

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 12 MAY 2019.

BH116	0.7-0.95
ZINC	590

BH106	0.02-0.15
CARCINOGENIC PAHs	6.4
TRH(C_{16}-C_{34})	410

BH2	0.04-0.2
CARCINOGENIC PAHs	73
TOTAL PAHs	640
TRH(C_{16}-C_{34})	1,700
B(a)P	50

BH105	0.2-0.4
CARCINOGENIC PAHs	6.3
TRH(C_{16}-C_{34})	410

BH117(0.7)
BH116(1.7)
BH113(0.5)
BH115(1.0)
BH112(0.5)
BH114(0.2)
BH111(1.0)-MW111
BH108(0.4)
BH109(0.3)
BH110(>0.5)
BH3(0.2)
BH6(0.35)
AMF1
BH107(0.5)
BH106(0.4)
BH2(1.2)
BH105(>0.6)
BH104(0.8)
BH5(0.2)
BH102(0.2)
BH103(0.1)
BH1(0.2)
BH4(0.0)
BH101(0.3)

OSBORN ROAD

MOUNT PLEASANT AVENUE

LEGEND

APPROXIMATE SITE BOUNDARY

BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

APPROXIMATE OUTLINE OF PROPOSED BUILDING

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (mg/kg)

SOIL CONTAMINATION ABOVE SAC FOR ENVIRONMENTAL RISK (mg/kg)

0 12.5 25 37.5 50 62.5

SCALE 1:1250 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **CONTAMINATION DATA PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 3

JKEnvironments

PLOT DATE: 24/05/2019 2:50:15 PM DWG FILE: S:\5 EIS\5C EIS JOBS\31000'S\E31772KL NORMANHURST\CAD\E31772KL_DSI.DWG

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 12 MAY 2019.

BH116	0.7-0.95
ZINC	590

BH106	0.02-0.15
CARCINOGENIC PAHs	6.4
TRH(C_{16}-C_{34})	410

BH2	0.04-0.2
CARCINOGENIC PAHs	73
TOTAL PAHs	640
TRH(C_{16}-C_{34})	1,700
B(a)P	50

BH105	0.2-0.4
CARCINOGENIC PAHs	6.3
TRH(C_{16}-C_{34})	410

BH117(0.7)
BH116(1.7)
BH113(0.5)
BH115(1.0)
BH112(0.5)
BH114(0.2)
BH111(1.0)-MW111
BH108(0.4)
BH109(0.3)
BH110(>0.5)
BH3(0.2)
BH6(0.35)
BH107(0.5)
BH106(0.4)
BH2(1.2)
BH105(>0.6)
BH104(0.8)
BH5(0.2)
BH102(0.2)
BH103(0.1)
BH1(0.2)
BH4(0.0)
BH101(0.3)

OSBORN ROAD

MOUNT PLEASANT AVENUE

LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- NOMINATED PAH IMPACTED REMEDIATION AREA

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

- SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (mg/kg)
- SOIL CONTAMINATION ABOVE SAC FOR ENVIRONMENTAL RISK (mg/kg)

0 12.5 25 37.5 50 62.5
SCALE 1:1250 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **REMEDIATION AREA PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 4

JKEnvironments

PLOT DATE: 24/05/2019 2:50:15 PM DWG FILE: S:\5 EIS\5C EIS JOBS\31000'S\E31772KL NORMANHURST\CAD\E31772KL_DSI.DWG

Appendix B: Development Plans

Revisions

No.	Date	Description	Ver	App'd
1	10.12.2018	ISSUED FOR COORDINATION		
2	18.12.2018	CONCEPT PROPOSAL		
3	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

N

Client
LORETO NORMANHURST

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ABN 53 003 782 250

Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
STAGE 1 WORKS

Sheet Status
NOT FOR CONSTRUCTION

Scale
1:500 @ A1

Drawing No.
A0003

Issue
3

0 5 10 20 40 m

REF: C:\Users\shurstable\Documents\18008_MasterPlan_shurstable.rvt
PLOTTED & CHECKED BY: Author
PLOT DATE & TIME: 10/01/2019 4:22:01 PM