



ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

MARIA GALIS

ON

REMEDIATION ACTION PLAN (RAP)

FOR

**REPLACEMENT OF UNDERGROUND STORAGE
TANKS AND RE-CONSTRUCTION OF THE SERVICE
STATION**

AT

**370-372 CARRINGTON ROAD, LONDONDERRY NSW
2753**

18 January 2019

Ref: E25431KGrpt3-Rev1



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ABBREVIATIONS

Asbestos Containing Material	ACM
Australian Drinking Water Guidelines	ADWG
Area of Environmental Concern	AEC
Acid Sulfate Soil	ASS
Below Ground Level	BGL
Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene	BTEXN
Chain of Custody	COC
Contaminant of Primary Concern	CoPC
Conceptual Site Model	CSM
Data Quality Indicator	DQI
Data Quality Objective	DQO
Environmental Management Plan	EMP
Environmental Site Assessment	ESA
General Approvals of Immobilisation	GAI
General Solid Waste	GSW
Health Investigation Level	HILs
Health Screening Level	HSLs
Lab Control Spike	LCS
Light Non-Aqueous Phase Liquid	LNAPL
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Polycyclic Aromatic Hydrocarbons	PAH
Potential Contaminants of Concern	PCC
Photo-ionisation Detector	PID
Practical Quantitation Limit	PQL
Quality Assurance	QA
Quality Control	QC
Remediation Action Plan	RAP
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
Standing Water Level	SWL
Standard Sampling Procedure	SSP
Trip Blank	TB
Toxicity Characteristic Leaching Procedure	TCLP
Total Recoverable Hydrocarbons	TRH
Trip Spike	TS
Underground Storage Tank	UST
Virgin Excavated Natural Material	VENM
Volatile Organic Chlorinated Compound	VOCC
Workplace, Health and Safety	WHS

1 INTRODUCTION

Maria Galis ('the client') commissioned Environmental Investigation Services (EIS)¹ to prepare a Remediation Action Plan (RAP) for proposed replacement of underground storage tanks (USTs) and re-construction of the existing service station at 370-372 Carrington Road, Londonderry.

The site location is shown on Figure 1 and the site extent is shown on Figure 2. The RAP has been prepared for the management and validation of remediation works to support the lodgement of a Development Application (DA).

1.1 Proposed Development Details

The proposed development includes demolition of all aboveground buildings, removal of all aboveground fuel infrastructure, removal of all existing USTs and associated fuel delivery infrastructure, installation of new larger USTs and re-construction of the service station.

1.2 Background

EIS installed three groundwater monitoring wells at the site in 2011 to meet the requirements of the UPSS Regulation (2017²). Visual inspection of the wells for Phase Separated Hydrocarbon (PSH) and/or indications for hydrocarbon contamination (well testing) was undertaken by EIS from 2011 to 2016. The last well testing, by EIS, was undertaken in November 2016 and the report concluded that there was no visual evidence of PSH in the wells.

EIS have also undertaken a Detailed Site Investigation (DSI) for the site and a report (Ref: E25431KGrpt2) was issued on 17 July 2018. Based on the findings of the investigation, EIS made the following recommendations in order to make the site suitable for the proposed development:

- Undertake additional investigations in the areas closer to the USTs, under the canopy, under the existing building footprint and near fill-box after the removal of these infrastructure (EIS understand that none of the above infrastructure had been removed at the time of the preparation of this report);
- Prepare a RAP for the management and validation of remediation works (including the removal of fuel storage and delivery infrastructure); and
- Undertake a hazardous building material survey (HazMat) and remove any hazardous building material including the asbestos (if encountered).

This RAP should be read in conjunction with the DSI report. A brief summary of DSI findings are provided in **Section 3**.

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

² Protection of Environment Operation (General) Amendment (Underground Petroleum Storage Systems - UPSS) Regulation 2017 (previously known as UPSS Regulation 2008)

1.3 Objectives

The objectives of the RAP are to:

- Summarise any site contamination issues;
- Identify remediation and management measures to minimise potential risk to site receptors;
- Outline the remediation and/or management procedures for the UST/s removal and replacement;
- Prepare a validation plan to be implemented in conjunction with the remediation work;
- Prepare a contingency plan for the remediation works; and
- Outline management procedures to be implemented during remediation work.

1.4 Scope of Work

The RAP was prepared generally in accordance with an EIS proposal (Ref: EP48092KG) of 18 September 2018 and written acceptance from the client of 27 November 2018.

The scope of work included the following:

- Summarise the site contamination issues;
- Identify potential remediation options;
- Outline the remediation procedures;
- Outline the validation sampling and analysis plan for the remediation work; and
- Preparation of the RAP report.

1.5 Guidelines

The RAP was prepared with reference to regulations/guidelines³ of National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)⁴, other guidelines made under or with regards to the Contaminated Land Management Act (1997)⁵ and State Environmental Planning Policy No.55 – Remediation of Land (1998)⁶. A list of reference documents/guidelines is included in the appendices.

³ <https://www.epa.nsw.gov.au/your-environment/contaminated-land>

⁴ National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)*. (referred to as NEPM 2013)

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)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Site Address:	370-372 Carrington Road, Londonderry, NSW 2753 (The site was previously identified as 519-521 Londonderry Road, Londonderry)
Lot & Deposited Plan:	Lot 2 in DP1179316
Current Land Use:	Service Station
Proposed Land Use:	Service Station
Local Government Authority:	Penrith City Council
Site Area (m ²):	1,315
RL (AHD in m) (approx.):	20
Geographical Location (approx.):	Latitude: -33. 645256 Longitude: 150. 736083
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.2 Site Location and Regional Setting

The site is located in a predominantly residential and commercial area of Londonderry, on the southern side of Carrington Road and eastern side of Londonderry Road, at the intersection of Carrington and Londonderry Roads.

2.3 Topography

The regional topography is flat. The site surface is also generally flat.

2.4 Site Inspection

An inspection of the site was undertaken by EIS in June 2018 during the sampling for the DSI. EIS understand that the site configuration has not altered since the inspection in 2018. The observations made during the site inspection are listed below:

2.4.1 Site Use and/or Indicators of Former Site Use

At the time of the inspection, the site was occupied by an active Caltex branded service station.

2.4.2 Buildings, Structures and Roads

The majority of the service station forecourt was concrete paved. The only building on the site was a single storey service station with a canopy extending over the forecourt. Four petrol dispensers (bowsers) were located under the canopy. One diesel bowser was located outside of the canopy at the western corner of the service station building.

2.4.3 Boundary Conditions, Soil Stability and Erosion

The southern and eastern site boundaries were fenced. The other site boundaries were not fenced.

2.4.4 Visible or Olfactory Indicators of Contamination

Hydrocarbon stains were observed near the diesel bowser. Moderate to large cracks were observed in the concrete pavement.

2.4.5 Presence of Drums/Chemicals, Waste and Fill Material

An aboveground storage tank (AST) that was used to store diesel fuel was located near the diesel bowser. The AST was inside a shipping container and was on site temporarily. The client informed EIS that the diesel in the UST had been found to contain water, therefore it was replaced by the AST.

2.4.6 Drainage and Services

Surface water runoff from the service station forecourt would drain to stormwater system beneath Carrington Road and Londonderry Road.

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.

The closest potentially receiving water bodies are Rickabys Creek located approximately 1km to the east and Nepean River located approximately 5km to the west. Both water bodies support fresh water ecosystems. (Nepean River is generally being used for recreational purposes).

2.4.8 Landscaped Areas and Visible Signs of Plant Stress

Plant dieback was not observed within the site. Some areas of minor landscaping were located on the north boundary and northwest corner of the site.

2.5 Surrounding Land Use

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

- North – Carrington Road and a relatively new housing estate generally consisting of double storey brick houses beyond the road;
- South – Residential property;
- East – Commercial property with a number of retail shops and a café; and
- West – Londonderry Road and residential properties beyond the road.

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

2.6 Regional Geology

A review of the regional geological map of Penrith (1991)⁷ indicated that the site is underlain by Hawkesbury Sandstone, which typically consists of medium to coarse grained quartz sandstone with minor shale and laminite lenses.

3 SUMMARY OF PREVIOUS INVESTIGATIONS

EIS did not observe visual evidence of PSH during the installation of the groundwater monitoring wells in 2011 or during the subsequent well testings. The last round of well testing was undertaken by EIS in November 2016.

The DSI 2018 encountered no elevated concentrations of contaminants, above the site assessment criteria (SAC), in the soil samples analysed. On this basis, the DSI concluded that the risk of widespread significant soil contamination at the site was low.

Elevated concentrations of zinc and copper were encountered in the groundwater. The zinc and copper in groundwater is considered to be a regional issue associated with leaking water infrastructure and surface water run-off. As no significant elevations of zinc and copper were identified in the soil samples, the DSI concluded that the zinc and copper in the groundwater did not need to be considered any further.

The groundwater in one of the wells was less than 2m below the levels of the site surface. Total Recoverable Hydrocarbons (TRH) and Benzene, Toluene, Ethylbenzene, Xylene (BTEX) concentrations in water were assessed using the site-specific criteria. The elevated concentrations were not considered to pose a vapour risk to receptors in the present setting.

⁷ Department of Mineral Resources, (1991). *1:100,000 Geological Map of Penrith (Series 9030)*

4 REQUIREMENT FOR REMEDIATION WORKS

The investigations undertaken by EIS have not identified any significant contamination issues that will need to be addressed during remediation works. EIS are not aware of any other contamination investigations undertaken for the site by others.

Based on our previous experience of other service station investigations, it is likely that pockets of soil contamination be encountered in the areas such as near the UST pit, beneath the bowsers and around the fill-box. Based on this EIS identified the following issues/concerns to be addressed in the RAP:

1. Hydrocarbon impacted soils likely to be encountered in the immediate vicinity of the existing UST pit, beneath the bowsers and around the fill-box area after the removal of these infrastructure. Excavation/removal of impacted soil/sand from these areas will be required;
2. The excavation of a new tank pit at the northeast corner of the site for the installation of new USTs may result in the excavation/removal of impacted soil;
3. If significant hydrocarbon contamination is identified during the excavations, care should be taken to prevent any hydrocarbon vapour impacts to the surrounding area;
4. Some of the excavated soil (potentially impacted by hydrocarbons) may need to be disposed of into land fill. The soil to be excavated should be assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)⁸ prior to the disposal; and
5. Hazardous building material (HazMat) likely to be encountered in the near surface soils after the removal of the existing buildings. Removal of any HazMat including asbestos will be required.

5 REMEDICATION OPTIONS

5.1 Remediation Hierarchy

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

- On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level.
- 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:

- Consolidation and isolation of the soil on-site by containment within a properly designed barrier.
- Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material.

⁸ NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. (referred to as Waste Classification Guidelines 2014)

- 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.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)⁹ provides 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 Soil Remediation

The soil remediation options for consideration are outlined in the following table:

Table 5-1: Soil Remediation Options

Remediation Option	Details
<p><u>Option 1</u> On-site treatment</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 include:</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>

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

Remediation Option	Details
	<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</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><u>Option 3</u> Removal of 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><u>Option 4</u> Consolidation and isolation of impacted material 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 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 public notification of the EMP would need to be implemented (e.g. notification of Land Title).</p>

5.3 Groundwater Remediation Options

The requirement for groundwater remediation should be assessed after the replacement of the USTs and other fuel infrastructure and regular monitoring of the groundwater contamination trend for three months.

EIS understand that the existing groundwater monitoring wells, installed by EIS in 2011, will most likely be destroyed during the proposed construction works. New groundwater monitoring wells will be required to be installed, in order to comply with the UPSS Regulation 2017.

Should groundwater remediation be required at the site, the preferred order for the remediation and management of contaminated groundwater presented in the Groundwater Contamination Guidelines 2007 is outlined below:

1. Clean-up so that the natural background water quality is restored;
2. Clean-up to protect the environmental, human and ecological health; and
3. Clean-up to the extent practicable.

The groundwater remediation options for consideration are outlined in the following table:

Table 5-2: Groundwater Remediation Options

Remediation Option	Details
<p><u>Option 1</u> In-situ treatment</p>	<p>Some of the in-situ treatment options include:</p> <p><u>Bio-remediation:</u> Addition of oxygen and nutrient compounds to accelerate the natural process of organic compound decay within the environment.</p> <p><u>Chemical oxidation:</u> Addition of chemical compounds to oxidise the contaminants in groundwater into compounds that are less harmful to the environment</p> <p><u>Zero-Valent Iron (ZVI):</u> Corrosion of iron results in the formation Fe^{2+} and hydrogen, both of which are potential reducing agents for chlorinated solvents. The ZVI can be installed as permeable barriers or mixed with soil.</p> <p><u>Electro-kinesis:</u> This involves the application of an external direct current to electrodes placed in the ground causing contaminants to migrate the electrodes by electrophoresis and electro osmosis. The method can be effective for heavy metals and polar organic compounds. This can be used to concentrate and extract contaminants.</p> <p><u>Air Sparging and Extraction:</u> Air is forced through the contaminated groundwater system to volatilise organic contaminants. The air is then extracted and captured for treatment leaving reduced contaminant concentrations within the sub-strata.</p>

Remediation Option	Details
<p><u>Option 2</u> Ex-situ treatment</p>	<p>Some of the ex-situ treatment options include:</p> <p><u>Air stripping:</u> This involves the transfer of dissolved VOCs from water into a flowing air stream. This typically undertaken in a tower or aeration tank.</p> <p><u>Adsorption/absorption:</u> This utilises the preferential binding of contaminants to various solid media such as granular activated carbon (e.g. organics) or ion-exchange resins (e.g. metals).</p> <p><u>Chemical Precipitation:</u> Changing chemical parameters (e.g. pH) of the groundwater can result in contaminants precipitating out of solution. The precipitated contaminants can then be separated in settling tanks.</p> <p><u>Bioreactors:</u> Groundwater is pumped into an above ground tank and treated with inorganic nutrients. Oxygen is introduced in to the tank by sparging. Hydrocarbons are broken down by naturally occurring bacteria</p> <p>Contaminated groundwater is transported to an approved/licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site or transported to an alternative facility for disposal</p>
<p><u>Option 3</u> On-going management & monitoring</p>	<p>Measures to manage groundwater contamination may include:</p> <ul style="list-style-type: none"> • Notifying appropriate government agencies, owners of subsurface facilities and any other appropriate parties of the presence of groundwater contamination; • Plume containment and minimisation; • Active or passive clean-up of contaminated groundwater; • Installation of barriers/capping to prevent contact with groundwater; • Ongoing monitoring of natural attenuation (MNA) following removal of primary and secondary sources of contamination; • Implementing management or contingency plans to reduce risks; and • Restricting groundwater use in and down gradient of the contaminated plume.

5.4 Vapour Intrusion

The strategy for basic approach in dealing with vapour intrusion is outlined below:

- Adequate assessment of vapour intrusion by active and passive sampling to prepare a Conceptual Site Model (CSM);
- Identify chronic and acute risks associated with the vapour intrusion;
- Undertake a human health risk assessment (HHRA¹⁰); and
- Modelling vapour intrusion and ongoing management.

The HHRA forms an integral part of the vapour assessment. If the HHRA identifies that the risk posed by vapour is high, then remediation of vapour will be required to address the risk.

The preferred order for the remediation and management of vapour is outlined below:

1. On-site treatment of material impacted by volatile compounds;
2. Off-site treatment of material impacted by volatile compounds so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the material 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 material impacted by volatile compounds on-site by containment within a properly designed barrier.

¹⁰ HHRA should be undertaken by a suitable qualified assessor in accordance with guidelines published by the NSW EPA; Department of Health and Ageing and EnHealth Council (Commonwealth of Australia 2012); NEPM 2013; WHO; and other guidelines.

6 SITE SPECIFIC REMEDIATION OPTIONS

The remediation goal is to assess and validate contamination issues associated with the following:

- Remove the USTs and other infrastructure;
- Complete the excavation of the tank farm pit down to final levels required to install the new larger USTs; and
- Remove the contaminated fill and backfill-sand.

The tables below summarise the site-specific remediation options:

Table 6-1: Site Specific Remediation Options

Option	Discussion	Applicability
<p><u>Option – 1:</u></p> <p>On-site treatment.</p>	<p>The development will include excavation/expansion of the existing tank farm pit. This will require off-site disposal of excavated soil.</p> <p>In-situ treatment of any groundwater impacted by hydrocarbons may be required if there is unacceptable vapour risk to receptors.</p>	<p>Not applicable for soil.</p> <p>May be required for groundwater if the vapour risk is unacceptable.</p>
<p><u>Option – 2:</u></p> <p>Removal of impacted material to an appropriate facility.</p>	<p>This is considered to be the most viable option for the site as the majority of the development will include removal of the existing fuel infrastructure followed by excavation/expansion of the existing tank farm pit.</p> <p>The main disadvantage with this option is the cost associated with the disposal of fill soil (and natural soil if impacted by contamination) to landfill. However, this may require more detailed sampling and analysis.</p> <p>In the event the groundwater is contaminated and pose a vapour risk, active pumping of groundwater and removal to a suitable facility may be required.</p>	<p>Most applicable option for the soil excavated for the proposed development.</p> <p>The ground support around the perimeter of the site would limit the horizontal extent of excavation.</p> <p>Most applicable for significant groundwater contamination.</p>
<p><u>Option – 3:</u></p> <p>On-going monitoring of groundwater</p>	<p>This could be an effective option for addressing any contaminated groundwater that does not pose a significant vapour risk.</p>	<p>Applicable for groundwater provided the risk is acceptable.</p>

7 **REMEDIATION PLAN**

7.1 **Regulatory Approvals**

The site remediation is an integral part of the development that is subject to a Development Application (DA). The following approvals will be required prior to the commencement of remediation works:

- Any DA conditions relevant to the remediation works will need to be complied with; and
- SafeWork NSW and any other authority approvals.

The roles and responsibilities for the implementation of this RAP are outlined in the table below.

7.2 **Roles and Responsibilities**

Table 7-1: Roles and Responsibilities

Role	Responsibility
Client	<p>Maria Galis Contact: Arthur Galis Phone: 0414 911 553 Address: TBA Email: Arthur.Galis@aussie.com.au</p> <p>The client is required to appoint the project team for the development. The client is required to provide all investigation reports including this RAP to the project manager, remediation contractor, Consent Authority and any other parties involved in the project.</p>
EPA Accredited Site Auditor	Based on the information available to EIS an Auditor will be not required for this project.
Project Manager	<p>TBA</p> <p>The project manager is required to review all documents prepared for the project and implement the procedures outlined in this RAP. The project manager needs to ensure that the remediation contractor and others have understood the RAP and will implement it in its totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the development. Further details are outlined in the sections below.</p>

<p>Remediation Contractor</p>	<p>TBA. The remediation contractor is required to review all documents prepared for the project and implement the procedures outlined in this RAP.</p> <p>The remediation contractor is required to collect all necessary documentation and forward them onto the client and project manager as they become available. Further details are outlined in the sections below.</p>
<p>Environmental Consultant</p>	<p>Environmental Investigation Services (EIS) – Subject to agreed fee proposal Contact: Para Bokalawela / Vittal Boggaram Phone: 02 9888 5000 Address: PO Box 976, North Ryde BC, NSW 1670</p> <p>Subject to agreed fee proposal for remediation works the environmental consultant provides consulting advice on the ongoing remediation work at the site. The Environmental Consultant is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. The Environmental Consultant is required to liaise with the client, project manager and remediation contractor on all matters pertaining to the site contamination and remediation. Further details are outlined in the sections below.</p>
<p>Other Consultants & Contractors (tank removal, HazMat, earth moving etc.)</p>	<p>TBA. Other consultants/contractors who may become involved in the project from time to time should be made aware of this RAP. The other consultants/contractors are required to review this RAP and implement the procedures outlined in the RAP. The other consultants/contractors are required to collect all necessary documentation and forward them onto the project manager and environmental consultant for documentation as they become available. Further details are outlined in the sections below.</p>

7.3 Interim Site Establishment and Management

The site management plan outlined in **Section 11** should be reviewed and implemented by the project manager, remediation contractor and all others involved in site remediation. Specific management plans are required for the removal of Hazardous Building Material.

As a minimum, the following controls should be established:

- Health and safety requirements including the personal protective equipment (PPE) required for the works;
- Work area should be secured with appropriate fencing, signage and emergency contacts;
- Stormwater and sediment controls including sediment fencing should be in place; and
- Wash down bays, dedicated lunch rooms and other areas free of contamination should be established as required.

7.4 Off-site Disposal of Material

Additional sampling and analysis will be required to assign a waste classification to the soil that will be excavated and disposed of off-site in accordance with the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)¹¹. EIS have identified the following (potential) waste categories at the site:

Table 7-2: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	<ul style="list-style-type: none"> • If Specific Contaminant Concentration (SCC) \leq Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP \leq TCLP1 and SCC \leq SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	<ul style="list-style-type: none"> • If SCC \leq CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP \leq TCLP2 and SCC \leq SCC2 then treat as restricted solid waste.
Hazardous Waste	<ul style="list-style-type: none"> • If SCC $>$ CT2 then TCLP not needed to classify the soil as hazardous waste; and • If TCLP $>$ TCLP2 and/or SCC $>$ SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	<p>Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following:</p> <ul style="list-style-type: none"> • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

All material will require disposal at an NSW EPA licensed facility which can accept the waste stream. The project manager/remediation contractor should identify the appropriate waste facilities and contact them for disposal approvals prior to commencement of works.

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

7.5 Identification of Environmental Values

The following environmental values have been assessed as part of this remediation:

7.5.1 Terrestrial Ecosystems

The majority of the site has been paved. Based on the observation of surrounding areas, the site may have been a vacant or agricultural land prior to the construction of the service station. The site has been used for commercial purposes (service station) and will be continued to use as a service station after the proposed tank re-construction has been completed. EIS anticipate limited landscaping post development which will limit soil exposure to terrestrial ecosystems.

7.5.2 Aquatic Ecosystems

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds. The closest potentially receiving water bodies are Rickabys Creek located approximately 1km to the east and Nepean River located approximately 5km to the west. Both water bodies support fresh water ecosystems. Care should be taken to minimise degradation of the groundwater within the site that could potentially move into the aquatic ecosystem.

7.5.3 Human Uses

Groundwater is unlikely to be used as a drinking water source or for recreational uses at the site as such activities will use potable water or town water supplied to the site. However, the groundwater is likely to be used for agricultural purposes in the surrounds. The potential for exposure to contaminants in landscaped areas will be minimised as new landscaping will be established in clean topsoil imported on-site for plant growth. Water used for landscaping purposes will be obtained from the town water supply.

7.5.4 Buildings and Structures

The contaminants are not considered to be aggressive to buildings and/or built structures.

7.6 Inspection Requirements

The environmental consultant should inspect the site during remediation work to inspect for unexpected conditions and manage any issues associated with site contamination. Validation inspections and sampling should be undertaken by the environmental consultant as described in this plan.

7.7 Documentation

The project manager/remediation contractor must retain all documentation associated with the remediation (e.g. UST destruction certificates, landfill disposal dockets, clean soil importation information, material tracking information, photographs, waste disposal dockets, letters from suppliers of products, reports issued by other consultants etc.). Copies of these documents must be forwarded to environmental consultant in a timely manner for the compilation of the site validation report. The preparation of a site validation report is subject to the agreed fee proposal.

8 REMEDIATION DETAILS

8.1 Remediation of Soil – UST Pit, Beneath the Bowsers and Fill-Box

The preferred remediation option for the UST pit, beneath the bowsers and around the fill-box is removal of the existing USTs and other associated fuel infrastructure followed by excavation of the impacted backfill material and off-site disposal to an appropriate facility.

8.1.1 Identify the Boundary of the UST Area

The remediation area (UST area) should be surveyed and clearly marked with spray paint and/or pegs. A Ground Penetrating Radar (GPR) survey could be undertaken in the vicinity of UST area to assess the extent of the subsurface features. The GPR survey should be undertaken by a licensed operator in a grid by grid pattern.

8.1.2 Removal of Above Ground Features

Any above ground structures in the UST area i.e. canopy, bowsers should be removed by a licensed contractor in accordance with the relevant regulations and guidelines.

8.1.3 Work Sequence and Timing

The proposed works will involve:

- Removal of the concrete pavement around the USTs, bowsers and the fill-box area;
- Removal of the existing USTs and all related appurtenances including the existing containment system and any contained hydrocarbons. This should be removed in a manner that prevents any further contamination of the site;
- Excavation of the old tank pit backfill and hydrocarbon impacted soil around the bowsers and fill-box;
- Validation of tank pit excavation and waste classification of backfill for off-site disposal;
- Reinstatement of the new USTs, bowsers and fill-box; and
- Reinstatement of the pavement.

In order to minimise the time that the excavation is open, EIS propose to undertake as much as of the excavation/validation as possible using a combination of observation and PID readings. On completion of the excavation EIS propose the client to introduce approximately 250kg of calcium peroxide into the base of the excavation prior to installing the new USTs. Calcium peroxide gradually releases oxygen on contact with water. The additional oxygen should accelerate the breakdown of any remnant hydrocarbons in the excavation.

8.1.4 UST Removal

The UST removal works should be undertaken by a licensed operator in accordance with the Australian Guidelines outlined in AS4976-2008¹². Prior to removal the tanks should be emptied of residual hydrocarbons and filled with an inert gas.

The pavements in the remediation area should be carefully removed using an excavator and/or backhoe. Liquid and/or sludge within the tanks should be pumped out and disposed of by a licensed liquid waste operator.

All tanks, containment system, associated pipe works and fuel bowsers should be removed by the contractor in a controlled manner and should be disposed off-site at a licensed facility.

Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing the tank removal. In particular the tank removal should not impact on any ground support installed around the perimeter of the site prior to bulk excavation.

8.1.5 Backfill Excavation

The backfill soils (most likely to be sandy fill) surrounding the tanks and hydrocarbon impacted soils in the vicinity of the bowsers and fill-box should be excavated and stockpiled separately. This material should be analysed for the Contaminant of Potential Concern (CoPC) to confirm the waste classification for off-site disposal.

The excavation of the tank pit backfill should extend to a depth of approximately 0.5m beyond the base of the tanks and approximately 0.5m in all directions horizontally from the tanks. The excavation in the vicinity of the fill-box should chase out hydrocarbon impacted soil.

A calibrated Photo-ionisation Detector (PID) unit should be used during excavation as a guide to identify areas potentially impacted by Total Recoverable Hydrocarbons (TRH). Such areas should be targeted for validation sampling. In the event of high PID readings, the TRH impacted material should be over excavated until cleared material is exposed.

The backfill material will need to be sampled and analysed so that it can be assigned waste classification for off-site disposal.

Validation samples should be obtained from the walls and base of the excavation pits as outlined in Section 9. Any seepage encountered within the pit should be sampled during validation. The seepage should be pumped out by a liquid waste contractor and disposed off-site at a NSW EPA licensed facility.

¹² Standards Australia, (2008), *The Removal and Disposal of Underground Petroleum Storage Tanks*. (referred to as AS4976-2008)

8.1.6 Documentation

All documents including landfill docket, tank disposal docket, liquid/soil waste disposal docket etc. should be retained and forwarded for inclusion into the validation report prepared by the environmental consultant.

8.1.7 Validation Sampling

Validation sampling and reporting should be undertaken by the environmental consultant appointed for the project as detailed below. Reference should be made to Section 9 for additional validation requirements.

8.1.7.1 Sampling Frequency

Validation samples should be undertaken in accordance with the NSW EPA (2015) *Technical Note: Investigation of Service Station Sites*. EIS consider the sampling density outlined in the technical note is adequate for the validation assessment.

8.1.7.2 Excavation Base

A minimum of two (2) soil samples should be obtained from the base of each tank from the UST pit. A minimum of two soil samples should be obtained from the base of other excavation pits.

8.1.7.3 Excavation Walls

Samples should be obtained from both fill and natural soils exposed along the walls. A minimum of two (2) soil samples should be obtained from each wall exposed in the excavation pit (minimum 2 samples per wall, total 8 from the walls). Based on the depth of the wall exposed, additional samples should be obtained as required depending on the presence of odour, discoloration and elevated PID readings. The depth of each wall sample and base samples should be recorded along with a material description of the soil samples.

8.1.7.4 Seepage Water

If seepage is encountered at the base of the excavations, a minimum of one (1) water sample should be obtained from each excavation using a disposable PVC bailer.

8.1.7.5 Pipe Line Excavation

In the event feed lines are encountered during the excavation, a minimum of one (1) sample should be obtained per 5m of exposed length.

8.1.7.6 Tankpit backfill

Sampling of the tankpit backfill and excavated soil for waste classification should be undertaken at a frequency of one (1) sample per 25m³. A minimum of three (3) samples should be collected.

8.1.7.7 Sampling Methodology

Samples should be obtained using hand equipment or directly from the excavator bucket (based on the depth of excavation). Samples should be obtained approximately 200mm into the exposed profile where possible.

A calibrated PID unit should be used to screen the samples for the presence of VOCs. Samples with elevated PID reading should be selected for analytical testing. Appropriate field QA/QC samples should be obtained as outlined in **Section 9.1.5**.

8.1.7.8 Analytical Schedule

Soil and seepage water samples should be analysed for the following CoPC commonly associated with service stations: Lead, TRH, BTEX and naphthalene. The results should be assessed against the Validation Assessment Criteria (VAC) outlined in **Section 9.3**.

8.1.7.9 Validation Reporting

A validation report should be prepared documenting the remediation works undertaken above as detailed in **Section 9.5**.

8.1.7.10 Contingency Measures

The contingency measures outlined in **Section 10** should be implemented in the event of unexpected finds or continued validation failure.

8.2 Remediation of Contaminated Groundwater

8.2.1 Monitoring Natural Attenuation

Based on the findings of the previous investigations undertaken by EIS, the remediation of groundwater is not required at this stage. However, if groundwater is impacted at a later stage, Monitoring Natural Attenuation (MNA) is considered to be a suitable option for the remediation of TRH and BTEXN compounds in groundwater provided the source of contamination is identified and removed. Once the sources of hydrocarbon impacts are removed, the potential to naturally attenuate the groundwater, when subsurface geochemical conditions are favourable, is considered to be relatively high.

The MNA process will generally include the following stages:

- Stage 1 – Assessment, feasibility and acceptability of applying MNA;
- Stage 2 – Initial evaluation of natural attenuation;
- Stage 3 – Detailed characterisation and demonstration of natural attenuation;
- Stage 4 – Verifying the progress of natural attenuation as anticipated; and
- Stage 5 – Achieving closure.

Should monitoring indicate that MNA has been unsuccessful, alternative groundwater remediation strategies such as treatment should be considered. Active remediation is only required if a Human Health Risk Assessment (HHRA) indicates that the remaining contaminants pose an unacceptable risk to off-site/on-site receptors.

The sampling frequency and details on analytical schedule can be discussed at a later stage if groundwater remediation was considered to be necessary.

8.2.2 Validation Reporting

A validation report should be prepared documenting the remediation works undertaken above as detailed in **Section 9.5**.

1.1 Summary

A summary of the remediation approach and the additional data requirements is provided below:

Table heading and reference should be placed here.

Issue	Remediation Method	Additional data required
Contaminated soil and tank-pit backfill.	Excavation and off-site disposal	Confirmation of Waste classification.
Underground storage tanks and related appurtenances.	Removal and off-site disposal	None
Contaminated groundwater (if encountered).	Monitored Natural Attenuation (MNA). If there is high risk posed by vapours, active remediation may be required.	Results of the groundwater monitoring program after removal and validation of the source.

9 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 9.2. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on site observations made during remediation.

As recommended in the DSI, undertaking additional soil investigations in the areas closer to the USTs, under the canopy, under the existing building footprint and near fill-box will be required after the removal of these infrastructure (EIS understand that none of the above infrastructure had been removed at the time of the preparation of this report).

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.

9.1 Data Quality Objectives (DQO)

Schedule B2 of NEPM 2013 defines the DQO process as a seven-step iterative planning tool used to define the type, quantity and quality of data needed to inform decisions relating to the environmental condition of the site. These seven steps are applicable to the validation assessment and are summarised below:

9.1.1 State the Problem

The RAP has identified contamination issues at the site which require remediation as outlined in **Section 3**. The fill material may represent a short-term exposure risk to site workers. The groundwater post-construction may be contaminated and may pose a vapour risk to the final occupiers of the site.

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.

9.1.2 Identify the Decisions/Goals

The data collection will be designed based on the following:

- Review of existing site information and any additional information relevant to the remediation/validation process;
- Assess the risks to site receptors posed by contaminants remaining on site after remediation;
- Adopt a suitable Validation Assessment Criteria (VAC) to assess the analytical results; and
- Data interpretation based on the following decision statements:
 1. No single value exceeds 250% of the VAC;
 2. Statistical analysis will be used to assess the laboratory data against the VAC when there are results above the VAC. The following criteria will be adopted:
 - The 95% Upper Confidence Limit (UCL) value of the arithmetic mean concentration of each contaminant should be less than the VAC; and

- The standard deviation (SD) of the results must be less than 50% of the VAC.
- 3. Statistical calculations are not required if all results are below the VAC.
- 4. Statistical calculations will not be undertaken on the following:
 - Elevations above the Health Screening Levels (HSLs), Direct Contact and Management Limits which can pose a risk to receptors (vapours etc.);
 - Elevations above the Groundwater Investigation Levels (GILs) which can indicate a wider regional issue; and
 - Soil vapour results.

9.1.3 Identify Information Inputs

The following information will be collected:

- Sampling and analysis of all media (soil, groundwater) that warrant potential remediation as part of the remediation validation;
- The VAC will be designed based on the criteria outlined in NEPM 2013. Other criteria will be used as required and detailed in this report;
- The samples will be analysed in accordance with the analytical methods outlined in NEPM 2013;
- Field screening information (i.e. PID, presence of hydrocarbons etc.) and observations made during validation will be taken into consideration in selecting the analytical schedule; and
- Any additional information that may arise during validation will also be used as data inputs.

9.1.4 Define the Study Boundary

The study boundary is the site area as shown on the attached figures. The vertical extent of the remediation will be the final excavation level for the expanded tank farm.

9.1.5 Develop the Analytical Approach (or Decision Rule)

The analytical data should be assessed against the VAC outlined in the RAP. Any importation of material should be assessed against the criteria outlined in **Section 9.4**.

As part of the data quality assessment the following data quality indicators (DQIs) will be assessed:

- Precision – The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD). The following acceptance criteria will be used to assess the RPD results:
 - results > 10 times the practical quantitation limit (PQL), RPDs < 50% are acceptable;
 - results between 5 and 10 times PQL, RPDs < 75% are acceptable;
 - results < 5 times PQL, RPDs < 100% are acceptable; and
 - An explanation is provided if RPD results are outside the acceptance criteria.

- Accuracy – Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured. The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes.

Accuracy is the proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

- Representativeness - Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handling and analysis protocols and use of proper chain-of-custody and documentation procedures.
- Completeness - Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:
 - Chain-of-custody forms; Sample receipt form;
 - All sample results reported; All blank data reported;
 - All laboratory duplicate and RPDs calculated;
 - All surrogate spike data reported;
 - All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
 - Spike recovery acceptable limits reported; and
 - NATA stamp on reports.
- Comparability - Comparability is the evaluation of the similarity of conditions (eg. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:
 - Collection and analysis of samples by different personnel; Use of different techniques;
 - Collection and analysis by the same personnel using the same methods but at different times; and
 - Spatial and temporal changes (due to environmental dynamics).

A summary of the DQI for the validation program is outlined in the table below:

Table 9-1: VAC DQI Summary

DQI	Frequency	DQ Criteria
<u>Precision:</u>		
Intra-laboratory duplicates	1 per 20 samples	See above RDP Criteria
Inter-laboratory duplicates	1 per 20 samples	See above RDP Criteria
<u>Accuracy:</u>		
Laboratory duplicate samples	Set by Schedule B3 NEPM 2013	See above RDP Criteria
Laboratory control samples	1 per lab batch	<PQL/LOR
Surrogate Spike	1 per lab batch	70%-130%
Matrix Spike	1 per lab batch	70%-130%
Laboratory blanks	1 per lab batch	<PQL/LOR
<u>Representativeness:</u>		
Sampling of appropriate media	All Samples	All Samples
Samples extracted and analysed within holding times	All Samples	All Samples
Samples analysed for the right analytes	All Samples	All Samples
Field rinsate samples	1 per sample batch	<PQL/LOR
Trip spike samples	1 per sample batch	70%-130%
Trip blank samples	1 per sample batch	<PQL/LOR
<u>Completeness:</u>		
Appropriate field documentation	All samples	All samples
Chain-of-custody forms; sample receipt forms		
NATA stamp on laboratory reports		
Frequency of QA samples maintained		
All critical samples to be analysed		
<u>Comparability:</u>		
Standard sampling and operation procedures	All samples	All samples
Standard analytical methods for all analysis		
Consistent sampling staff trained in sampling		
Spatial and temporal changes (due to environmental dynamics)		

9.1.6 Specify the Performance or Acceptance Criteria

NEPM 2013 defines decision errors as '*incorrect decisions caused by using data which is not representative of site conditions*'. This can arise from errors during sampling or analytical testing. A combination of these errors is referred to as '*total study error*'. The study error can be managed through the correct choice of sample design and measurement.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false.

The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. In this case, for example, the contaminants identified in the RAP are considered to pose a risk to receptors unless proven not to. The null hypothesis has been adopted for this assessment.

9.1.7 Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the validation objectives. Data collection will be optimised by the use of field screening and observations by a suitably qualified practitioner.

9.2 Sampling Program

9.2.1 Sampling Frequency and Methodology

The sampling program for the validation is outlined under the remediation details in this RAP. This is the minimum requirement based on conditions known to exist at the site.

Site observations will also be used as a validation tool to assess the extent of site contamination. In particular visual indicators such as odours will be used to assist the validation process.

Where validation sampling indicates that contamination is likely to extend beyond the study boundary validation should be completed to the extent practical and the client advised of findings.

9.2.2 Laboratory Analysis

The analysis of all samples should be undertaken by NATA accredited laboratories. The laboratories are required to meet the QA/QC requirements outlined in Schedule B3 NEPM 2013. The analytical schedule is outlined under the remediation details in this RAP.

9.3 Validation Assessment Criteria (VAC)

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

Table 9-2: 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.
Soil validation	<p>Soil VAC will include the HIL-D and HSL-D criteria for 'commercial/industrial' land use, based on NEPM (2013).</p> <p>Management Limits (NEPM 2013) and Direct Contact Limits (CRC TR No. 10) for commercial/industrial land use will be used where appropriate.</p> <p>Aesthetics: soils to be free of staining and odours</p>
Groundwater	<p>The NSW Department of Environment and Conservation (now EPA) Guidelines for the Assessment and Management of Groundwater Contamination (2007¹³) require an assessment of environmental values including:</p> <p><u>Aquatic Ecosystems:</u> The guidelines for recreational water quality (primary and secondary contact) presented in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) will be adopted as screening criteria to assess potential human-health risks in the nearest receiving water body (Nepean River) as it is used for recreational purposes.</p> <p><u>Human Health Risk in Non-use Scenarios:</u> Health risks in non-use scenarios are usually associated with the presence of vapours associated with volatile contaminants. The HSL-C: commercial/industrial criteria will be adopted for the assessment.</p>
Imported materials	<p>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.</p> <p>Aesthetics: soils to be free of staining and odours</p>

¹³ NSW DEC (2007), *Guidelines for the Assessment and Management of Groundwater Contamination* (referred to as Groundwater Guidelines 2011)

9.4 Material Importation Requirements

It is likely that tank pit backfill sand will be required to import. The importation criteria outlined in this section of the report should be used as a guide for an initial assessment. Marginal elevations of individual compounds should be assessed on a case by case basis in consultation with the regulatory authorities.

9.4.1 Material for Landscaping

The proposed development will require suitable material (topsoil, nutrient rich soil, etc.) to be imported onto the site for landscaping purposes. In our experience, this type of material generally does not meet the definition of virgin excavated natural material (VENM) as outlined in the Waste Classification Guidelines 2014.

In order to minimise the risk of importing potentially contaminated material onto the site, the following measures should be adopted:

- A licensed supplier of landscaped material should be contacted to identify suitable material for importation;
- Prior to the importation of the topsoil, the following documentation should be obtained from the supplier:
 - Documentation from the source site indicating that the topsoil is VENM or natural soil;
 - Regular laboratory testing data indicating that the material is not contaminated. The laboratory testing results should be reviewed by the VC against the EAC and VAC;
 - Product details and other documents;
- An inspection of the source material should be undertaken by the VC prior to importation onto the site. As a minimum, the material to be imported should be sampled at a ratio of 1 sample per 25m³ (as outlined in NEPM 2013). The samples should be analysed for: heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc); TRH/BTEXN, PAHs, OCP/OPP/PCBs; and asbestos. A suitable field QA/QC procedure should be adopted;
- The analytical data should be assessed against the VAC;
- Provided that the analysis results do not exceed the VAC, the material can be imported onto the site and stockpiled away from the remediation area or any other stockpiles located on site; and
- Upon importation, the material should be inspected by the VC to confirm that the material is the same as what was initially sampled/supplied and is 'free from evidence of contamination'.

All material importation documents should be issued to the VC for inclusion in the validation report.

9.4.2 Material Imported for Bulk Filling

Material classed as VENM should be imported for bulk filling provided it meets the requirements outlined below.

9.4.2.1 Importation of Virgin Excavated Natural Material (VENM)

The Waste Classification Guidelines 2014 define VENM as natural material (such as clay, gravel, sand, soil or rock fines):

- That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities;
- That does not contain sulfidic ores or other waste; and
- Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

The following procedures should be adopted for all imported material:

- An inspection of the source site to confirm and document that:
 - Historical and current use of the site has not resulted in contamination of the site;
 - Potential acid sulfate soil materials are not present at the site;
 - The appearance of material excavated from the site is consistent with natural material, i.e. relatively homogenous and without any debris (any fill material should have been removed prior to the inspection);
 - The physical characteristics of the material to be imported, i.e. soil/rock description, colour, etc. This should be confirmed by photographic documentation;
- Source sites should be inspected by the VC and any relevant reports should be reviewed, prior to acceptance of any material onto the site;
- All material imported as VENM should be accompanied by analytical data showing that the material has been analysed and meets the VAC;
- The material should be inspected by the VC on arrival to confirm that the material is consistent with the documentation reviewed from the source site and is free from evidence of contamination; and
- Geotechnical advice should be sought regarding compaction so that all backfilled areas are suitable for the proposed use.

Based on the site inspection and review of any relevant documentation there are likely to be two potential scenarios for selecting an appropriate sampling density:

1. The risk of the VENM being impacted by contamination is considered to be low. In this case a minimum of three samples of the VENM should be sampled and analysed from across the site;
or
2. The risk of the VENM being impacted by contamination is considered to be medium to high. In this case the material should be sampled and analysed in accordance with the NEPM 2013 guidelines.

A suitable QA/QC procedure should be adopted.

All material importation documents should be issued to the VC for inclusion in the validation report.

9.4.2.2 Importation of Excavated Natural Material (ENM)

In the event that a source of VENM is not readily available and filling of the site is required, Excavated Natural Material (ENM) may be considered as an alternative. The inspection procedures specified for VENM should be undertaken when assessing imported ENM. All sampling, analysis and data interpretation must conform to the criteria specified in the NSW EPA Excavated Natural Material Exemption (2014¹⁴) and the NSW EPA Excavated Natural Material Order (2014¹⁵).

The ENM should be accompanied by appropriate documentation verifying that the material has been assessed in accordance with the ENM guidelines. The material should be inspected on arrival to confirm that the material is consistent with the documentation reviewed from the source site and is free from evidence of contamination. If considered necessary, the material delivered onto the site can be samples and analysed as a QA measure. These details will be included in the RWP.

Material classed as ENM can only be used as engineered fill in areas specified in the ENM guidelines provided it is geotechnically suitable.

All material importation documents should be issued to the environmental consultant for inclusion in the validation report.

9.4.2.3 Importation of Recycled Material (RM)

Recycled material such as crushed concrete, bricks, AC, road base, gravel etc. may be required for the development. Such materials should only be sources from licensed suppliers who can demonstrate that adequate testing is undertaken on a regular basis to meet the waste exemption requirements or EPL set out by the NSW EPA.

Recycled material should be accompanied by appropriate documentation verifying that the material meets the waste exemption requirements set out by the NSW EPA. The material should be inspected by the VC on arrival to confirm that the material is consistent with the documentation reviewed from the source site and is free from evidence of contamination. The material should be sampled and analysed for the CoPC as a QA measure.

¹⁴ NSW EPA (2014), Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the Protection of the Environmental Operations (Waste) Regulation 2014 (ENM Exemption 2014)

¹⁵ NSW EPA (2014), Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environmental Operations (Waste) Regulation 2014 (ENM Order 2014)

Recycled material can only be used as engineered fill in areas specified in the exemption guidelines provided it is geotechnically suitable.

All material importation documents should be issued to the environmental consultant for inclusion in the validation report.

9.5 Validation Report

As part of the validation process, a validation report should be prepared by the environmental consultant. The report should outline the remediation work undertaken at the site and any deviations to the remediation strategy. The report should summarise the results of the validation assessment and should be prepared in accordance with the EPA Guidelines for Consultants Reporting on Contaminated Sites 2011.

The validation report should include:

- Details of the remediation works undertaken at the site;
- Sampling, analysis and quality plan (SAQP) adopted for the validation assessment;
- Details of the validation results including the analytical results assessed against the VAC;
- Details of material disposal analysis and review of contractor documentation;
- Details of material imported onto the site;
- Any deviation to the remediation strategy adopt for the study;
- Data Quality Assessment;
- Details of on-going monitoring and/or management requirements;
- Results from the groundwater monitoring events (if applicable at the stage of the preparation of the validation report);
- Any optimisation of the remediation works; and
- Discussion on the suitability of the site for the proposed land use.

10 **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 finding during earthworks.

10.1 **Unexpected Finds**

There is a possibility that additional hazards may exist at the site. The extent of the contamination has been interpreted from point source data and a documented process of reviewing historical site activities. However, ground conditions may vary between sampling locations and additional hazards may arise as result.

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: additional USTs, asbestos, odorous or stained hydrocarbon impacted soils and groundwater, demolition waste or significant ash and slag contaminated 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 works;
- In the event potential friable asbestos material is encountered, a qualified occupational hygienist and/or asbestos consultant should be contacted;
- The appointed Environmental Consultant should attend the site and assess the extent of additional remediation that may be required and/or adequately characterise the contamination in order to dispose off-site and validate;
- In the event further remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an addendum to the remediation action plan (RAP) may be required;
- 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.

10.2 **Validation Failure**

The initial validation screening for the tank pit should be undertaken using a PID and visual observations. On completion of the tank pit, bowser pits and fill-box excavations, samples should be undertaken of the base and walls as specified in Section 8.

- If the validation results meet the specified validation criteria then installation of the new tanks and other infrastructure can proceed; and
- If there are elevated concentrations in the validation samples the first action will be to chase out the contamination by additional excavation followed by validation.

In the event of persistent validation failure, the following course of action will be adopted;

- Undertake a HHRA to assess the potential impacts of the elevations on site receptors; and
- Implement an Environment Management Plan (EMP) to manage potential exposure of site receptors to the contamination.

In the event that any remnant hydrocarbon contamination cannot be removed and is found to pose an unacceptable risk, a more active remediation system will need to be implemented such as the installation of a pump and treat system.

10.3 Importation Failure for VENM and Recycled Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in **Section 8.3**, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

10.4 Dewatering

In the event that dewatering is necessary the following options can be considered for the disposal of any hydrocarbon impacted groundwater:

- Disposal to stormwater following treatment (this could possibly include filtration through a granular activated carbon filter). This would also require Council approval;
- Establishing a Trade Waste Agreement with Sydney Water for disposal to sewer; or
- Temporary storage pending disposal to an off-site licensed treatment facility.

10.5 Disposal of Waste

Waste classified as 'hazardous' in accordance with the Waste Classification Guidelines 2014 due to high levels of contaminants is generally not suitable for disposal to a landfill in NSW without treatment. However, if the contaminants are 'immobilised' so that they will not be released into the landfill leachate at levels of concern, then the EPA may grant an immobilisation approval to enable the waste to be landfilled.

The General Approvals of Immobilisation (GAI) are issued by the EPA under the Protection of the Environment Operations (Waste) Regulation 2014. A list of the GAI can be found on the NSW EPA website <http://www.epa.nsw.gov.au/wasteregulation/immobilisation.htm>

The RCP recommends undertaking additional waste classification testing to confirm the extent of the waste streams. Any material classed as HW, will require treatment prior to off-site disposal. Disposal approvals may also be required from the NSW EPA and EPA licensed landfill facility. The disposal of HW should be planned in advance to avoid significant delays and additional cost to the project.

11 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. EIS understand that a client has a Development Application (DA) submitted to the relevant authority therefore this section of the RAP may require amendment in future for consistency with relevant consent conditions.

The sampling and analysis of the groundwater should be undertaken from the existing monitoring wells (if not destroyed) or from new replacement wells. The groundwater analytical results will be another indicator for the success of the soil remediation works.

11.1 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 primary point for complaint acceptance on site will be the site foreman, who will then relay all details to the project manager. The contact details of key project personnel are summarised below.

Table 11-1: Project Contacts

Role	Company	Contact Details
Client /Project Manager (PM)	Maria Galis (the property owner)	Contact: Arthur Galis Phone: 0414 911 553 Address: TBA Email: Arthur.Galis@aussie.com.au
Remediation Contractor (RC)	TBA	TBA
Environmental Consultant (EC)	Environmental Investigation Services (Subject to approved fee proposal)	Contact: Para Bokalawela / Vittal Boggaram Phone: 02 9888 5000 Address: 115 Wicks Road, Macquarie Park, NSW 2113 Email: pbokalawela@jkggroup.net.au
EPA Accredited Site Auditor	Based on the information available to EIS an Auditor will be not required for this project.	-
Asbestos Consultant (AC)	TBA	TBA
Certifier	TBA	TBA
DA Contact Officer	Penrith City Council	TBA
Emergency Services	Ambulance, Police, Fire	000

11.2 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 Personal Protective Equipment (PPE) required for remediation work. All excavations should be clearly marked with coloured tape to reduce the risk to site personnel from injury by falling into open excavations.

11.3 Timing and Sequencing of Remediation Works

The remediation works should be undertaken during the initial stages of development. The timing for completion of the remedial works will be dependent upon the final remediation strategy that is adopted.

In general the remediation works are generally expected to follow the following sequence:

- HazMat assessment;
- Demolition of aboveground infrastructure;
- HazMat clearance;
- Removal of the concrete pavement around the USTs;
- Removal of fill-box, bowsers and any other aboveground fuel infrastructure;
- Removal of the USTs;
- Excavation/expansion (where necessary) of the old tank pit backfill and hydrocarbon impacted soil around the fill-box;
- Validation of the tank pit, and other excavation pits;
- Groundwater monitoring;
- Reinstatement of the new USTs and other fuel infrastructure; and
- Reinstatement of the pavement.

11.4 Site Soil and Water Management Plan

The remediation 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.

11.4.1 Flood Management Plan

EIS understand that the site is located in a flood prone area and therefore recommend the following strategy in order to manage any contaminated stockpiles of soil or excavations in an event of potential flooding:

- Check the weather forecast for at least one week prior to the commencement of any excavation work to make sure no excessive rain events are forecast in the area;
- Remove any stockpiles of soil within a few days prior to such events; and
- Backfill excavations a few days prior to such event.

11.5 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in Australian Standard AS-2460 (2002¹⁶) should be adopted. Other measures specified in the consent conditions should also be complied with.

Noise producing machinery and equipment should be operated between the hours approved by the Council (refer to DA 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 PM/remediation contractor, specifying the expected duration of the noisy works.

11.6 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 presented 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;

¹⁶ Australian Standard, (2002), AS2460: *Acoustics - Measurement of the Reverberation Time in Rooms*.

- 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 excessive dust (i.e. visible dust carried beyond the site boundary) is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed. Dust monitoring may be considered under these circumstances.

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. The street outside the site access points should be swept free of dust that may be tracked 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.

11.7 Health and Safety Plan

A site specific work, health and safety (WHS) plan should be prepared by the contractor for all work to be undertaken at the site.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. Gloves, dust masks and eye protection should be worn when working on remediation activities.

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.

11.8 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 demolition materials. Excavated tankpit backfill and soil must be tested (Section 8.1.7.6) and assigned an appropriate waste classification for off-site disposal to an appropriately licensed facility.

11.9 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 (possible delay) 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.

11.10 Hours of Operation

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

12 REGULATORY REQUIREMENTS

12.1 Contaminated Land Management Act 1997 (CLM Act)

The CLM Act establishes a legal framework that gives the EPA powers to require the assessment and remediation of sites where contamination is significant enough to warrant regulation. Where the EPA's intervention is not needed, the NSW planning and development framework will determine the appropriate use of sites in the future.

Under section 60 of the CLM Act the following people are required to notify the EPA as soon as practical after they become aware of the contamination:

- Anyone whose activities have contaminated land; and
- An owner of land that has been contaminated.

12.1.1 Duty to Report Contamination

The duty to report contamination to the EPA is outlined in the NSW EPA (2015¹⁷) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*.

Based on the site information, EIS consider that the site contamination does not meet the notification triggers outlined in the Duty to Report Guidelines.

12.1.2 Public Notification of Contamination

In the event the remediation process will required MNA or the preparation of an EMP, appropriate public notification of the MNA/EMP will be established under Section 10.7 of the Environmental Planning and Assessment Act (1979) or a covenant registered on the title to land under Section 88B of the Conveyancing Act (1919).

12.2 NSW EPA Requirements

12.2.1 Protection of the Environment Operation 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.

12.2.2 Water Management Act 2000

The remediation of contaminated groundwater may require treatment. Relevant approval should be obtained from NSW EPA and NSW Department of Industry - Water (DIW) prior to the commencement of pumping and treatment.

¹⁷ referred to as Duty to Report Contamination 2015

12.3 Local Government Requirements

12.3.1 SEPP55 Remediation of Land

Local councils assess potential site contamination under the NSW planning and development framework which includes State Environmental Planning Policy No. 55 – Remediation of Land and Managing Land Contamination – Planning Guidelines. The planning and development process will determine what remediation is needed to make the land suitable for a particular landuse. Site remediation can fall under two categories outlined below. The SEPP55 is currently under review and a Draft SEPP55 has been published. Reference should be made to the Draft SEPP for changes with the below categories.

12.3.1.1 Category 1 Remediation

Category 1 remediation works are those undertaken in a designated development where the following areas specified under Clause 9 of SEPP55 apply:

- Carried out on land declared to be a critical habitat;
- Development for which another SEPP or REP requires a development consent;
- 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; and
 - 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. 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).

12.3.1.2 Category 2 Remediation

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.

12.3.2 Dewatering Approvals

In the event groundwater is intercepted during excavation works, dewatering will be required. Council and other relevant approvals will be required prior to disposal of groundwater into the stormwater system.

12.3.3 Work Health and Safety

Sites contaminated with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan in accordance with the WHS Code of Practice 2011¹⁸.

¹⁸ WHS Regulation, (2011), *Code of Practice – How to Manage and Control Asbestos in the Workplace*.

13 **CONCLUSION**

13.1 **Site Suitability**

EIS are of the opinion that the remediation of the site is technically feasible and can be made suitable for the proposed development, provided the following recommendations are successfully implemented.

1. RAP is implemented accordingly. A site validation assessment (SVA) report should be prepared on completion of remediation activities and should be submitted to the consent authority; and
2. EIS understand that the existing groundwater monitoring wells, installed by EIS in 2011, will most likely be destroyed during the proposed construction works. New groundwater monitoring wells should be installed in order to comply with the UPSS Regulation 2017. The sampling and analysis of the groundwater should be undertaken from the monitoring wells. The groundwater analytical results will be another indicator for the success of the soil remediation works.

14 **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.

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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.

REPORT FIGURES



PLOT DATE: 4/07/2018 2:05:42 PM DWG FILE: S:\5 EIS\SC EIS_JOBS\925000\S\E25431KG_LONDONDERRY (UPSS)\CAD\E25431KG.DWG

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

Title:		SITE LOCATION PLAN	
Location:		370-372 CARRINGTON ROAD LONDONDERRY, NSW	
Report No:	E25431KG	Figure No:	1
ENVIRONMENTAL INVESTIGATION SERVICES			



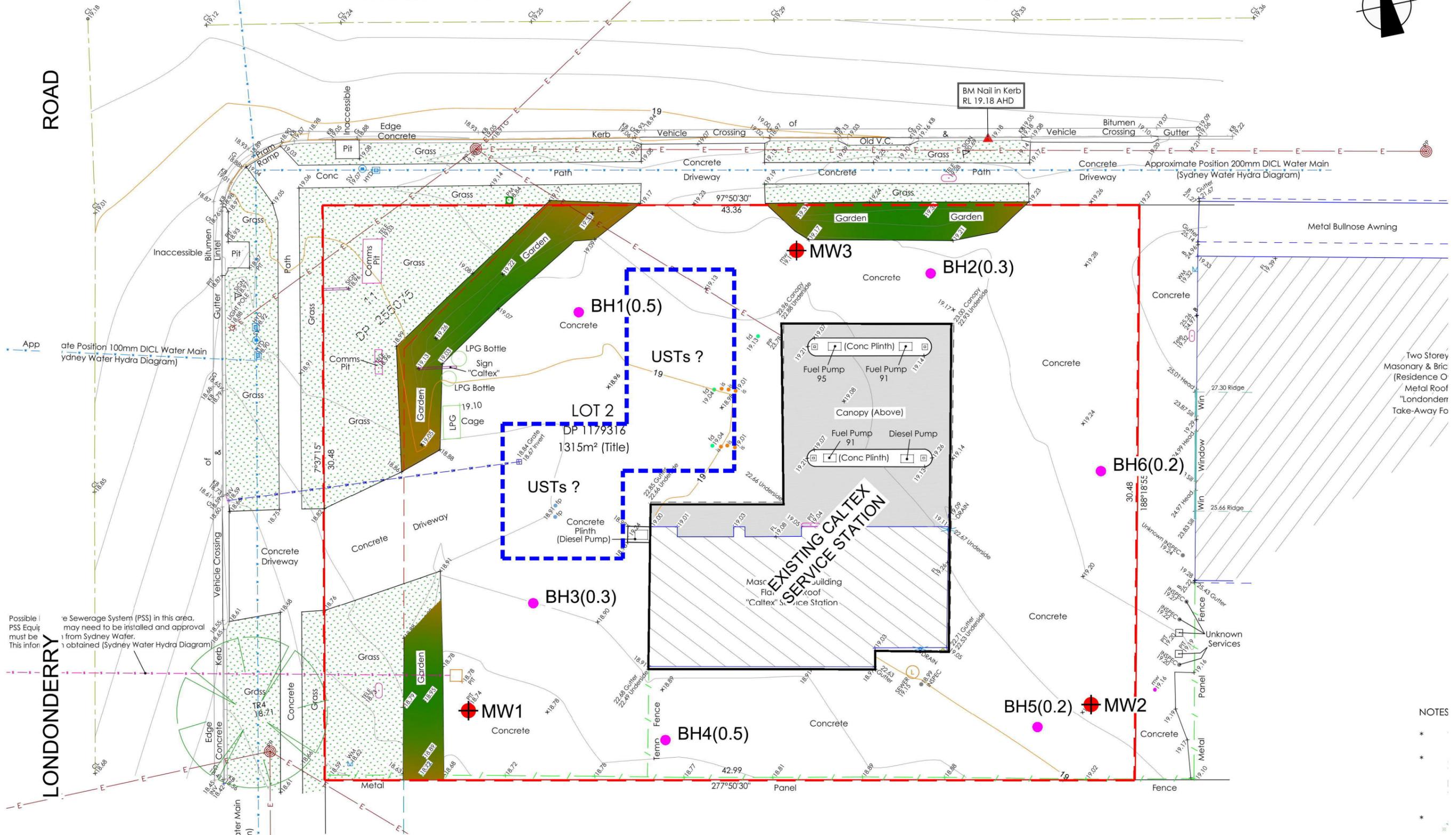
This plan should be read in conjunction with the EIS report.

CARRINGTON ROAD

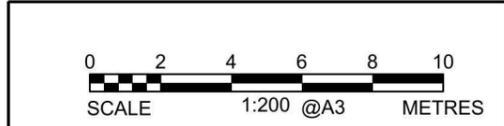
ROAD

ROAD

LONDONDERRY



- LEGEND**
- APPROXIMATE SITE BOUNDARY
 - BH (Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
 - ⊕ MW GROUND WATER MONITORING WELL LOCATION
 - APPROXIMATE UST LOCATION



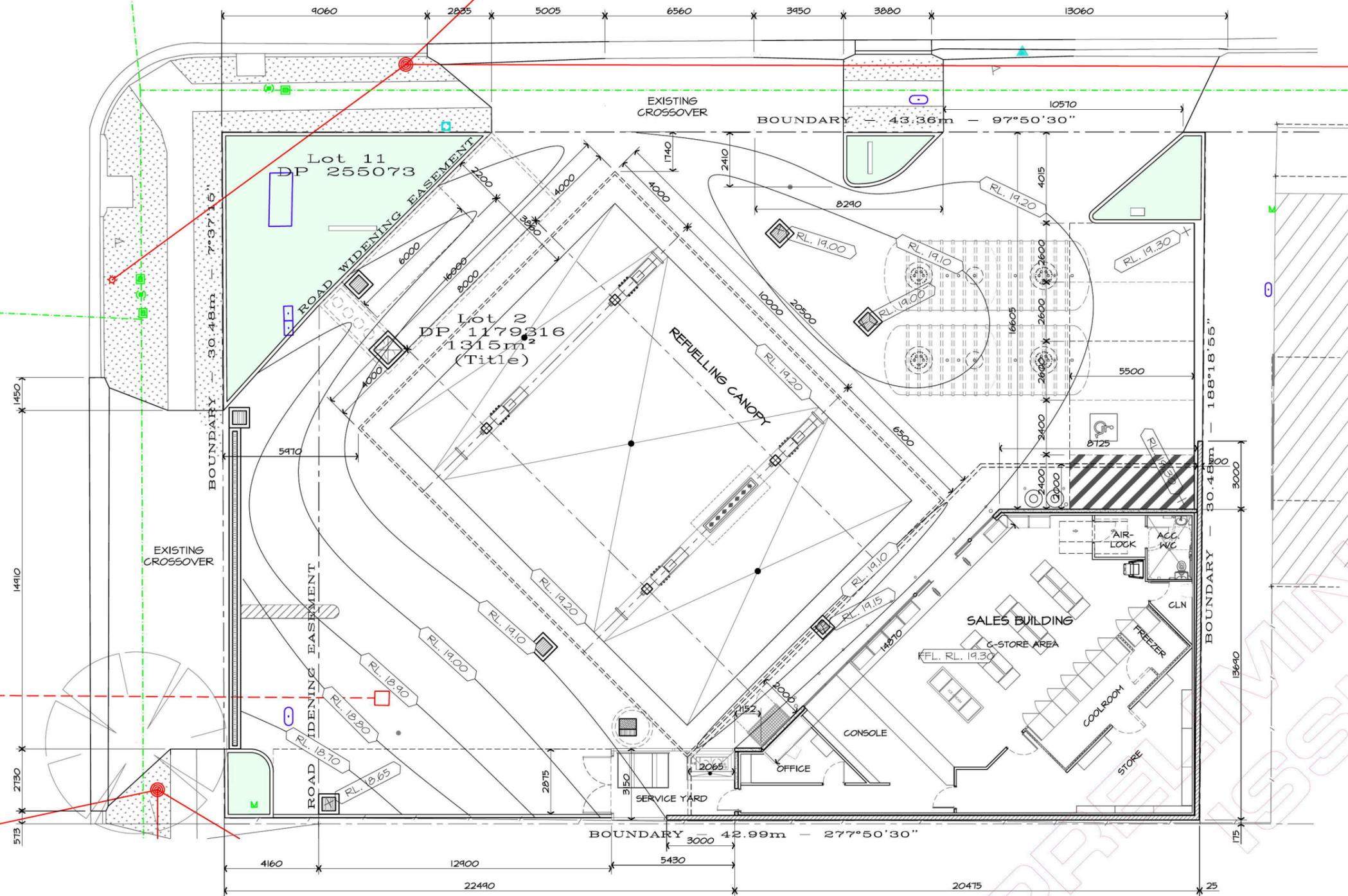
This plan should be read in conjunction with the EIS report.

Title: SITE FEATURES PLAN	
Location: 370-372 CARRINGTON ROAD LONDONDERRY, NSW	
Report No: E25431KG	Figure No: 2
ENVIRONMENTAL INVESTIGATION SERVICES	



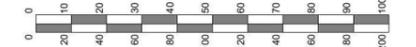
PLOT DATE: 9/01/2019 9:51:45 AM DWG FILE: S:\5 EIS\SC EIS JOBS\E25431KG LONDONDERRY (UFS)\CAD\E25431KG.DWG

Appendix A: Proposed Tankpit Configuration



DIMENSIONED PLAN

SCALE BAR 1 : 1 On A1 Size Original



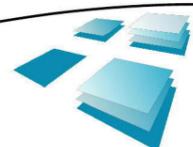
SCALE BAR 1 : 2 On A3 Size Reduction

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No.	Amendment	By	Date
PI	PRELIMINARY ISSUE. NOT FOR CONSTRUCTION.	VP	08.03.2018
DAI	ISSUED FOR DEVELOPMENT APPROVAL ONLY. NOT FOR CONSTRUCTION.	VP	06.03.2018



Client: Maria Galis
 Building Designers Australia
 Accredited Building Designer: 6318
 Victoria: RBP DP-AD 15329
 Tasmania: ASP CC010
 New Zealand: BP 131362



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Project
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 LONDONDERRY NSW
 FOR
MARIA GALIS
 Drawing Title
DIMENSIONED PLAN

**PRELIMINARY ISSUE
 NOT FOR CONSTRUCTION**

Approved	Designed
Date March 2018	Drawn VP
Scale 1:100 @ A1 # 1:200 @ A3	Checked VP
Project No. 16-096	Drawing No. A-03
	Amdt. DAI

Appendix B: Guidelines and Reference Documents

Australian Standard, The Removal and Disposal of Underground Petroleum Storage Tanks - AS4976-2008.

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