Framework Remediation Action Plan

28-32 Bourke Road, Alexandria, NSW, 2015

Prepared for: Alexandria Property Development Pty Ltd c/- Johnstaff Projects Pty Ltd

EP2515.002_v3 | 04 July 2022

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems QMS Certification Services

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EP RISK

Framework Remediation Action Plan

28-32 Bourke Road, Alexandria, NSW, 2015

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4 July 2022

LIMITATIONS

This Framework Remediation Action Plan was prepared on behalf of Alexandria Property Development Pty Ltd c/- Johnstaff Projects (NSW) Pty Ltd for the purpose/s stated in **Section 1**.

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It is not possible in a Framework Remediation Action Plan to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

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Executive Summary

Alexandria Property Development Pty Ltd c/- Johnstaff Projects (NSW) Pty Ltd (Alexandria Property Development c/- Johnstaff) engaged EP Risk Management Pty Ltd (EP Risk) to prepare a Framework Remediation Action Plan (Framework RAP) for 28-32 Bourke Road, Alexandria, NSW, 2015 (the Site). The Site is legally described as Lots 1, 2 and 3 in Deposited Plan (DP) 324707 and is approximately 3,000 m² in area.

It is understood that Johnstaff are planning to redevelop the Site from its current industrial land use to a commercial building, which may involve the excavation of the soil within the Site to approximately 1.0 meters below ground level (mBGL) for the purposes of the construction of a semi-underground car park. The final development design solution, including basement depth and configuration is subject to a design excellence competition and separate State Significant Development Application (SSDA). The Framework RAP is required to address the findings of the Soil Contamination Assessment (SCA) (EP Risk 2021) and the Detailed Site Investigation (DSI) (EP Risk 2022) which was previously prepared for the Site.

Prior to the preparation and implementation of a Detailed RAP and the commencement of the development works, further Site investigations will be undertaken to gain a greater understanding of the Site contamination and appropriate remedial options through undertaking bench trials. The purpose of the Framework RAP is to detail the preferred remedial strategies covering multiple likely scenarios from the further investigation works to render the Site suitable for the Proposed Development.

The SCA (EP Risk 2021) and DSI (EP Risk 2022) identified multiple contaminants of potential concern (CoPC) within the Site which pose a potential human health risk to current and future users of the Site, including remediation and construction workers, and a risk to the surrounding environment if shown to have the potential to move off-site. Most notably, Lead contamination within the Site was shown to significantly exceed the adopted human health criteria for commercial/industrial land use (as shown in the National Environmental Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure*, as amended April 2013 (ASC NEPM 2013)) by over 250% as well as the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA 2014) Specific Contaminant Concentration (SCC 2) and Toxicity Characteristic Leaching Potential (TCLP) 2 value for Hazardous Waste (HW).

Consequently, the remediation scope as outlined within the Framework RAP comprises the following:

- Assignment of roles and responsibilities.
- Preparation of WHS documentation, CEMP and Site establishment.
- Site establishment
- Further Site investigation:
    - Targeted sampling of Area 1 for concentration and leachability of Lead in FILL material and natural soil.
    - Targeted sampling of previously inaccessible areas within Area 2 for a range of CoPC.
    - Installation of additional Groundwater Monitoring Wells (GMWs), and groundwater monitoring and sampling throughout the Site, including in Area 1.
    - Monitoring of groundwater depth and hydraulic conductivity.
    - Soil Treatment Trials to measure the immobilisation potential of CoPC, in particular lead, in soil.
    - Preparation of an updated DSI for the Site.

- Preparation of a Detailed RAP and/or Remedial Work Method Statement (RWMS) to supplement this framework RAP.
- Remediation and associated tasks, which may involve (depending on the findings of the future Site investigations):
    - Segregation of ASBINS within Area 1 and disposal off-site as Special Waste (Asbestos) – Hazardous Waste (non-putrescible).
    - Excavation and segregation of remaining Restricted Solid Waste (RSW) and HW.
    - On-site immobilisation treatment of RSW and HW.
    - Further waste classification of segregated General Solid Waste (GSW) and HW and off-site removal and disposal.
    - Excavation of remainder of the soil within the planned basement development as GSW.
    - Monitoring Natural Attenuation (MNA) of CoPC within groundwater monitoring wells.
    - Asbestos Air Monitoring.
- Validation of the Site, including for ASS in accordance with the ASSMP.
- Contingency Plan and/or Long Term Environmental Management Plan (if required).
- Unexpected Finds Protocol.

EP Risk considers implementation of the remediation strategy and subsequent validation works and associated activities outlined in this framework RAP can make the Site suitable for the proposed commercial / industrial land use.

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Appendix A Unexpected Finds Protocol

1 Introduction

EP Risk Management Pty Ltd (EP Risk) is pleased to provide Alexandria Property Development Pty Ltd c/- Johnstaff Projects (NSW) Pty Ltd (Alexandria Property Development c/- Johnstaff) with this framework Remediation Action Plan (Framework RAP) for the proposed construction of a hospital located at 28-32 Bourke Road, Alexandria, NSW, 2015 (the Site). The Site is approximately 3,000 m² in area and currently consists of a disused factory / warehouse. The Site comprises three (3) lots, defined as Lots 1-3 in Deposited Plan (DP) 324707. The Site is currently zoned as B7 – Business Park, under the Sydney Local Environmental Plan (LEP) (2012).

This Framework RAP is required to address the findings and recommendations of a Soil Contamination Assessment (SCA) (EP Risk 2021[1]) and Detailed Site Investigation (DSI) (EP Risk 2022[2]) conducted by EP Risk and issued to Alexandria Property Development c/- Johnstaff.

It is understood that Johnstaff are planning to redevelop the Site from its current industrial land use to a ten (10) storey hospital, which may involve the excavation of the soil within the Site to approximately 1.0 meters below ground level (mBGL) for the purposes of the construction of a semi-underground car park. The final development design solution, including basement depth and configuration is subject to a design excellence competition and separate State Significant Development Application (SSDA).

EP Risk understands that the Site is proposed to be redeveloped into and semi-below ground car park to 1.0 meter below ground level (mBGL).

At the time of writing this Framework RAP, the Site was inaccessible to Johnstaff and EP Risk. Although the DSI (EP Risk 2022) revealed the presence and extent of Lead contamination within soil of the Site, additional assessment is required to further characterise the contamination and inform an update to the RAP.

Further Site investigation works are scheduled to be undertaken when access can be provided, however due to Site constraints this cannot be undertaken before the submission of Stage 1 for the State Significant Development Application (SSD-38600121). On 7th April 2022, Secretary's Environmental Assessment Requirements (SEARs) were provided by NSW Department of Planning and Environment. Condition 15 requires the submission of a Preliminary Site Investigation (PSI), Detailed Site Investigation, Remediation Action Plan (including interim audit advice from a NSW Environment Protection Authority (NSW EPA) Accredited Site Auditor (the Site Auditor)) and an Acid Sulfate Soils Management Plan. It is noted that a Preliminary Long-term Environmental Management Plan will be prepared at a later stage (if required).

The Site location and layout is provided as **Figure 1** in the '**Figures**' section of this report.

1.1 Ongoing Project Information

EP Risk understands that Alexandria Property Development c/- Johnstaff require this Framework RAP to gain State Significant Development Approval for the proposed construction. A proposal was provided to Alexandria Property Development c/- Johnstaff to conduct further assessment works as detailed in **Section 9.4** of this report to satisfy the recommendation within he DSI (EP Risk 2022).

Based on the current lease agreement for the Site, EP Risk was unable to attend site to complete the additional investigation works, including a soil treatment trial, and as such EP Risk is unable to provide a Detailed RAP. Upon consultation with the appointed Site Auditor, it was agreed that a framework RAP would be sufficient for the development application process, and that the Detailed RAP and/or RWMS would be prepared once Site access can be granted to EP Risk to undertake further soil investigation works.

[1] EP Risk (2021), Soil Contamination Assessment, 28-32 Bourke Road, Alexandria, NSW, 2015, ref: EP2460.002_v1, dated 23 December 2021 (EP Risk 2021).
[2] EP Risk (2022), Detailed Site Investigation, 28-32 Bourke Road, Alexandria, NSW, 2015, ref: EP2515.001_v1, dated 10 March 2022 (EP Risk 2022).

The Framework RAP, therefore, should cover multiple possible remedial options until such time as further data is collected and a preferred remedial approach can be determined. These include but are not limited to:

- The groundwater quality underneath and near the identified Lead contamination in soil and the potential for off-site contamination;
- The results of the soil treatment trial a variety of lead immobilisation reagents;
- The presence of asbestos on-site; and
- Groundwater characteristics.

A Framework RAP cannot cover all potential findings of the further field testing. This Framework RAP should therefore be supplemented with a RAP or RWMS at the conclusion of the field sampling and analysis, including the soil treatment trials.

1.2 Objective

The objective of this Framework RAP is to provide a plan to ensure the Site can be remediated to a standard suitable for the proposed hospital Site redevelopment.

1.3 Scope of Work

The scope of work associated with the preparation of this RAP included:

1. Review of available historical soil and groundwater analytical data and prepare an up-to-date Conceptual Site Model (CSM).
2. Review potential remedial options and technologies with respect to regulatory requirements, site constraints and the Proposed Development.
3. Develop an appropriate remedial strategy for each likely outcome of the future Site soil analytical data, including the results of the soil treatment trial.
4. Document the procedures to be followed to render the Site suitable for the Proposed Development.
5. Outline any validation and long term environmental management requirements for the Site to be prepared prior to issuance of a final Site Audit Statement (SAS) for the Site following completion of remediation works.
6. Preparation of a Framework RAP in accordance with the requirements of NSW *State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP),* and NSW Environment Protection Authority (NSW EPA) *Consultants Reporting on Contaminated Land – Contaminated Land Guidelines* (2020).

2 Technical Framework

EP Risk performed the works with the usual care and professionalism of the consulting industry. The works associated with the RAP were performed in general accordance with the following guidance:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guielines (ANZG 2018).
    - ANZG 2018 is the current revision of the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) guidelines, presented as an online platform
- Australian Standard (AS) 4482.1 (2005) *Guide to Investigation and Sampling of Sites with Potentially Contaminated Soil, Part 1: Non-volatile and Semi-Volatile Compounds*.
- AS 4482.2 (1999) *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 2: Volatile Substances*.
- *Contaminated Land Management Act 1997* (CLM Act).
- enHealth (2001) *Exposure Scenarios and Exposure Settings*, enHealth Council Australia.
- enHealth (2012) Australian Exposure Factor Guide. Department of Health and Ageing and enHealth Council Australia.
- enHealth (2012) Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risk from Environmental Hazards. Department of Health and Ageing and enHealth Council Australia.
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).
- *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Friebel, E & Nadebaum, P (2011) *Health Screening Levels for Petroleum Hydrocarbons in soil and Groundwater. Part 1: Technical development document*, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.
- National Health and Medical Research Council and National Resource Management Ministerial Council (NHMRC/NRMMC) (2011), *Australian Drinking Water Guidelines 6* (ADWG), version 3.4, updated October 2017 (Drinking Water Guidelines).
- *National Environment Protection Council Act 1994* (NEPC Act).
- National Environmental Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure*, as amended April 2013 (ASC NEPM 2013).
- National Health and Medical Research Council and National Resource Management Ministerial Council (NHMRC/NRMMC) (2011), *Australian Drinking Water Guidelines 6* (ADWG), version 3.4, updated October 2017 (Drinking Water Guidelines).
- NHMRC (2008) *Guidelines for Managing Risk in Recreational Waters* (GMRRW 2008).
- NSW Acid Sulfate Soils Management Advisory Committee (1998), *Acid Sulfate Soils Assessment Guidelines*.
- NSW Department of Environment and Conservation (DEC) (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW Groundwater Guidelines).

- NSW Environment Protection Authority (NSW EPA) (1995) *Sampling Design Guidelines*.
- NSW EPA (2020) *Assessment and Management of Hazardous Ground Gases*.
- NSW EPA (2014) *Waste Classification Guidelines: Part 1 – Classifying Waste* (NSW EPA 2014).
- NSW EPA (2014) *Scheduled Chemical Wastes Chemical Control Order* (Chemical Control Order 2014).
- NSW EPA (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*.
- NSW EPA (2017) *Guidelines for the NSW Auditor Scheme (3rd Edition)* (NSW Auditor Guidelines).
- NSW OEH (2020) *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites*.
- State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)NSW *Work Health and Safety Act 2011* (WHS Act).
- NSW *Work Health and Safety Regulation 2017* (WHS Regulation).
- *Protection of the Environment Operations Act 1997* (POEO Act).
- *Protection of the Environment Operations (Waste) Regulation 2014*.
- Water Quality Australia (2018) *National Acid Sulfate Soils Guidance: National acid sulfate soils sampling and identification methods manual*.
- WA Department of Health (2021) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DOH 2021), in combination with the NSW EPA Position Statement – *WA guidelines for asbestos contaminated sites, 14 April 2022* (NSW EPA 2022).

3 Site Identification

Pertinent Site identification details are presented in **Table 1**.

Table 1 – Site identification

Item	Description
Site Address	28-32 Bourke Road, Alexandria, NSW, 2015 (as shown in **Figure 1**)
Legal Description	Lots 1, 2 and 3 in DP 324707
Approximate Site Area	3,000 m²
Municipality	Council of the City of Sydney (Council)
Zoning	B7 – Business Park under Sydney Local Environmental Plan 2012 (currency 18/02/2022)
Proposed Land Use	Hospital and Medical Care Uses
Proposed Land Classification*	Commercial / Industrial
Current Land Use	Vehicle and tyre storage and workshop
Current Land Classification*	Commercial / Industrial

* Land classification as defined in the National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure 1999 (2013 amendment).

4 Site History

The information provided in the following sections was predominantly obtained from the Lotsearch Environmental Risk and Planning Report (2021)[3] provided within EP Risk (2021a) and publicly available Council and NSW EPA records.

4.1 Sources of Information

The Site history sources utilised during the review include:

- Historical aerial photography from the years 1930, 1943, 1951, 1961, 1965, 1970, 1978, 1982, 1986, 1991, 1994, 2000, 2005, 2011, 2016 and 2021.
- Historical certificates of Title.
- Publicly available Council and NSW EPA records.

4.2 Council and Regulatory Records

A summary of the information accessible through publicly available records is summarised below.

Table 2 – Council and Regulatory Records Search

Record	Findings
Topography and Elevation	The Site has an approximate elevation of 8-12 m Australian Height Datum (m AHD) and slopes gradually from the southern to northern portion of the Site.
Geology	According to the NSW Department of Industry, Resources & Energy, 1:100,000 scale map, the Site is underlain by Quaternary medium to fine-grained marine sand with podosols.
Soil Landscapes	According to the NSW Department of Planning, Industry & Environment Soil Landscapes of the Penrith 1:100,000 Sheet[4], the Site is dominated by medium to very coarse-grained quartz sandstone, minor laminated mudstone and siltstone lenses of alluvial floodplain origin.
Hydrogeology	According to the Geoscience Australia Hydrogeology Map of Australia, Aquifers on-site are anticipated to be porous, extensive with high productivity. Several groundwater wells were identified within 2 km of the Site, with the closest located approximately 94 m to the northeast of the Site. Within the 2 km boundary of the Site, standing water levels (SWL) ranged from 0.79 m below ground level (mBGL) (409 m west) to 90.0 mBGL (960 m, south). The borehole closest to the Site with available SWL data (227 m southeast) recorded a standing water level of 5.10 mBGL.
Mining Subsidence	No Mining Subsidence Districts were identified within 1 km of the Site.

[3] Lotsearch (2021) *Environmental Risk and Planning Report*, *28-32 Bourke Road, Alexandria NSW*, ref: LS027294_EP, dated 06 December 2021 (Lotsearch 2021).
[4] NSW Department of Planning, Industry & Environment, Soil Landscapes of the Penrith 1:100,000 Sheet map 9030, Department of Environment, Climate Change and Water, accessed on 13 December 2021.

Table 2 – Council and Regulatory Records Search	
Record	**Findings**
	However, a number of historical Mining & Exploration Titles were identified on-site, held by several entities for petroleum and mineral resources during the years 1967 to 2015.
Coastal Protection Act 1979	The land was not subject to the operation of State Environmental Planning Policy (SEPP) 14 or SEPP 71 of the Coastal Protection Act 1979.
Contaminated Land	As of 7 December 2021, the Site was not listed on the NSW Environment Protection Authority (NSW EPA) Record for Contaminated Sites notified to the NSW EPA in accordance with the CLM Act 1997. Two (2) sites were identified within 1 km of the Site where contamination has been deemed as significant to warrant regulation under the CLM Act. These included Alexandra Canal Sediments and Sydney Park which are located 720 m southwest and 903 m west from the Site (respectively). In addition, 15 sites, listed as not requiring regulation under the CLM Act were identified within 114 m to 932 m of the site. Due to the shallow groundwater there is potential for contamination. Furthermore, one (1) site was found to be formerly regulated under the CLM Act, one (1) under current assessment and one (1) where contamination was addressed via the planning process (EP&A Act). These three sites are situated more than 600 m away from the Site.
State Environmental Planning Policy (SEPP) State Significant Precincts	There were no records of SEPP State Significant Precincts identified within 1 km of the Site and therefore this is unlikely to have impacted the Site.
Waste Management Facilities	There were two (2) record of waste management facilities identified within 1 km of the Site.
Historical Business Directories	• Wilson & Gilkes Pty Ltd – Manufacturing and Metal Workers • Paul Roberts and Parsons Pty Ltd – Dairy Machinery Manufacturers, Nut and Bolt Manufacturers • Corona Chemical Co. Pty Ltd – Chemical Manufacturers • Austral Bronze Crane Copper Pty Ltd – Metal Manufacturers • Advance Machinery Pty Ltd – Machinery Manufacturers • Booth, Frederick, H & Son Pty Ltd – Zinc and Lead Merchants • Union Mouldings Pty Ltd – Plastic Manufacturers • By-Products & Chemical Pty Ltd – Chemical Manufacturers • McEnally Spray Painters Pty Ltd – Sprayers Industrial • Wiggins Teape Australia Pty Ltd – Adhesives Manufacturer

Table 2 – Council and Regulatory Records Search

Record	Findings
Licensed Activities Under POEO Act 1997	Nine (9) records of licensed activities under the Protection of the Environment Operations (POEO) Act 1997 were identified within 1 km of the Site. To the northwest of the Site, approximately 173 m away, licensed activities included Railway systems activities and infrastructure construction. Railway systems activities, metal waste generation and metal coating activities were noted further south of the site at (approximately 625 m). Towards the southwestern end of the Site, approximately 972 m to 993 m away, licensed activities included waste, waste storage, non-thermal treatment of waste, and the recovery of general waste.
Delicensed Activities still Regulated by NSW EPA	There were six (6) records of delicensed activities still regulated by the NSW EPA identified within 1 km of the Site. Of these six (6), four (4) sites were involved with Hazardous, Industrial or Group A Waste Generation or Storage activities: • Australian Metal Co Pty Ltd, located 20 m north of the Site; • Daimler Chrysler Australia/Pacific Pty Ltd, Mercedes Benz of Sydney, located 584 m east of the Site; • Ausgrid, Energy Australia, located 691 m east of the Site; and • Alexandria Plating Pty Ltd, located 804 m south of the Site. The remaining two (2) sites were involved with Concrete work activities: • Concrite Pty Ltd, located 156 m north of the Site; and • Metromix Pty Ltd, Able Alexandria, located 593 m north of the Site.
Acid Sulfate Soils (ASS)	The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Atlas of Australian Acid Sulfate Soils (2013) indicates the Site is located in an area of ASS Class 3. Under a Class 3, works more than 1 m below the natural ground surface and works that may lower the water table by 1 m below natural ground surface presents an environmental risk. According to the CSIRO Atlas of ASS, there is a low to moderate (6%-70%) probability that the Site is affected by ASS. The Site is in an area classified as 'Disturbed Terrain' with regard to ASS, which indicates "*areas which have been mined or filled or have been subjected to other significant soil disturbance activities*" – Department of Land, Water and Conservation, *Guidelines for the Use of Acid Sulfate Soils Risk Maps, Second Edition*, March 1998 (DWI 1998).

Table 2 – Council and Regulatory Records Search	
Record	**Findings**
Heritage	There were no records of Commonwealth Heritage and National Heritage items identified within 1 km of the Site. Three State Heritage items were identified within 1 km of the Site and include: • Yiu Ming Temple, located 385 m north of the Site; • Pressure Tunnel and Shafts, located 776 m north of the Site; and • Alexandra Canal, located 814 m southwest of the Site. Several Environmental Planning Instrument Heritage Items were identified within 1 km of the Site.
Bushfire Prone Area	There were no records of vegetation categorised as bushfire prone on Site.
Dryland Salinity	According to the National Land and Water Resources Audit, no salinity data is available for the Site.
Coastal Wetland	The Site does not fall within the proximity area for coastal wetlands.
PFAS Investigation & Management Programs	There is one (1) record of PFAS Investigation & Management Programs listed within 1km of the site: • Alexandria Fire and Rescue NSW located 77 m northeast of the site.

4.3 Review of Historical Aerial Photos

A detailed review of the historical aerial photography is given in the DSI (EP Risk 2022). The findings of the aerial photographs can be summarised as:

- The earliest historical aerial photograph is from 1930, during which the Site appears to consist of a partially constructed warehouse surrounded by other construction.
- Significant industrial development occurred in the area of the Site from 1930 until the 1970s.
- Extensions to the Site buildings were conducted in the 1990s, and some buildings in the surrounding area were demolished and rebuilt.
- The last development within the area shown by the aerial photos was between 2016 and 2021, when the area south-west of the Site was cleared of storage units.

4.4 Previous Investigations

A list of previous investigations undertaken at the Site include:

1. Non-Destructive Hazardous Materials (HAZMAT) Assessment (EP Risk 2021a[5]);
2. Soil Contamination Assessment (EP Risk 2021); and
3. Detailed Site Investigation (EP Risk 2022).

[5] EP Risk, *Non-destructive Hazardous Materials (HAZMAT) Assessment, 28-32 Bourke Road, Alexandria, NSW, 2015,* ref: EP2460.001_v1, dated 22 December 2021 (EP Risk 2021a).

4.4.1 HAZMAT Assessment (EP Risk 2021a)

A non-destructive HAZMAT survey was undertaken on the Site by EP Risk for due-diligence purposes prior to the purchasing of the Site by the Client and a Non-destructive HAZMAT Assessment was prepared (EP Risk 2021a) detailing the location, type and extent of all visible and accessible HAZMAT within the Site boundary, as shown in **Figure 1**.

Following the Site purchase, a destructive pre-demolition HAZMAT survey was undertaken on the Site by EP Risk and a Destructive HAZMAT Assessment was prepared (EP Risk 2022a) which incorporated the HAZMAT identified during both the destructive and non-destructive HAZMAT surveys.

A review of the assessment (EP Risk 2022a) conducted identified the following HAZMAT on Site, as presented in **Table 3** below.

Table 3 – Hazardous building materials identified at the time of Assessment

Property	ACM		SMF	PCB	LCP	LCD	ODS	Mould
	Non-friable	Friable						
Interior western warehouse	**Present**	**Present**	**Present**	Not present	**Present**	**Present**	**Present**	**Present**
Interior eastern warehouse	**Present**	**Present**	**Present**	Not present	**Present**	**Present**	Not present	Not present
Exterior of entire site	**Suspected**	Not present	Not present	Not present	**Present**	Not present	Not present	Not present

4.4.2 SCA (EP Risk 2021)

The SCA (EP Risk 2021) was conducted to determine the presence and extent of CoPC within the Site soil prior to the purchasing of the Site by Alexandria Property Development. The findings of the SCA are outlined below.

- CoPC were reported at concentrations exceeding the adopted Health Investigation Levels (HILs) in four (4) of the nine (9) test pits:
    - Lead;
    - Heptachlor; and
    - B(a)P.
- One (1) of the nine (9) test pits were shown to contain asbestos in the form of a non-friable (bonded) asbestos cement fragment.
- The exceedances are summarised in **Table 4** below and are compared against the National Environmental Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure* as amended April 2013 (ASC NEPM 2013) HILs and Ecological Screening Levels (ESLs):

Table 4 – CoPC exceedances within the SCA

Location	Depth	Asbestos (presence/absence)	Lead (mg/kg)	B(a)P (mg/kg)	Heptachlor (mg/kg)
Exceedance Criteria			1,500[1]	1.4[2]	50[1]
TP04	0.1	-	-	-	223
TP05	0.1	-	-	5.3	-
TP06	0.1	Present	12,800	2.4	-
TP09	0.1	-	21,600	3.9	-

[1] ASC NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil

[2] ASC NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil

- Vertical or horizontal delineation works were not undertaken as part of the SCA. The full extent of the contamination cannot be determined from the available data within the SCA (EP Risk 2021).
- Also, heptachlor and chlordane are classified as scheduled chemicals and must be managed under the Chemical Control Order in relation to Scheduled Chemical Wastes as the total concentration of scheduled chemical wastes exceeds 50 mg/kg.

4.4.3 DSI (EP Risk 2022)

The DSI (EP Risk 2022) was conducted to address the findings of the SCA and obtain further data on the extent of contamination from all CoPC. The findings of the DSI are outlined below.

- Concentrations of Lead in soil are shown to be the most significant CoPC analysed within the Site. The concentrations of Lead in eight (8) of the 43 samples analysed exceeded the National Environment Protection Measures 2013 (ASC NEPM 2013) Health Investigation Level (HIL) D criteria for Commercial/Industrial land use. The highest Lead concentration is over 250% of the HIL value, which confirms that the HIL is said to be 'exceeded' as per ASC NEPM 2013.
- Concentrations of Benzo(a)Pyrene (B(a)P) Toxic Equivalence Quotient (TEQ) were detected at low levels (highest concentration was 6 mg/kg in BH05 – 1.5) and below the ASC NEPM 2013 HIL D criteria for Commercial/Industrial of 40 mg/kg.
- Asbestos in soils concentrations were reported below the laboratory Limit of Reporting (LOR) in all soil samples analysed. Furthermore, asbestos containing material (ACM) were not visually identified in soil during the intrusive investigation. However, ACM was visually observed within the Site during the initial SCA (EP Risk 2021), and is therefore known to be present within the Site.
- The analytical results of the groundwater monitoring event (GME) reported detectable levels of Arsenic, Chromium and Lead, however these did not exceed the adopted ASC NEPM 2013 criteria for Fresh or Marine water or the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) 95% Toxicant Default Guideline Values (DGVs).

- Concentrations of Zinc were detected in excess of the ANZG (2018) 95% Toxicant DGVs for Marine Water and Fresh Water in all samples taken.
- Concentrations of Nickel were detected in excess of the ANZG (2018) 95% Toxicant DGVs for Fresh Water in all samples taken, for Marine Water in two (2) of the four (4) samples taken.
- Groundwater is likely to be an exposure pathway to future construction and/or remediation workers on the Site due to the relatively shallow groundwater and the future plans of the Site to construct a semi below ground car park.
- There is no evidence to suggest there is a current or potential future direct contact exposure pathway for identified Site receptors as the proposed development will act as a seal, effectively eliminating groundwater ingress/access.
- Field and laboratory analysis was undertaken for indicators of Acid Sulfate Soils (ASS). The results of the field analysis proved to be useful for determining areas requiring more in-depth analysis, however comparing the data obtained from this analysis with the National Association of Testing Authorities (NATA) accredited analysis from the laboratory testing showed that the field testing tended to show a significantly higher field-oxidised pH (pH_{FOX}) value. The results of the field testing should therefore not be the only basis for determining the presence of ASS.
- The net acidity in one (1) sample (BH03_3.0) is equal to the adopted criteria from the National ASS Guidelines Table 5.4; Course and Peats sands to loamy sands. As per the guidelines, if the results are equal to or greater than the adopted criteria then an ASS management plan is required.
- Ten (10) of the 43 samples analysed exceeded the NSW Environment Protection Authority (NSW EPA) Specific Contaminant Concentration (SCC) 2 value for Restricted Solid Waste (RSW), which classifies the soils as Hazardous Waste. This is the most significant contaminant with regards to soil.
- In one location (TP04-0.1 – EP Risk 2021) some limited scheduled chemical waste (chlordane and heptachlor) has been observed. This needs to be managed in accordance with the relevant Chemical Control Order.
- Other contaminants, including B(a)P and some metals exceed the NSW EPA Contaminant Threshold (CT) 1 criteria.
- Asbestos was not visually observed within the soils nor detected above the laboratory LOR, however the SCA (EP Risk 2021a) detected asbestos in the soil on the eastern side of the Site. The presence of asbestos classifies the soil as Special Waste (Asbestos), however delineation may be possible using the data obtained for the SCA and DSI.

4.5 Site History Summary

The Site is located on Bourke Street, Alexandria on an area sloping from the south at an elevation of 12 mAHD to the north at 8 mAHD. The site is adjacent to Bowden Street to the west, Wyndham Street to the east and O'Riordan Street to the south.

Based on a review of available historical aerial photographs, the northern portion of the industrial warehouse appears to have been situated at the Site since 1930, but based on historical title records, may have existed as early as 1920. Major developments to the Site include the construction of the southern section of the Site between 1930 – 1943, extensions to the building between 1943 – 1951, 1965 – 1970, 1986 – 1991 and the replacement of roof sheeting between 1994 - 2000. A large amount of industrial development was undertaken within the surrounding properties between 1930 - 1943, which generally involved the conversion of the nearby unoccupied land from rural to commercial/industrial.

Ownership of the Site varied between the Lots until 1989, when current owner Mooney Properties Pty Ltd acquired all three sites. Between 1935 – 1938, Lot 1 was leased to James Hardie Trading Company Limited. James Hardie Trading Company Limited was Australia's largest manufacturer of asbestos cement products.

The Site was not listed on the NSW EPA Record for Contaminated Site notified to the NSW EPA in accordance with the CLM Act. Within the 1 km boundary lies two (2) sites where contamination has been deemed as significant to warrant regulation under the CLM Act. Furthermore, nine (9) records of licensed activities under the POEO Act 1997 were identified within 1 km of the site. Due to the separation distance all sites and activities considered unlikely to have impacted the Site.

5 Site Condition and Surrounding Environment

In February 2022, EP Risk field personnel conducted an inspection of the Site and immediate surroundings prior to and during intrusive sampling works (EP Risk 2022). The following features were observed:

- The Site is located within a known industrial area, situated on Bourke Road between Bowden Street to the west, Wyndham Street to the east and O'Riordan Street to the south.
- The Site was accessible by vehicle and foot from Bourke Road to the north.
- The Site comprised of one (1) industrial warehouse with internal offices on the ground and mezzanine level. The warehouse itself is divided into three adjoining rooms (western north-eastern and south-eastern sections) and one partially covered outdoor area (central eastern section). The Site is currently used as a vehicle storage warehouse.
- Several cars were stored on-site, and it was known that the Site previously stored many more cars.
- All areas were paved with concrete throughout. The concrete slab extended to a depth of approximately 0.15 mBGL throughout site. A double concrete slab was encountered at the western end of the Site The slab was observed to be in good condition.
- Building structures on the Site were observed to contain suspected bonded (non-friable) ACM. A HAZMAT inspection undertaken concurrently with the SCA (EP Risk 2021)[1] also identified LCP and LCD on-site.
- Based on discussions with on-site personnel and the site inspection, there was no anecdotal or visual evidence of underground fuel storage infrastructure observed on accessible portions of the Site.
- A proportional Triple Interceptor Trap (TIT) was identified in the south-western portion of the Site. No further information was provided at the time of the inspection.
- A drain or potentially another TIT with hoses directing waste into it, was observed in the middle of the site in Lot 2, adjacent to stored chemicals.
- Chemicals such as all-purpose thinner and grease remover were observed on-site in un-bunded chemical storage. No chemical leaks were observed.
- A vehicle spray booth was in the south-east corner of the site.
- Visible black surface staining was observed throughout the site from the workshop, there was also evidence of disturbance in the concrete flooring. Chemicals were observed to be stored and used on-site.
- A sewer/stormwater drain ran underground Lot 2, approximately 0.3 mBGL, potentially the length of the site.

5.1 Surrounding Land Use

The Site is located within a primarily industrial area. Surrounding land use within a 1 km radius comprised of the following:

To the North

- Bourke Road running south-west to east.
- Australian Metal Co scrapyard.

- Fire Station (Fire and Rescue NSW Alexandria Fire Station) to the north-east.
- Rail Operations Centre (Transport NSW) to the north-east.

To the South

- Taxi Depot to the south.
- O'Riordan Street running south to north-east.
- Head Office of Australian Red Cross.

To the East

- Café Mecca.
- Green Square Train Station.
- Car repair and maintenance.
- Corner of Bourke Road and O'Riordan Street.

To the West

- Industrial Properties.
- Bowden Street running north-west off Bourke Road.

5.2 Topography and Drainage

The topography of the Site was observed to be relatively flat with a downward gradient towards the north of the Site from the south. The Site appeared consistent and level with the surrounding properties. The elevation was between approximately 8 and 12 mAHD.

5.3 Sensitive Receptors

Potential sensitive receptors identified at and near the Site were:

- General public / customers of the business.
- Maintenance / future construction / workers at the Site.
- Residents of surrounding commercial premises.

6 Conceptual Site Model

The CSM was refined following the findings of the DSI (EP Risk 2022).

Known and Potential Sources of Contamination

The current known and potential sources of contamination at the Site and in the vicinity of the Site are presented in **Table 5**.

Table 5 – Known and Potential Contamination Sources

Location	Source	CoPCs	Affected Media
On-site	Hazardous building materials	Friable asbestos, Non-Friable Asbestos, SMF, LCD, LCP	Airborne dust, building materials
	Various former industrial works resulting in Lead in soil	Lead, B(a)P, Heptachlor, Asbestos	Soil, groundwater
Off-site	Historical use of the surrounding area for various industrial works	Potentially Heavy Metals, Hydrocarbons, BTEX, PAH, PCB, OCP, OPP	Potentially soil, groundwater, soil vapour

Type and Extent of Contamination

A summary of the analytical results from the previous investigation reports are discussed in **Section 4.4.**

Affected Media

The current affected media at the Site is soil and potentially groundwater (additional groundwater assessment is required), including the possibility of ASS. Groundwater contamination is shown to be limited, however given the high concentrations of Lead in the soil it is possible that the groundwater within the vicinity of these soils is contaminated and could migrate off-site.

Human and Ecological Receptors

Potential human and ecological receptors at and near the Site are considered to be:

- On-site receptors:
    - Current and future intrusive workers/construction workers.
    - Future Site users.
- Off-site receptors:
    - Current and future intrusive construction and maintenance workers at surrounding commercial/industrial properties.

6.1 Potential and Complete Exposure Pathways

The following potential and complete exposure pathways for the CoPC have been identified to exist for known contamination sources based on review of historical investigations (EP Risk 2021 and 2022) and the results of this investigation:

- Potentially leaching of contaminants from soils to underlying groundwater.
- Fugitive dust during future construction and/or remediation works on-site.
- Dermal contact with and/or ingestion of contaminated Lead soils.

An analysis of the potential and complete source-pathway-receptor linkages between the CoPC are presented in **Table 6** below:

Table 6 – Potential Exposure Pathways

Location	Primary Sources	Secondary Sources / Affected Media	Release Mechanism	Pathway	On-Site: Current and future intrusive construction / maintenance workers	On-Site: Current temporary and future users and visitors of the Site, including future residents / commercial workers	On-Site: Limited on-Site ecological receptors (terrestrial flora and fauna) in the landscaped areas at the Site	Off-Site: Current and future intrusive construction and maintenance workers at surrounding properties	Off-Site: Current and future employees, occupants and visitors of surrounding properties	Off-Site: Aquatic fauna and flora at Botany Bay and Associated Tributaries
On-site	Potentially imported fill materials of unknown origin and quality.	Soil Groundwater	Direct Contact	Dermal Contact	**High** / **Moderate**	N/A	N/A	**Low**	N/A	N/A
	Demolition of former buildings and structures			Ingestion	**Moderate to High**	N/A	N/A	N/A	N/A	N/A
	Use of the Site for mechanics and auto workshop purposes and previous Site usage as Lead merchants resulting in high levels of Lead in soil			Dermal Contact	**High** / **Moderate**	**Moderate to High**	N/A	N/A	N/A	N/A
				Ingestion	**Moderate to High**	**Moderate to High**	N/A	N/A	N/A	N/A
				Fugitive Dust (Ingestion)	**High**	**Low**	N/A	**High**	**High**	N/A
				Uptake by flora and fauna	N/A	N/A	N/A	N/A	N/A	**Low**
Off-site	Adjacent commercial / industrial properties	Off-site Groundwater	Migration of contaminated groundwater	Dermal Contact	**Low**	**Low**	**Low**			
				Ingestion	**Low**	**Low**	N/A			
				Uptake by flora and fauna	N/A	N/A	**Low**			

Potential Exposure Pathway Key:

Soil

Groundwater

6.2 Identified Data Gaps

Based on the findings of the DSI (EP Risk 2022), a number of data gaps were identified which require further assessment. The identified data gaps are outlined in **Table 7** below.

Table 7 – Identified Data Gaps

Media	Quality	Data Gap	Possible outcomes
Soil	Lead concentration	Insufficient lead in soil data in the eastern section of the Site in natural material.	Concentrations of Lead in natural soil are shown to be greater than the HILs.
	Lead leachability	Insufficient lead leachability data for the areas of high lead concentration.	Lead is shown to have high leachability and may be leaching into the groundwater and potentially leaving the Site.
	Lead immobilisation potential	Immobilisation data required for the potential immobilisation of lead	Soil Treatment Trials show lead **can cost-effectively be immobilised with treatment.**
			Soil Treatment Trials show lead **cannot cost-effectively be immobilised with treatment.**
	CoPC concentration	Sections of Site soil not sampled and analysed for a broad suite of contaminants do to being previously inaccessible.	Concentrations of CoPC in previously inaccessible areas shown to be below CT1 for Restricted Solid Waste, thereby being classified as **General Solid Waste.**
			Concentrations of CoPC in previously inaccessible areas shown to be above CT1 for **Restricted Solid Waste**
			Concentrations of CoPC in previously inaccessible areas shown to be above CT2 for **Hazardous Waste.**
Groundwater	Lead concentration	Groundwater monitoring wells have not been installed in sections of the Site where high lead concentrations have been observed in soil.	Lead contamination levels are shown to be greater than the adopted Groundwater Investigation Levels. Potential offsite impacts with contaminated groundwater.
Groundwater	Groundwater depth and hydraulic conductivity	Depth to groundwater and hydraulic conductivity was no obtained during previous investigation works	Depth to groundwater is shown **to vary above** the level of the planned excavation works.
			Depth to groundwater is shown not to vary above **the level of the planned excavation works.**
Soil	Asbestos in soil	Asbestos containing material may be observed within soil material during future Site investigation works	ACM is observed during future works.
Soil	Acid Sulfate Soils (ASS)	The DSI showed no exceedance of the ASS guidelines that would	ASS are shown to be present.

Table 7 – Identified Data Gaps

Media	Quality	Data Gap	Possible outcomes
		indicate the presence ASS, however the data was sufficiently close to the guidance values that it was decided that more data is required.	

7 Legislative and Regulatory Framework

7.1 Environmental Planning and Assessment Act 1979

The EP&A Act regulates development in NSW and incorporates the principles of Ecologically Sustainable Development through the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation).

Part 3A of the EP&A Act was repealed and replaced by the Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011. The complementary planning policy has also been revised to the State Environmental Planning Policy (State and Regional Development) 2011.

State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)Resilience and Hazards SEPP under the EP&A Act provides a framework for contaminated land remediation.

Remediation work which requires development consent is known as Category 1 remediation work. Category 1 remediation work refers to work:

- Categorised under Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011 under the Environmental Planning and Assessment Act 1979 as a State Significant Development (general)
- Categorised as designated development under Schedule 3 of the EP&A Regulation or under a planning instrument.
- Proposed on land identified as critical habitat under the Threatened Species Conservation Act 1995.
- Where consideration of Section 5A of the EP&A Act indicates the remediation work is likely to have a significant effect on threatened species, populations, ecological communities, or their habitats.
- Proposed in an area or zone identified in a planning instrument as being an area of environmental significance such as scenic areas, wetlands. These are listed in the SEPPs.
- Requires consent under another SEPP or a regional environmental plan.

In accordance with Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011, the development is considered State Significant Development if it involves a development that has a capital investment of more than $30 million for a hospital, medical centre, or health, medical or related research facility.

7.2 Assessment against Category 1 Criteria

An assessment of the Site against the criteria for Category 1 remediation work in Resilience and Hazards SEPP is presented in **Table 8** below:

Table 8 – Assessment of Category 1 Remediation Work

Requirement	Assessment
Is the work designated development?	No.
Proposed on land identified as critical habitat?	No.
Likely to have a significant effect on critical habitat or a threatened species, population or ecological community.	No.

Development for which another State environmental planning policy or a regional environmental plan required development consent?	Yes.
Carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument: i) coastal protection; ii) conservation or heritage conservation; iii) habitat area, habitat protection area, habitat or wildlife corridor; iv) environment protection; v) escarpment, escarpment protection or escarpment preservation; vi) floodway; vii) littoral rainforest; viii) nature reserve; ix) scenic area or scenic protection; x) wetland; or xi) carried out on land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council or any local government area in which the land is situated.	No.

Based upon the assessment provided in **Table 8**, it is considered that the proposed remediation work is classified as Category 1 remediation works in accordance with Resilience and Hazards SEPP.

7.3 Protection of the Environment Operations Act 1997

7.3.1 Environment Protection Licence

Under Section 48 of the POEO Act, an Environment Protection Licence (EPL) is required if the activity undertaken is listed in Schedule 1.

The POEO Act also defines 'waste' for regulatory purposes.

Contaminated soil treatment is declared to be a scheduled activity requiring a licence if:

- In any case, it has the capacity to treat more than 1,000 cubic metres (m^3) per year of contaminated soil received from off-site, or
- Where it treats contaminated soil originating exclusively on-site, it has a capacity:
    - to incinerate more than 1,000 m^3 per year of contaminated soil, or
    - to treat (otherwise than by incineration) and store more than 30,000 m^3 of contaminated soil, or

to disturb more than an aggregate area of 3 ha of contaminated soil.

The remediation works for the Proposed Development do not fall into the above categories and therefore do not require an EPL under the POEO Act.

7.4 Contaminated Land Management Act 1997

The CLM Act establishes a process for the investigation and remediation of land that is contaminated where the contamination is considered significant enough to warrant regulation. Where the NSW EPA decides to regulate land it can be declared 'Significantly Contaminated Land'.

Under Section 60 of the CLM Act, a person whose activities have contaminated land or a landowner whose land has been contaminated is required to notify the NSW EPA when they become aware of the contamination.

Under Section 105 of the CLM Act, the NSW EPA has the authority to make or approve guidelines which must be taken into consideration by the NSW EPA, accredited Site Auditors and contaminated land consultants. The NSW EPA has created the following guideline to assist landowners and persons who have the responsibility to report Contamination under the CLM Act:

- NSW EPA (2015) Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997*.

7.4.1 Duty to Report

Under Section 2.3.1 of the NSW EPA (2015) Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997,* notification of contamination is required where the 95 % upper confidence limit on the arithmetic average concentration of a contaminant in or on soil is equal to or above the HILs and/or Health Screening Levels (HSLs) for that contaminant for the current or approved use of the respective on-site land, as specified in Section 6, Schedule B1 of the ASC NEPM 2013.

The results of analytical testing undertaken in the DSI (EP Risk 2022) were compared to the Duty to Report Guideline (EPA 2015) to determine whether Alexandria Property Development c/- Johnstaff has any obligations under s60 of the CLM Act to notify the NSW EPA.

Concentrations of lead were identified significantly greater than the adopted HILs, however based on the current status no person will foreseeably be exposed to the soil contamination and there is no groundwater data available from below the contamination source. Consequently, there is considered not to be a requirement to

notify the NSW EPA under the Duty to Report Guideline (EPA 2015). However, the duty to report contamination should be reassessed after completion of the additional assessment works. It is also noted that the Site Auditor might have a different opinion on this and under Section 2.2.2 of the Duty to Report Guideline, the Site Auditor might decide to advice that there is a duty to notify the EPA.

Additionally, concentrations of nickel and zinc in groundwater were shown to exceed the adopted Groundwater Investigation Levels (GILs) for the Site and as such there exists a duty to report contamination under NSW EPA (2015).

7.5 Work Health and Safety Regulation 2017

The works will be undertaken in accordance with the requirements of the Model Work Health and Safety (WHS) Regulation 2017.

7.6 SafeWork NSW Code of Practice – How to Safely Remove Asbestos, 2019

The works undertaken within the Site will be undertaken in general accordance with SafeWork NSW Code of Practice: *How to Safely Remove Asbestos,* 2019 in the area of the Site where asbestos has previously been identified.

The How to Safely Remove Asbestos Code of Practice (2019) was developed to provide practical guidance for a PCBU who have duties under the WHS Act and WHS Regulation to safely remove asbestos from workplaces where asbestos may be found including structures, plant and soil. The code of practice provides information and guidance pertaining to removal techniques, control measures and personal protective equipment (PPE).

7.7 SafeWork NSW Code of Practice – How to Manage and Control Asbestos in the Workplace, 2019

This Code of Practice has been developed to provide practical guidance for a PCBU on how to manage risks associated with asbestos and ACM at the workplace. This code provides information on how to identify the presence of asbestos at the workplace and how to implement measures to eliminate or minimise the risk of exposure to airborne asbestos fibres.

7.8 Protection of the Environment Operations (Waste) Regulation 2014

All material that requires disposal off-site must be classified in accordance with the NSW EPA Waste Classification Guidelines: *Part 1 Classifying Waste* (2014) prior to disposal.

7.9 Chemical Control Order 2014

Under the Chemical Control Order 2014, the on-site disposal of scheduled chemical wastes is prohibited, with exception of solid scheduled chemical waste disposed of to a landfill lawfully permitted to receive such waste. The Order defines liquid or solid waste as containing one or more of the scheduled chemicals where the total concentration of the chemicals is more than two (2) mg/kg.

The Chemical Control Order applies to several chemicals, including chlordane and heptachlor, which the SCA (EP Risk 2021) showed to be present within the soil. As one sample within the SCA (EP Risk 2021) contained concentrations of these CoPC above the levels of the Chemical Control Order 2014, the soil excavated from the area of the respective borehole should be removed to a suitably licensed waste facility.

8 Remediation Objectives, Extent and Options

8.1 Remediation Objectives

With reference to the NSW EPA Auditor Guidelines (2017) and the ASC NEPM 2013 and the Proposed Development design limited bulk excavation across the Site, the remediation objectives were established as follows:

- Minimise the human health risk to site users and workers posed by the identified CoPC within the Site, both during and after construction.
- Minimise the human health and environmental risk posed by the potential migration of contamination off-site.
- Identify and treat actual and potential ASS within the Site.
- Suitably remediate and address potential migration of CoPC from the Site. Remedial works must not obstruct the long-term management of the Site and must not affect future Site users.
- Perform remedial works in accordance with applicable standards.
- Validate the remediation works in accordance with the relevant guidelines.
- Document the validation process.

Following the additional investigation works, the objectives will be refined (where appropriate).

8.2 Remedial Extent

The remediation extent is based on the findings in the DSI (EP Risk 2022) for the proposed development to address identified on-site contamination. The remedial extent for lead contamination covers Area 1 shown in **Figure 2 – Contamination Areas** and may cover Area 2 depending on the results of the additional investigation. Depths to natural soil material and bedrock were observed to be:

- Bedrock – between 6.0 and 8.5 mBGL.
- Natural soil (i.e. depth of fill) – between 0.6 and 2.0 mBGL.

The excavation of the planned basement is understood to extend to 1.0 mBGL. As such, the remediation works will only extend to this depth, except where further excavation for footings or removal of unacceptable contamination is required (i.e. leachable lead to be removed if full where practicable).

Areas outside the basement footprint such as deep soil planting areas will have to meet City of Sydney requirements as well as the health and ecological criteria as per the NEPM.

8.2.1 Area 1 – Hazardous Waste

Area 1 as shown in **Figure 2 – Contamination Areas** is shown in the DSI (EP Risk 2022) to contain levels of lead in exceedance of the SCC2/TCLP2 value for HW within NSW EPA 2014, and in exceedance of the adopted HILs. The extent of the remediation within this area is dependent on the results of further Site investigations to be undertaken. The approximate Area of Area 1 is approximately 600m^2.

Based on observational data from the DSI (EP Risk 2022) and the SCA (EP Risk 2021) the depth to fill in Area 1 is calculated to be on average 1.16 mBGL, based on five (5) out of the ten (10) boreholes in Area 1 where natural material was reached. The volume of FILL material to be classified as Hazardous Waste is therefore conservatively calculated to be 1,200 m^3 using an excavation depth of 1.5m.

It should be noted that of the seventeen (17) boreholes excavated for the DSI (EP Risk 2022), twelve (12) were only excavated to a target depth of 2 mBGL or prior refusal, while the remaining five (5) were excavated to refusal on bedrock.

The depths to natural material will be confirmed during the additional investigation.

8.2.2 Area 2 – RSW and HW

Area 2 as shown in **Figure 2 – Contamination Areas** is shown in the DSI (EP Risk 2022) and SCA (EP Risk 2021) to contain some locations of elevated OCPs, lead, nickel and Benzo(a)Pyrene (B(a)P) concentrations within FILL material exceeding the CT1 criteria for General Solid Waste (GSW), and one (1) exceedance of the CT2 criteria for RSW. These areas should be treated in their respective levels of classification to the nearest delineation borehole where elevated concentrations of CoPC were not detected. These hotspots are located in:

- TP01 – RSW – Western corner of the Site
- TP04 – HW – South-western side of the Site
- TP07 – HW – Southern corner of the Site

Accurate estimation of the volume of material within these contamination areas is impossible without further investigation of the Area. Further data points are therefore needed in this area. Additionally, TCLP data should be acquired of the contaminants (specifically lead, nickel and B(a)P) as this may reduce the waste classification of these hotspots.

The remainder of Area 2 is currently considered to be GSW, however this may change depending on the findings of further investigations, in which case additional hotspots may be identified.

8.2.3 ASBINS Area

It is shown in **Figure 2 – Soil Contamination Areas** that the area containing asbestos contamination within the soil, as identified in the SCA (EP Risk 2021a) is located along the north-eastern boundary of the Site. An addition to the FILL material within this area being classified as Hazardous Waste, the section containing ASBINS should be treated as **Special Waste – Asbestos**, from the area where the asbestos was observed to the nearest delineation point, i.e., the nearest borehole where ACM was not observed.

Additionally, any suspected ACM observed during future Site works should be analysed for the presence of asbestos and, if shown to contain asbestos, the area should be treated as **Special Waste – Asbestos** in addition to any other waste classifications the area may contain, to the nearest delineation borehole where asbestos was not observed.

8.3 Remedial Options and Appraisal

Remediation and/or management of the impacted soil is required so that the Site does not pose an unacceptable risk to human and ecological health with respect to the proposed commercial/industrial land use. Remedial options that may achieve the remedial objectives for the Proposed Development are listed in the following order in Section 6 (16) of Schedules A and B of the ASC NEPM 2013:

- *On-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level; and*
- *Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site; or*

If the above are not practicable:

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

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

In order to determine the optimal remediation strategy in accordance with the hierarchy above, the following remedial options that may achieve the remedial objectives include:

- Do nothing.
- On-site treatment utilising in-situ stabilisation / immobilisation.
- On-site treatment to reduce leachability and off-site disposal to a licensed disposal facility.
- Source removal (soil) for disposal off-site to a licensed disposal facility and/or ex-situ treatment.
- Isolation on site by engineered barrier containment.
- Pump and treat (groundwater only).

A summary of these options, including an assessment of the advantages and disadvantages and overall feasibility in relation to the Proposed Development is present in **Table 9.**

Table 9 – Preliminary Remedial Options Appraisal

Possible Outcome	Option	Targeted Media	Strategy	Advantages	Disadvantages	Project Feasibility
Remediation Requirement: Lead in soil material in Area 1						
Concentrations of Lead in FILL material are shown to be **Above** the HILs (**confirmed**).	Do Nothing	Soil	No action.	No remediation costs. Created minimal disturbance to Site. Retains material on-site. No risk of exposure to remediation workers.	Contamination remains on-site. Ongoing long-term management required.	Not feasible as the excavation of the soil is required for the planned development work.
	Isolation / segregation	Soil	Installation of impermeable barrier to prevent exposure to contaminated material.	May partially remove the need for remediation. Minimises risk of exposure to future Site users.	Contamination remains on-site. Does not address contaminant leaching. LTEMP required	May be feasible for material below the level of the planned basement excavation. Not feasible for material above planned excavation level.
	On-site treatment and reuse	Soil	Soil treatment trials followed by immobilisation of CoPC to prevent leaching.	Retains material on-site.	Costly. Involves disturbance of the soil.	May be necessary for the material remaining on-site below the level of the basement excavation to prevent leaching of CoPC off-site.
	On-site treatment off-site disposal	Soil	Soil treatment trials followed by immobilisation of CoPC to prevent leaching and removal off-site to a suitably licensed waste facility.	Will likely reduce waste classification and thereby reduce cost of off-site disposal.	Costly. Involves disturbance of the soil.	Cost of disposing of untreated Hazardous Waste may be extremely high, therefore the cost of on-site remediation may be offset. Would remove asbestos containing hotspot along with soil.

Table 9 – Preliminary Remedial Options Appraisal

Possible Outcome	Option	Targeted Media	Strategy	Advantages	Disadvantages	Project Feasibility
	Source removal without treatment	Soil	Excavate and remove material to levels necessary for construction.	Removal of risk of exposure to hazardous waste.	High cost of disposal of Hazardous Waste.	May be most cost effective depending on the cost of on-site remediation vs cost of removing untreated Hazardous Waste.
Remediation Requirement: CoPC Concentration in Area 2						
Concentrations of CoPC in previously inaccessible areas above the relevant HILs/HSLs (OCPs and potential other unexpected finds during additional assessment).	Do Nothing	Soil	No action.	Retains material on-site. No risk of exposure to remediation workers.	Contamination remains on-site. Ongoing management required.	Not feasible for shallow soil due to planned basement excavation.
	On-site treatment and off-site disposal	Soil	Immobilisation of CoPC to prevent leaching and disposal as GSW.	May reduce the cost of disposal. Removes RSW from Site.	Costly. Involves disturbance of the soil.	Cost saving of disposing of GSW may offset the cost of on-site remediation. Most feasible option.
	Source removal	Soil	Removal of soil off-site.	Removes RSW from Site. Less risk of exposure to remediation workers.	Costly. Involves disturbance of the soil.	Less feasible than on-site remediation, as likely to be more costly.

Table 9 – Preliminary Remedial Options Appraisal

Possible Outcome	Option	Targeted Media	Strategy	Advantages	Disadvantages	Project Feasibility
Remediation Requirement: Groundwater Contamination						
CoPCs are shown to be **present in groundwater** at significant concentrations**.**	Do nothing	Groundwater	No action.	Little to no remediation cost.	May result in a contamination plume which affects the local human health and environment.	Not feasible as this could cause widespread damage to human health and the environment.
	Monitoring Natural Attenuation (MNA)	Groundwater	Process of biological breakdown and natural dilution processes	Cheaper than pump and treat	Does not remove contamination. Biological breakdown unlikely to occur for lead.	Feasible at lower concentrations if source of contamination has been removed.
	Pump and treat	Groundwater	Physically remove impacted groundwater for ex-situ treatment.	Effectively removes groundwater exposure pathways. Dewatering may already be required for basement excavation works.	Contaminants may remain in-situ if absorbed into soils.	Feasible if undertaken in conjunction with remediation or removal of contamination source.

8.4 Preferred Remedial Strategies

The preferred remedial strategies selected must be the most cost-effective solutions, which does not bring about unacceptable long-term liabilities, and which does not impose unreasonable constraints on future Site developments. The strategy must also be capable of achieving the technical, environmental, sustainable and economic objectives of the overall project.

8.4.1 Area 1

In view of the remedial options appraisal (**Table 9**), the most favourable remedial strategies for the various outcomes of the future Site investigations for Area 1 are listed below.

If concentration of lead is above the relevant HIL criteria in natural soil

Isolation of the natural soil involving the installation of an impermeable barrier to prevent the exposure of natural soil to contaminated material would be the most cost effective and would be addressed regardless of the contamination due to the planned works on-site involving the excavation of fill material to a proposed depth of 1.0 m BGL. This would have minimal effect on natural soil, and the remainder of the natural material would be confined beneath the basement slab.

In the event that a deeper excavation is required as part of the development works, isolation will not be sufficient as the natural soil will be required to be removed. This may include the installation of the building footings. In this case, either source removal or on-site treatment and removal will be required. The option that would be most cost-effective is dependent on the volume of soil excavated.

If concentration of lead is below the relevant HIL criteria in natural soil

Isolation of the natural soil will take place regardless of the concentration of lead due to the nature of the development, however if the concentration of lead is below the CT1 criteria then off-site disposal can be achieved cost effectively in the event that deeper excavation is required.

Lead in FILL material

On-site treatment followed by off-site disposal is the preferred remediation option for the FILL material in Area 1. In its present state, off-site disposal may be prohibitively expensive due to its classification as Hazardous Waste, however, remediation measures to prevent the possibility of leaching may immobilise the lead within the soil, thereby reducing this classification. This would result in a decrease in the cost of off-site disposal. Soil treatment trials should be undertaken to determine the best method of immobilisation and the method that most effectively reduces the leachability of the lead should be enacted.

On-site reuse is not a feasible option because of the planned basement excavation works to be undertaken as part of the development.

8.4.2 Area 2

In view of the remedial options appraisal (**Table 9**), the most favourable remedial strategies for the various possible outcomes of the future Site investigations for Area 2 are listed below.

If concentration of CoPC in previously inaccessible areas is shown to be below HIL/HSL criteria

No action needs to be taken for the soil in the areas classified as General Solid Waste, however it is required as part of the planned development that up to 1m of soil be removed from the entire Site, and therefore the removal of this soil under the waste classification guidelines is the most practical option.

The areas classified as Restricted Solid Waste should be adequately delineated with further sampling and removed to a suitably licensed waste facility that is capable of accepting Restricted Solid Waste.

If concentration of CoPC in previously inaccessible areas is shown to be above HIL/HSL criteria

Excavation, offsite disposal and validation would be the preferred methodology to deal with any soil contamination within Fill materials in Area 2.

8.4.3 Asbestos in Soil

The presence of ACM within the FILL material has been confirmed in the SCA (EP Risk 2021), as shown in **Figure 2**. In view of the remedial options appraisal (**Table 9**), the most favourable remedial strategy for the ASBINS is source removal as Special Waste (Asbestos). This must be undertaken for all soil within the delineated ASBINS area, which extends to the closest borehole in which asbestos was not observed or additional validation samples. The FILL material within this area must be classified as Special Waste (Asbestos) in addition to Hazardous Waste due to the high lead concentration.

If asbestos is observed during future works

Likewise, if any asbestos is observed during future works, the area from which the ACM is identified should be delineated both vertically and horizontally, extending from the source borehole to the nearest 'clean' boreholes or validation sampling points (with regards to asbestos). The soil within this delineated area should be treated as Special Waste (asbestos) in addition to any other waste classification the soil may have.

Whether the delineated ASBINS is required to be removed is dependent on the depth of the ASBINS and the concentration. ACM located below the planned basement excavation works may not be required to be excavated as the installation of the basement will suitably encapsulate the ACM. Otherwise, the delineated ASBINS should be removed as Special Waste (Asbestos). LTEMP might be required depending on the ASBIN concentrations.

8.4.4 Groundwater Contamination

If future Site investigation works show CoPCs are present in groundwater at significant concentrations, in view of the remedial options appraisal (**Table 9**), the most favourable remedial strategy for the Site groundwater is Monitoring Natural Attenuation, which involves the ongoing monitoring of biological breakdown (not the case for heavy metals) and dilution, sorption and/or precipitation processes of contamination within the groundwater. A Human Health Ecological Risk Assessment (HHERA) could be undertaken for the contaminated groundwater (if any) in combination with ongoing groundwater monitoring events with the aim to achieve favourable trends in concentrations.

Effectiveness of the MNA process has to be proved by showing the decreasing concentrations (long term monitoring data is required) of contaminants in the local environment, and is considerably more cost effective than a pump and treat solution, which may prove to be unnecessary.

9 Remediation Strategy Scope

The scope of work associated with the preferred remedial strategy can be broken down into the following stages, which are detailed in sections 10.1 to:

1. Assigning roles and responsibilities.
2. Preparation of WHS documents, construction environment management plan (CEMP) regulatory approval, licensing and notifications.
3. Site establishment.
4. Further Site investigation:
    a) Targeted sampling of Area 1 for concentration and leachability of lead in FILL material and natural soil.
    b) Targeted sampling of previously inaccessible areas within Area 2 for a range of CoPC.
    c) Delineation of areas of elevated CoPC.
    d) Installation of Groundwater Monitoring Wells and groundwater monitoring and sampling throughout the Site, including in Area 1.
    e) Monitoring of groundwater depth and hydraulic conductivity over time.
    f) Soil Treatment Trials to measure the immobilisation potential of CoPC, in particular lead, in soil.
5. Review of Framework RAP and preparation of Detailed RAP.
6. Remediation and associated tasks, which may involve (depending on the findings of the future Site investigations):
    a) Segregation of ASBINS within Area 1 and disposal off-site as Special Waste (Asbestos) within a Hazardous Waste Soil Matrix (non-putrescible).
    b) Asbestos Air Monitoring
    c) Excavation and segregation of remaining hotspots from a waste classification perspective.
    d) On-site immobilisation treatment of RSW and HW.
    e) Further waste classification and off-site removal and disposal.
    f) Excavation of remainder of the soil within the planned basement development as General Solid Waste.
    g) Monitoring Natural Attenuation (MNA) of CoPC within groundwater monitoring wells.
7. Validation of Site, including for ASS in accordance with the ASSMP and provision of a validation report for Site Auditor review.
8. Long term Management Plan and/or Contingency Plan (if required).

9.1 Assigning Roles and Responsibilities

For the purposes of the remedial work the roles and responsibilities are presented in **Table 10**.

Table 10 – Roles and Responsibilities

Role	Party	Responsibilities
Principal/Owner	Alexandria Property Development c/- Johnstaff	To engage the consultants, Site Auditor and contractors.
Project Management	Alexandria Property Development c/- Johnstaff	Undertake all stakeholder management.
NSW EPA Accredited Site Auditor	Rod Harwood, Harwood Environmental Consultants	Approve remediation approach. Review and comment on remediation approach, validation reports and other relevant documents. Oversee the design, installation, CQC, CQA and post-construction validation testing processes and review associated data.
Validation Consultant	EP Risk	Oversee further Site investigation. Oversee implementation of Detailed RAP. In-situ waste classification sampling of fill material required for off-site disposal (if required) Assess unexpected findings. Perform validation sampling and inspections. To prepare a validation report.
Remediation Contractor with Class B Asbestos Removal License	TBC[6]	To carry out the excavation, remediation and off-site disposal work in accordance with the Detailed RAP.
Building Contractor	TBC	Piling works and installation of the concrete slab.

9.2 Preparation of Management Plans, Regulatory Approvals and Licensing

Safety and environmental management documentation must be finalised with staff and any other relevant stakeholders. The likely documentation required includes:

- All regulatory and landowner approvals and notifications.
- Up to date insurance certificates.
- WHS documentation detailing safe work methods to be adhered to during civil works. Emergency response procedures should also be included.
- Construction environmental management plan (CEMP) detailing how the environment will be protected during the civil works.

An initial summary of environmental and safety management requirements is provided as **Section 11** and **Section 13** respectively.

[6] To be confirmed.

9.3 Site Establishment

Following approval of all the required documentation and notification to SafeWork, the contractor can mobilise all plant, equipment and amenities as required to complete the remedial works.

All safety and environmental controls are to be implemented at the first stage of remediation works. These controls include:

- Community consultation
- Demarcation of remediation areas and creation of required exclusion zones
- Site signage and contact numbers; and
- Dust suppression and controls

9.4 Further Site Investigation

9.4.1 Targeted Sampling of Area 1

Sampling of Area 1 will involve the drilling of 20 boreholes within Area 1 and sample collection at a range of depths for Lead concentration, lead TCLP and lead Australian Standard Leaching Procedure (ASLP). These samples will be collected from both FILL material and natural soil to compare the differences between the two strata (refer to **Figure 3 – SCA, DSI and Proposed Sampling Locations**).

9.4.2 Targeted Sampling of previously inaccessible areas within Area 2

Sampling of Area 2 within areas that were previously inaccessible with a drill rig due to space constraints will take place in conjunction with the targeted sampling of Area 1. The samples collected from Area 2 will be analysed for a range of CoPC, with TCLP testing as needed. A final in-situ waste classification will be prepared for the Site showing the classification of all material to be excavated within the Site will be prepared.

9.4.3 Delineation of areas showing elevated levels of CoPC

The areas where the concentration of CoPC exceeds the relevant HILs by over 250% should be delineated to the nearest borehole or validation sample which shows the CoPC reduced to within levels below the relevant HIL. Likewise, the ASBINS should be delineated to the nearest borehole or validation sample where asbestos has not been identified. As no soil within the Site is accessible, delineation can be undertaken using marking paint, and access will not be required to be restricted to these delineated areas until the commencement of the remediation and construction works, or until the cement slab has been removed.

9.4.4 Groundwater Monitoring and Sampling

Three (3) groundwater monitoring wells will be installed within the Site in addition to the four (4) existing groundwater monitoring wells. The proposed locations of the well are shown in **Figure 3 – SCA, DSI and Proposed Sampling Locations**, however, the existing groundwater wells will be surveyed and groundwater flow direction will be obtained prior to the installation of the wells to confirm the ideal locations for the additional wells. The installation will be undertaken as per the *Minimum Construction Requirements for Water Bores in Australia (4th Edition),* 2020. Following this, a groundwater monitoring event will be conducted within all seven (7) wells whereby the groundwater will be sampled and analysed for a range of CoPC. A decision can then be made if offsite groundwater assessment and duty to report is warranted.

9.4.5 Monitoring of groundwater depth and hydraulic conductivity

Following the installation of the groundwater monitoring wells, ongoing monitoring of groundwater depth and hydraulic conductivity over time will be conducted. Records of the maximum and average groundwater depth will be highly relevant to the Detailed RAP as it will affect the level of exposure of groundwater to contaminants in the FILL material.

9.4.6 Soil Treatment Trials

Soil treatment trials will be undertaken which will determine the capability of different immobilisation techniques to lower the leachability of lead and other CoPC. Following the soil treatment trials, a specific immobilisation approval will be submitted for approval to the NSW EPA for the application of the relevant immobilisation methodology. By immobilising the contaminants in soil, the waste classification may be able to be reduced, thereby saving disposal costs.

The specific immobilisation strategy to be employed will be dependent on the results of the soil treatment trials. Following these trials, a detailed immobilisation plan will be prepared, and the immobilisation strategy will be sent to the NSW EPA for approval. The approved immobilisation techniques will be applied to the soil prior to the material being disposed of off-site.

9.5 Review of Framework RAP

Once the further Site investigations have been completed, the Framework RAP can be reviewed, and a Detailed RAP can be prepared based on the Framework RAP. The Detailed RAP will review the options outlined in **Section 8** and select the most suitable option for the outcomes of the investigation. The remediation works will be undertaken based on the Detailed RAP.

9.6 Remedial Works

9.6.1 Segregation of ASBINS

The ASBINS within the Site should be excavated and segregated from the remaining soil material. Currently, the ASBINS is within an area of Hazardous Waste. The ASBINS should therefore be classified as **Special Waste (Asbestos) within a Hazardous Waste soil matrix (non-putrescible)**, unless further waste classifications are undertaken on the material. The segregated ASBINS can then be removed to a suitably licensed waste facility, capable of accepting waste of this classification.

If any other areas of ASBINS are identified, the material should be classified accordingly.

9.6.2 Asbestos airborne fibre monitoring

For the duration of the ASBINS excavation works, control asbestos fibre air monitoring will be undertaken around the perimeter of the site (and / or specific remediation areas). Control monitoring is air monitoring using static or positional samples to measure the levels of airborne asbestos fibres in the work area and assists in assessing the effectiveness of implemented control measures.

9.6.3 Excavation and segregation of remaining RSW / HW

Once the ASBINS is removed according to its appropriate waste classification, the remaining RSW and HW within Area 1 and in hotspots identified in Area 2 should be excavated and segregated from the GSW. This should be undertaken in a manner that prevents mixing with the identified GSW as far as reasonably practicable and validated in accordance with **Section 10.**

9.6.4 On-site immobilisation treatment of RSW / HW

The immobilisation treatment of the RSW / HW will be undertaken. The results of the Soil Treatment Trials will be used to inform the best course of action to reduce the leachability of the contamination within the soil. This methodology will be applied to all soil classified as RSW or HW. More detail on the methodology and Site Specific Immobilisation application will be provided in the Detailed RAP.

9.6.5 Further waste classification of RSW / HW and removal

Following the immobilisation works undertaken on the segregated RSW / HW, validation and waste classification will be undertaken on the material so as to reclassify, if possible. Achieving this will reduce the cost of off-site removal and disposal. These works will be undertaken in accordance with the Specific Immobilisation Approval.

Following the results of the waste classification, the soil can be removed from Site and disposed of at a suitably licensed waste facility.

9.6.6 Excavation of the remaining soil

After removal and disposal of the previously classified RSW and HW, the remaining soil (GSW) can be removed and disposed of at a suitably licensed waste facility under standard construction / excavation / demolition conditions. The excavation of the Site to the basement level is understood to involve the removal of 1.0 m of soil from the entire Site. In addition to all relevant legislation, codes and standards for excavation works, this should be undertaken in accordance with:

- The ASSMP; and
- The Unexpected Finds Protocol (**Section 11**).

9.6.7 Monitoring natural attenuation

At the conclusion of the remedial works, the monitoring of the natural attenuation of the CoPC within groundwater should be undertaken. This will involve repeated and consistent groundwater monitoring events within the existing monitoring wells and wells to be established.

9.7 Site Validation

At the completion of the remedial works a Validation Report should be prepared in accordance with the requirements of the NSW EPA (2020) *Consultants Reporting on Contaminated Land – Contaminated Land Guidelines*, including:

- A clear definition of the sampling and analysis completed.
- A clear definition of the contamination assessment criteria.
- Figures displaying sampling locations.
- Analytical summary tables comparing results to assessment criteria.
- Field records (e.g. sampling logs, field instrument calibration records and photographs).
- Chain of custody documentation and laboratory analytical reports.
- An assessment of data reliability.
- A discussion of the field observations and analytical results.
- Recommendations for any changes to future monitoring scope or procedures.

The validation plan should account for the known and potential contaminants and for ASS, in accordance with the ASSMP.

A detailed summary of required validation sampling is outlined within **Section 10** of this report.

9.8 Contingency Plan

The following contingences presented in **Table 11** should be considered for unexpected finds and issues:

Table 11 – Remediation Contingency Plan

Anticipated Issues	Actions
Surplus fill material requiring off-site disposal	Any materials to be disposed of off-Site must be classified in accordance with the NSW EPA Waste Classification Guidelines 2014 and the Specific Immobilisation Approval, for off-site disposal to a waste management facility lawfully permitted to accept the materials.
Additional contamination sources including other co-contaminants that have not previously been identified.	Undertake characterisation sampling to determine suitability to retain on-site or off-site disposal in accordance with the UFP.
Contaminated soil is found to have migrated off-Site beyond the work area.	Excavate to the extent practicable. Undertake additional delineation of soil impact outside the work area (subject to approval from off-Site land owners if required). Should impacted soil be detected off-site due to leaching of contaminants originating from the Site then a health and/or ecological risk assessment, remediation and/ or on-going management may be required.
Criteria failure of imported material	Where material to be imported onto Site does not meet criteria outlined within **Section 10,** material should not be imported. Alternative material must be sourced that meets importation requirements.
Heavy rain or flooding	Construct sediment and surface water controls prior to commencing works. Prepare Dewatering Management Plan for the Site prior to commencing demolition / remediation / construction works.
Failure of management practices	Investigation into root cause and update management practices accordingly.
Emissions complaints (noise, odour, vibration, dust, etc.)	Monitoring of emissions during works. Use water sprays to suppress the dust or stop site activities generating the noise, odour, vibration, dust, etc until it abates.
Changes in future land use for the Site	Should the proposed land use change then the RAP should be revised to ensure that the adopted remedial option is suitable for the intended use.
Unexpected Finds	Implementation of an unexpected finds protocol (UFP). EP Risk's unexpected finds protocol is contained in **Appendix A**.

10 Validation Plan

Validation is required to demonstrate that remedial measures described in the RAP have been successful and that the Site is suitable for the intended land use.

Once the excavation, remediation and removal of the FILL (and if necessary, natural) material has been undertaken and the surface is now at the desired elevation for the commencement of the construction works, sampling of the remaining surficial material is required to assess the residual contamination levels within the Site.

Visual inspection of the final concrete layer is required in conjunction with physical validation (sampling) of imported materials. Sampling of imported materials is required for any material imported to Site throughout the remediation process and to the point that the Site validation report is prepared.

10.1 Validation Assessment Criteria

In order to develop appropriate validation assessment criteria (VAC) to address the objectives of the remediation, consideration was given to the latest screening criteria made available or approved by NSW EPA.

Tier 1 Site assessment criteria will be adopted as the VAC for CoPC defined within **Table 13 – Validation requirements**. VAC is outlined as follows:

Soil Validation Criteria

For the purposes of assessing the results of analytical testing of soils at the Site, the following guidelines are to be considered:

- NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (Third Edition); and
- ASC NEPM (2013) Schedule B1.

Soil concentrations will be compared against soil investigation levels (SILs) for commercial / industrial land-use settings.

Imported materials

Should soil material be required to be imported through the remediation and construction process, material imported as general fill must meet the requirements of VENM / ENM, or material classified under a suitable resource recovery order or exemption.

Groundwater Validation Criteria

For the purposes of assessing the results of analytical testing of groundwater at the Site, the following guidelines are to be considered:

- GILs as per ASC NEPM (2013) Schedule B1.
- Site specific groundwater criteria can be derived through a human health ecological risk assessment.

Soil concentrations will be compared against GILs for marine water settings.

10.2 Data Quality Objectives

To assess whether an appropriate validation sampling strategy was adopted, EP Risk adopted the data quality objectives (DQOs) planning process as:

- Recommended in the ASC NEPM 2013.
- Required within the NSW EPA Site Auditor Guidelines (2017).

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the validation process.

DQO's have been broadly established for the validation with regards to the seven-step process outlined within the NEPM:

- State the Problem;
- Identify the decisions / goals of the study;
- Identify inputs to the decision;
- Define the study boundary;
- Develop the decision rule;
- Specify performance / acceptance criteria; and
- Optimise the design for obtaining data.

10.3 State the Problem

The Site is proposed to be redeveloped for commercial / industrial land use, development of which will include the excavation of CoPC impacted soil and some ASBINS as Special Waste (Asbestos).

The data gaps identified in **Section 6.2** should be filled and validation is required to demonstrate the remediation is successful and the Site is suitable for the proposed land use and described within **Section 3** of this report**.**

To fill the identified data gaps, the following works should be undertaken:

- Drilling of four (4) further boreholes within areas previously deemed inaccessible for analysis of a broad suite of contaminants by a NATA accredited laboratory;
- Drilling of twenty (20) further boreholes within the area of the Site with significantly elevated lead concentrations for the analysis of lead concentration, lead TCLP and lead ASLP by a NATA accredited laboratory;
- Analysis of lead immobilisation potential in areas of elevated lead concentration;
- Installation of further groundwater monitoring wells in areas of high lead concentration for analysis of lead in groundwater by a NATA accredited laboratory;
- Groundwater monitoring event within all Site wells for groundwater depth and hydraulic conductivity;
- Observations for asbestos in soil within all boreholes;
- Observation for visual signs of ASS and analysis for ASS as per the Acid Sulfate Soil Management Plan.

10.4 Identify the Decision

To satisfy the requirements of the RAP, the following decisions need to be addressed:

- Will the adopted remediation strategy meet the adopted validation criteria?
- Is there a requirement for ongoing long-term management following remediation?

10.5 Identify Inputs into the Decision

The inputs required to make the decision include the following:

- Visual confirmation of the surface of the Site at the conclusion of the basement development, including site observations, inspections, survey information, as-built drawings and waste / import registers.
- Validation sampling results.

10.6 Define the Boundaries of the Study

The remediation and validation will be confined to the Site boundaries as outlined within **Section 3** and shown within **Figure 1.** The remediation works and validation assessment will be applicable at the time of the works and should be reviewed upon changes to the local environment, such as changed to the groundwater levels.

10.7 Develop a Decision Rule to Identify the Decision

The validation criteria for the contaminants of concern are presented in **Section 10**. These criteria have been adopted based upon the framework provided by the NSW EPA. These criteria have been used as screening levels to determine whether additional assessment is required. EP Risk considers these criteria are sufficiently conservative and have been adopted as the validation criteria. The following decision statements for analysis of the results were adopted with respect to the adopted criteria:

Soil Health-Based Remediation Criteria

I. Where the data sets are not sufficiently populated to allow calculation of the 95% upper confidence limit (UCL_{mean}) then the individual results must be less than the adopted criteria. If all the individual results are below the adopted criteria, then no additional assessment and/or management is required. Where individual results exceed that adopted criteria, then further assessment and/or management is required.

II. In accordance with the ASC NEPM 2013, where 95% UCL_{mean} of the average concentration for each soil analyte can be calculated, then the 95% UCL_{mean} must be below the adopted criteria; no single analyte concentration exceeds 250% of the adopted criteria; the standard deviation of the results must be less than 50% of the adopted criteria; and the normal distribution will only be used where the coefficient of variance is not greater than 1.2. Allowances to these decision rules apply where alternative 95% UCL methods that are not based on normal or log-normal distributions are adopted. Where 95% UCL_{mean} results exceed the aforementioned criteria, then further assessment and/or management is required.

Soil Ecological-Based Validation Criteria

Soil Ecological criteria are not considered applicable as the site will be completely covered by a concrete slab..

10.8 Specify Acceptable Limits of Decision Errors

The acceptable limits were as follows:

I. Individual or 95% UCL_{mean} concentrations to be below the adopted criteria or background concentrations.

II. 95% of the data must satisfy the data quality indicators (DQIs) which were determined for completeness, representativeness, precision and accuracy of both field and laboratory data. Therefore, the limit on the decision error was 5% that a conclusive statement may be incorrect.

III. A comprehensive QA/QC program was undertaken including representative sampling and sampling at an appropriate density for the purpose of the investigation.

The acceptable limit of error for sampling techniques and laboratory analysis was defined by the DQIs as follows:

Data Representativeness

Expresses the accuracy and precision with which sample data represents an environmental condition. Data representativeness was achieved by the collection of samples at an appropriate pattern and density as well as consistent and repeatable sampling techniques and procedures.

Completeness

Refers to, the percentage of data that can be considered valid data. Sufficient data was required to enable an assessment of the Decision Rules.

Comparability

A qualitative comparison of the confidence with which one data set can be compared to another. This was achieved through consistent sampling and analytical testing and reporting techniques.

Precision

A measure of the reproducibility of on measurements under a given set of conditions. The relative percent difference (RPD) has been adopted to assess the precision of data between duplicate sample pairs according to the following equation.

$$RPD\% = \frac{[\mathrm{Cp} - \mathrm{Cd}]}{\mathrm{Cp} + \mathrm{Cd}} \times 200$$

Where:
Cp = Primary sample
Cd = Duplicate Sample
An acceptance criterion of ±30% had been adopted for inorganic field duplicates and triplicates and ±50% for organic field duplicates and triplicates. However, it should be noted that exceedances of these criteria are common for heterogeneous soil or fill or for low analyte concentrations.

Accuracy

A measure of the bias in the analytical results and can often be attributed to: field contamination; insufficient preservation or sample preparation; or inappropriate analytical techniques. Accuracy of the analytical data is assessed by consideration of laboratory control samples and laboratory spikes.

Optimise the Design for Obtaining Data

A number of potentially contaminating activities, historical and current, have been undertaken at the Site associated with the operation of the Site as a chemical storage and blending facility. A systematic and targeted based validation sampling pattern is proposed based on a visual inspection and field screening of the Site. The adopted sampling approach is consistent with AS4482.1 (2005).

10.9 Data Quality Indicators

The DQOs, requirements and indicators for the assessment are presented in **Table 12**.

Table 12 – DQO, Requirements and Indicators

DQO	Requirement	DQI
Precision		
Standard operating procedures appropriate and complied with	The sampling methods comply with industry standards and guidelines	Meet requirement
Intra-laboratory duplicates	1 per 20 samples	RPDs < 50%
Inter-laboratory duplicates	1 per 20 samples	RPDs < 50%
Laboratory duplicates	Minimum of 1 per batch per analyte	RPDs < 50%
Accuracy		
Laboratory matrix spikes	1 per batch per volatile/semi-volatile analyte	Recoveries 50% to 150%
Laboratory surrogate spikes	1 per volatile/semi-volatile analyte sample (as appropriate)	Recoveries 70% to 130%
Laboratory control samples	At least 1 per batch per analyte tested for	Result < limit of reporting (LOR)
Representativeness		
Sampling methodology - preservation	Appropriate for the sample type and analytes	Meet requirement
Samples extracted and analysed within holding times	Specific to each analyte	Meet requirement
Field equipment calibration	All field equipment calibrated, and calibration records provided.	Meet requirement
Laboratory method blanks	At least 1 per batch per analyte tested for	Result < LOR
Trip blanks	1 per lab batch for volatile analytes	Result < LOR
Trip spikes	1 per lab batch for volatile analytes	Recoveries 60-100%
Rinsate	1 per lab batch for volatile analytes	Result < LOR
Comparability		
Sampling approach	Consistent for each sample	Meet requirement
Analysis methodology	Consistent methodology for each sample	Meet requirement
Handling conditions and sampler	Consistent for each sample	Meet requirement
Field observations and analytical	Field observations to support analytical results	Meet requirement
Consistent laboratory reporting limit	Consistent between primary and secondary laboratories	Meet requirement
Completeness		
Sampling staff	Consistent sampling staff used.	Meet requirement
Laboratory accreditation	National Association of Testing Authorities (NATA) Accredited laboratory for methods used	Meet requirement

Table 12 – DQO, Requirements and Indicators

DQO	Requirement	DQI
Accredited methods	NATA accredited methods used appropriate for each analyte.	Meet requirement
ASC NEPM 2013 lab methods	Lab methods consistent with the ASC NEPM 2013.	Meet requirement
Laboratory reporting limit	Laboratory reporting limit consistent and appropriate	Meet requirement
Consistent weather / field conditions	Consistent	Meet requirement
Chain of custody documentation	Appropriately completed	Meet requirement
Field sampling documentation	Appropriately completed	Meet requirement

10.10 Validation Sampling Works

The strategy to validate the remediation works will be undertaken according to requirements as outlined within **Table 13** below.

Table 13 – Validation requirements

Aspect	Sampling	Analysis	Observations and Documentation
Excavation			
Excavation Surface	Soil sampling density in accordance with the NSW EPA Sampling Design Guidelines (1995). Systematic sampling is recommended for site validation. Samples to be collected between 0-0.15m below the excavation surface. According to the Procedure A in EPA (1995): • EP Risk considers a 5m radius of the smallest hotspot acceptable • Size of the site is 3,000 m^2 • Sampling grid is 8.5m • 42 sampling points	Heavy metals, TRH, BTEX, PAH, OCP, PCB and asbestos. 10 L screening for visible bonded (non-friable) ACM 500 mL gravimetric asbestos sampling.	Results of the validation sampling must be included within the final validation report prepared for the Site.
Waste classification	All soil to be removed off-site that has not been classified as GSW and is to undergo remediation works should have a waste classification undertaken prior to off-site disposal. The number of samples required is based on the EPA Victoria Industrial Waste Resource Guidelines 702 – Soil Sampling (2009) and the Specific Immobilisation Approval.	Heavy metals, TRH, BTEX, PAH, OCP, PCB and asbestos.	Waste classification documentation requirements are outlined within **Table 15.**
ASS	As described in ASSMP, to be prepared.		
Validation of unexpected finds materials	A minimum of 3 samples is required for waste classification of materials requiring off-site disposal up to 75m^3 with one sample per 25 m^3 for volumes up to 250 m^3 Should UF material require off-site disposal, validation sampling of hotspot removal is required at the walls (1 per 5 linear metres) and base (5 m grid) of excavation. 200% sampling density is required for quantification of asbestos.	Analysis of CoPC dependant on unexpected find.	If an area of unexpected finds is deemed contaminated and required off-site disposal, the hotspot material is to be removed and validated by the Environmental consultant A validation report is to be prepared in accordance with the relevant guidelines outlined within **Section 11.7**
Imported Materials			

Table 13 – Validation requirements

Aspect	Sampling	Analysis	Observations and Documentation
Imported VENM / ENM	250 m^3 volume of material is anticipated to be required for landscaped areas. A total of 3 validation samples to verify ENM classification is required.	Heavy metals, TRH, BTEX, PAH, OCP, PCB and asbestos (500 mL). Additional analysis may be required dependant on source site. Additional sapling may be required for ENM suite.	Remediation contractor to supply existing ENM/ VENM documentation (report to be prepared in accordance with the NSW EPA waste classification reporting requirements). Material must be approved by validation consultant for importation to Site. Material is to be inspected prior to and upon importation to Site by the validation consultant to confirm material is free from visible / olfactory contamination. Where check sampling occurs by the validation consultant due to apparent deficiencies in existing VENM / ENM / documentation the following is required: - Date of sampling. - Description of material. - Estimated volume of material imported at time of sampling. - Sample location plan. - Analytical reports and tabulated results comparing to the VAC.
Imported engineering materials incl, road base materials, or material classified under a suitable resource recovery order or exemption..	At the validation consultant's discretion based on robustness of supplier documentation.	At the validation consultant's discretion based on robustness of supplier documentation.	Remediation contractor to provide documentation from supplier confirming the material is a product comprising only of natural quarried materials. Must be approved by the validation consultant. Review of quarry's EPL if applicable. Material is to be inspected prior to and upon importation to Site by the validation consultant to confirm material is free from visible / olfactory contamination. Where check sampling occurs by the validation consultant due to apparent deficiencies in existing VENM / ENM / documentation the following is required: - Date of sampling. - Description of material. - Estimated volume of material imported at time of sampling. - Sample location plan. - Analytical reports / tabulated results with comparison to the VAC.

Table 13 – Validation requirements

Aspect	Sampling	Analysis	Observations and Documentation
			Use of recycled aggregate is discouraged. Should recycled aggregate be imported for engineering purposes (at the discretion of the client) sampling and analytical testing for quantification of asbestos as per the NEPM guidelines will be required.

11 Unexpected Finds Protocol

The objective of the UFP is to provide clear guidance on the safe and appropriate actions in the event of encountering potential chemical or ordnance contamination during development works.

Where such material is uncovered the UFP prescribes the quarantining of the relevant area of concern (AOC), allowing other works to proceed unhindered, while the area of concern is assessed and, if necessary, remediated and validated.

The AOC may be identified by the Principal Contractor, Environmental Consultant or a site worker. The AOC will be quarantined by the Principal Contractor by means of some appropriate barrier to prevent access to the area. The quarantined area/s will be communicated with workers during the daily tool-box talks.

Two classes of potential contamination which may be discovered during excavation works include chemical and asbestos.

11.1 State the Problem

It is acknowledged previous investigations of the Site have been undertaken to assess CoPC. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during redevelopment. Bonded (non-friable) ACM has been previously identified at the Site, and further bonded (non-friable) asbestos has been identified within building materials at the Site, however further contamination, including hazardous material, not previously identified may exist within areas of fill not previously excavated. The nature of any residual hazards which may be present at the Site are generally detectable through visual or olfactory means, for example:

- Previously unidentified ACM in poor condition.
- Discoloured / odorous soils (visible and odorous).
- Drums / bottles / containers of chemicals (visible).
- Ash and/or slag contaminated soils / fill materials (visible).
- Petroleum contaminated soils (staining / odorous / discolouration visible).
- Volatile organic compound contaminated soils (odorous).
- Asphaltic concrete contaminated fill (visual).

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Appendix A** and detailed in the following sections is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use at the Site, will be posted in the site Office and referred to during the Site-Specific Induction by the Principal Contractor.

If the Principal Contractor considers material to be potential chemical contamination the area will be quarantined, and a suitably qualified Environmental Consultant will be contacted. The Environmental Consultant will be responsible for assessing the findings, taking samples to characterise and delineate the extent of the potential contamination and defining appropriate remedial actions.

Where contamination is identified within any AOC an Investigation Report will be prepared by the Environmental Consultant detailing how the impacts will be managed, validated and reported.

If the area is determined by the Environmental Consultant to not be contaminated or the analyses meet the relevant site criteria, the Environmental Consultant will notify the Principal Contractor that the quarantine

restrictions on the area can be lifted and the works in that area may resume. The Environmental Consultant will prepare a report on the investigation and the conclusions drawn.

11.2 Identify the Decision

Based on the decision-making process for assessing urban sites detailed in NSW EPA (2020), modified to meet the specific project objectives, the following decisions must be made during any unexpected find assessment:

- Are there any unacceptable risks to likely future on-site receptors from impacted soils during development?
- Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?
- Are there any impacts of chemical mixtures?
- Are there any aesthetic concerns in fill soils present at the Site?
- Is there any evidence of, or potential for, migration of contaminants off-site?
- Is the site-specific risk assessment required to be updated?
- Is a site management strategy required?

11.3 Identify Inputs to the Decision

Inputs to the decisions are:

- Environmental data as collected by sampling and analysis and site observations made during this investigation.
- Assessment criteria to be achieved on the site as based on the intended land use and project objectives, as defined by assessment criteria nominated in **Section 11.7.**
- Final site surface survey.
- Confirmation that data generated by sampling and analysis are of an acceptable quality to allow reliable comparison to assessment criteria as undertaken by assessment of quality assurance / quality control (QA/QC) as per the data quality indicators (DQIs) established.

11.4 Define the Study Boundaries

Each unexpected find identified and investigated and where required, remediated, will be surveyed (as required) to provide accurate boundaries.

11.5 Develop a Decision Rule

Laboratory analytical data will be assessed against adopted site criteria as identified in **Section 11.7.** The decision rules adopted to answer the decisions are summarised in **Table 14**.

Table 14 – Summary of Decision Rules

Site	Area and Aspect
1. Are there any unacceptable risks to likely future onsite receptors from impacted soils during development?	The nature and extent of soil impacts will be assessed, and soil analytical data will be compared against EPA endorsed criteria (health and ecological). Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions. The following statistical criteria will be adopted with respect to soils: Either: the reported concentrations are all below the site criteria; Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250% of the adopted site criterion; and the standard deviation of the results must be less than 50% of the site criteria. And: the 95% upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion. If the statistical criteria stated above are satisfied, and an assessment of risk indicates no unacceptable risks, the decision is No. Otherwise, the decision is Yes.
2. Are there any issues relating to the local area background soil concentrations that exceed relevant investigation criteria?	If the 95% UCL of natural soils exceeded calculated background concentrations (NEPC 2013), the decision is Yes. Otherwise the decision is No.
3. Are there any chemical mixtures	Are there more than one group of contaminants present which increase the risk of harm? If there is, the decision is Yes. Otherwise, the decision is No.
4. Are there any aesthetics issues in fill soils at the site?	If there are any unacceptable odours, anthropogenic materials or staining the answer to the decision is Yes. Otherwise, the answer to the decision is No.
5. Is there any evidence of, or potential for, migration of contaminants off-site?	Are contaminants present within natural soils at concentrations exceeding EPA endorsed criteria? If yes, the answer to the decision is Yes. Otherwise, the answer to the decision is No. And If groundwater analytical results exceed the NEPC 2013 criteria and the downgradient groundwater impacted, the decision is yes. Otherwise, the decision is No.
6. Is a site specific risk assessment required?	If the 95% UCLs of the COPC are detected above the adopted Site criteria, a Site Specific Risk Assessment may be required.
7. Is a site management strategy required?	Is the answer to any of the above decisions Yes? If yes, a site management strategy will be required to be developed. If no, a site management strategy is not required.

11.6 Optimise the Design for Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in EPA (1995), including judgemental, random, systematic and stratified sampling patterns. Random sampling is not considered appropriate for this Site. Based on the history of the Site a systematic sampling program is considered the most appropriate for any unexpected finds. Sampling locations should be placed systematically to assess each unexpected find.

Sampling methodology of unexpected finds should be in accordance with the ASC NEPM (2013) and NSW EPA (2014) for waste classification.

11.7 Assessment Criteria

For the purposes of assessing the results of any analytical testing of soils across the Site (if required), the following guidelines should be considered:

- NSW Department of Environment Protection Authority (2017), *Contaminated Land: Guidelines for the NSW Site Auditors Scheme* (3rd Edition) (NSW EPA, 2017).
- Western Australian (WA) Department of Health (DOH) (2021) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2021).[7]
- ASC NEPM (2013).
- NSW EPA (2020) *Consultants reporting on Contaminated land, Contaminated Land Guidelines* (NSW EPA, 2020).

Soil concentrations should be compared against the following SILs:

- **Health-based Criteria for the current land use**: ASC NEPM (2013) HILs for commercial / industrial land use. In accordance with the proposed development and the NEPM (Section 2.4.8), the HSL-D are applicable.
- **Management Limits**: ASC NEPM (2013) Management Limits for commercial / industrial land use (Management Limits).
- **Ecological Criteria for the current land use**: In the absence of site-specific data and biota study, generic ASC NEPM (2013) Ecological Screening Levels (ESLs) and Ecological Investigation Levels (EILS) for commercial / industrial land use were adopted.

[7] It should be noted that the updated 2021 guidelines are not yet endorsed by the NSW EPA / NEPM. The guidelines are considered in the context of the approved 2009 Western Australia Department of Health Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, and are considered to provide a more comprehensive review of asbestos contamination.

12 Site Management

A CEMP or similar environmental management document will be required prior to commencing the remedial works. The document will be provided by the construction contractor. A summary of the minimum environmental safeguards to be implemented during remediation works is provided in this section. These should be considered when preparing the final CEMP.

12.1 Remediation Schedule

The remediation schedule is anticipated be undertaken in the following succession:

1. Assigning roles and responsibilities.
2. Preparation of WHS documents, CEMP, regulatory approval, licensing and notifications.
3. Site establishment.
4. Remediation and associated tasks
    a) Asbestos Air Monitoring
    b) Additional in-situ waste classification sampling (if required)
    c) Excavation and Capping Works
    d) Importation of clean ENM/VENM or material classified under a suitable resource recovery order or exemption(if required).
5. Validation of AOCs and ASS prior to off-site disposal in accordance with the ASSMP (to be prepared).

12.2 Hours of Operation

Remediation works shall be undertaken as required during the following hours:

- Monday to Friday: 7:00 am to 5:00 pm.
- Saturday and Sunday: 8:00 am to 4:00pm.
- Public Holidays: No work expected.
- Emergency work is permitted to be completed outside of these hours.

12.3 Site Access

During remediation works, the works area will need to be secured around the perimeter of the remediation area which will restrict access to the Site. Only authorised persons will be able to enter the Site.

12.4 Imported Fill Materials

Prior to the importation of fill materials onto the Site the following must be undertaken:

- Material characterisation reports/certification showing the material being supplied is virgin excavated natural material (VENM) / excavated natural material (ENM) must be provided.
- Any imported VENM/ENM will need to be inspected at the source site and at the Site by a suitably qualified environmental consultant.
- Each truck entry will be visually checked and documented to confirm only approved materials consistent with the environmental approvals are allowed to enter the site. Only fully tarped loads

are to be accepted by the gatekeeper. Environmental assurance of imported fill material will be conducted to confirm the materials comply with NSW EPA Waste Classification Guidelines and the Earthworks Specification for the Site.

12.5 Material Tracking Procedure

The excavated soil will be subject to a strict waste segregation protocol (detailed in a CEMP) and tracked in a waste tracking spreadsheet.

If any materials from the basement excavation are proposed to be retained on-site the materials will need to meet the human health and environmental requirements specified in NEPM 2013.

All material handled during the construction of the proposed development will be tracked in accordance with the CEMP to be prepared by the Contractor. Materials are to be tracked from excavation, treatment (if required) to off-site disposal in accordance with all applicable standards. All waste removed from the Site will be tracked using the NSW EPA online waste tracking system and provided by the Contractor.

Information / documentation required for the waste classification, off-site disposal and importation of material is outlined in Table 15**.**

Table 15 – Material tracking documentation / information requirements

Material Tracking	Documentation / Information
Waste Classification	• Material source and description, • Sampling density, pattern, CoPCs, • Results summary, incl. appropriate table with comparison to acceptance criteria, • Waste classification.
Off-site disposal	• Source location, • Estimated volume (based on excavation size), • Actual volume of disposal, • Waste classification, • Transporter, • Final destination, POEO license, • Reconcile of waste dockets with actual disposal volume, • Reconciliation of actual disposal volume and the estimated volume of disposal (based on excavation size).
Importation of material	• Volume of imported material, • Source Site, • VENM certificate applicable for NSW EPA exemptions, • Placement location, • Transporter.

A Materials Tracking Plan (MTP) will be implemented during the development works. The aim of the MTP is to identify the source and destination of all materials on the Site at any time and requires the following tasks:

- Establish and maintain a nomenclature system for identification of all source and destination areas for soil both on and off the Site. This includes excavations, stockpiles (both clean and potentially contaminated), soils for treatment or disposal (including final destination) and off-site sources of material;
- Use appropriate signage to identify the classification of the material and area number for each excavation prior to soil movement using the project documentation or in consultation with the Contract Administrator, prior to work being undertaken;

- Complete a 'Record of Soil Movement' sheet identifying the source of the materials, classification, volume and destination area of each load of material moved on or off-site;
- Place the soil in an approved location for the material based on its soil classification;
- Maintain the location of the soil without mixing with other soil classes;
- Educate all operators in the requirements of the system; and
- Check 10% of waste dockets being supplied to ensure validity.

12.6 Stockpile Management

All stockpiles will be managed in accordance with the Contractors, CEMP, the ASSMP and with relevant standards and regulations. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.

Stockpiles shall be maintained to eliminate risk to workers and other people due to exposure to contaminants in dust and risk to the environment as a result of silt or contamination of stormwater in accordance with a Site Materials Management and Tracking Plan as part of the CEMP.

If assessment by the Environmental Consultant identifies contamination, or a stockpile is observed to be contaminated, then the Environmental Consultant will assess the stockpile in accordance with **Section 10** to delineate the contamination and assess the extent of remediation, if required. In the event the stockpile contains asbestos the stockpile will be covered to minimise dust and potential asbestos release.

In the event that covers are required, they shall extend beyond the perimeter of the stockpiles and shall be secured to prevent being blown away by wind.

Stockpiles must be placed in a secure location on-site and covered if to remain for more than 24 hours. Stockpiles will be placed at approved locations and located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in un-remediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).

12.7 Noise

All machinery and equipment used on-site will be in good working order and will be fitted with appropriate silencers when necessary and all equipment will be operated in an efficient manner.

12.8 Soil and Water Management

Details of the soil and water management procedures will be detailed in the contractor's CEMP, which will be prepared under a separate cover.

12.9 Disposal of Contaminated Soil

Soil within the excavation footprint need to be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines, and properly disposed of to a waste facility lawfully able to accept the waste.

12.10 Air Quality

Dust Control

Dust emissions should be confined within the Site boundary. The following dust control procedures will be employed to comply with this requirement as necessary:

- Erection of dust screens around the perimeter of the Site.
- Securely covering all loads entering or exiting the Site.
- Use of water sprays across the Site to suppress dust.
- Covering of all stockpiles of contaminated soil remaining on-site more than 72 hours.
- Keeping excavation and stockpile surfaces moist.

Odour Control

If significant odours are identified at the boundary of the Site, then appropriate actions will be taken to reduce the odours, which may include:

- Increasing the amount of covering of excavations/stockpiles;
- Mist sprays;
- Odour suppressants or maintenance of equipment;
- On-site air monitoring using a photoionisation detector (PID) to assess the concentration of volatile organic compounds (VOC) within the area.

In the event that VOC concentrations in ambient air exceedances, works must cease and a competent person engaged to further investigate the potential risk of vapour inhalation for workers and to make appropriate recommendations regarding the mitigation of the potential vapour inhalation risk (where necessary). This should include the sampling and analysis of VOCs in air to determine which compounds the workers have been exposed to. Consideration should be given to the use of a half face respirator fitted with a suitable organic vapour filter, should the workers note odours or experience symptoms such as headaches or dizziness.

Asbestos Air Monitoring

Asbestos fibre air monitoring should also be undertaken during ASBINS remedial works. Air monitoring should be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*. 2nd Edition [NOHSC: 3003 (2005)] and Australian Standard AS ISO/IEC 17025 – 2005, *General requirements for the competence of testing and calibration laboratories*.

Air monitoring reports will be issued in accordance with NATA's accreditation requirements and kept on file.

13 Work, Health and Safety

Health and Safety during the remediation works will be the responsibility of the contractor, including the preparation of a Health and Safety Plan and a hazard assessment.

13.1 Health and Safety Plan

A Work Health and Safety Plan (WHSP) will be prepared for the remedial works by the contractor. The purpose of the WHSP is to provide all relevant information to all Site personnel to ensure that they are aware of the hazards and the protective measures adopted to mitigate the identified hazards.

13.2 Hazard Assessment

All hazards associated with the remedial works should be identified by the contractors and incorporated into the WHSP.

13.3 Safe Work Practices

The WHSP will document all safe work practices required to protect personnel at the Site involved in the remedial works.

All workers undertaking remedial works on site are required to wear the following personal protective equipment:

- Disposable nitrile or cut resistant gloves, when in direct contact with the soil;
- Long pants;
- Long-sleeved shirt;
- Hard hat (when plant and machinery are in operation);
- High visibility fluorescent vest; and
- Steel-capped boots.

For workers working within the designated asbestos work zones the following PPE is also mandatory:

- Type 5 & 6 disposable coveralls;
- Half face respirator with P2 particulate filter or P2 disposable mask;
- Gloves; and
- Footwear that can be easily decontaminated (i.e. gumboots).

Respirators with appropriate organic vapour cartridges should be made available on site. As part of the WorkCover permitting process, additional PPE may be required in the event that friable asbestos is identified at the Site and will be upgraded to reflect WorkCover NSW requirements.

Further information regarding PPE to be worn at the Site should be outlined in the CEMP.

13.4 Contingency Plan for Site Incidents

Should Site operations or conditions results in an environmental or safety incident where the outlined health and safety requirements are not considered effective or have not adequately been followed, the following shall be implemented:

- Isolation of the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc) to prevent exposure to site personnel and/or off-site airborne dust migration;
- Appropriate PPE must be obtained / worn at all times;
- The Site Owner should be informed immediately; and
- Implementation of applicable procedures with respect to personnel and site management, or where appropriate the Unexpected Finds Protocol included in this RAP, and subsequent appropriate removal/management of the identified impacted material or reinstatement of appropriate PPE / safety practices.

Following this, a formal review of the incident by an appropriately qualified person appointed by the Site Owner with the objective of identifying the cause of the incident and providing recommendations on alternative procedures or systems to be implemented at the site and/or within the EMP to prevent/minimise the likelihood of the incident reoccurring.

Copies of all assessment of finds and actions to deal with the finds should be reported and copies held by the Site Occupier, Site Owner or any future landowners.

14 Conclusion

Alexandria Property Development c/- Johnstaff engaged EP Risk to prepare a Framework RAP for the Site located at 28-32 Bourke Road, Alexandria, NSW. The Framework RAP is required to address the findings of the SCA (EP Risk 2021) and DSI (EP Risk 2022), in which significant contamination was detected within FILL material below the existing concrete flooring.

The Site is proposed to be redeveloped into a commercial / industrial development, which presently comprises a ten (10) storey building and partially below-ground basement, which will extend 1 mBGL across the entire Site. Approximately 3,000 to 4,500 m^3 of soil is expected to be excavated as part of the development.

The purpose of the Framework RAP is to detail the preferred remedial strategies for multiple likely outcomes of the further Site investigations to be undertaken at a later date.

EP Risk identified several CoPC within FILL material at the Site in excess of the adopted HILs, including:

- Heavy metals, most notably Lead;
- Bonded (non-friable) asbestos;
- Benzo(a)Pyrene; and
- Heptachlor.

Concentrations of Lead are considered to pose a potential human health risk to current and future users / construction workers at the Site. Consequently, under the scope of the Framework RAP, EP Risk has reviewed all available remediation options applicable to the objectives stated within **Section 1.2**, with the preferred remediation strategy including:

- Assignment of roles and responsibilities.
- Preparation of WHS documentation, CEMP and Site establishment.
- Site establishment
- Further Site investigation:
    - Targeted sampling of Area 1 for concentration and leachability of lead in FILL material and natural soil.
    - Targeted sampling of previously inaccessible areas within Area 2 for a range of CoPC.
    - Installation of Groundwater Monitoring Wells and groundwater monitoring and sampling throughout the Site, including in Area 1.
    - Monitoring of groundwater depth and hydraulic conductivity over time.
    - Soil Treatment Trials to measure the immobilisation potential of CoPC, in particular lead, in soil including application with NSW EPA for a Specific Immobilisation Approval.
- Review of Framework RAP and preparation of Detailed RAP.
- Remediation and associated tasks, which may involve (depending on the findings of the future Site investigations):
    - Segregation of ASBINS within Area 1 and disposal off-site as Special Waste (Asbestos) – Hazardous Waste (non-putrescible).
    - Asbestos Air Monitoring.
    - Excavation and segregation of remaining hotspots.

- On-site immobilisation treatment of Lead contaminated soils above RSW and HW criteria.
- Further waste classification of waste (where required) and off-site removal and disposal.
- Excavation of remainder of the soil within the planned basement development as General Solid Waste.
- Monitoring Natural Attenuation (MNA) of CoPC within groundwater monitoring wells.

- Validation of Site, including for ASS in accordance with the ASSMP.
- Long term Environmental Management Plan and/or Contingency Plan (if required).

EP Risk considers implementation of the remediation strategy and subsequent validation works and associated activities outlined in the framework RAP can make the Site suitable for the proposed commercial / industrial land use.

Figures

EP RISK

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Framework Remediation Action Plan
28-32 Bourke Road, Alexandria, NSW, 2015

Figure 1 - Site Location and Boundary

Job No: EP2515
Date: 27/05/2022
Drawing Ref: EP2515.002 Fig. 1
Version No: v1

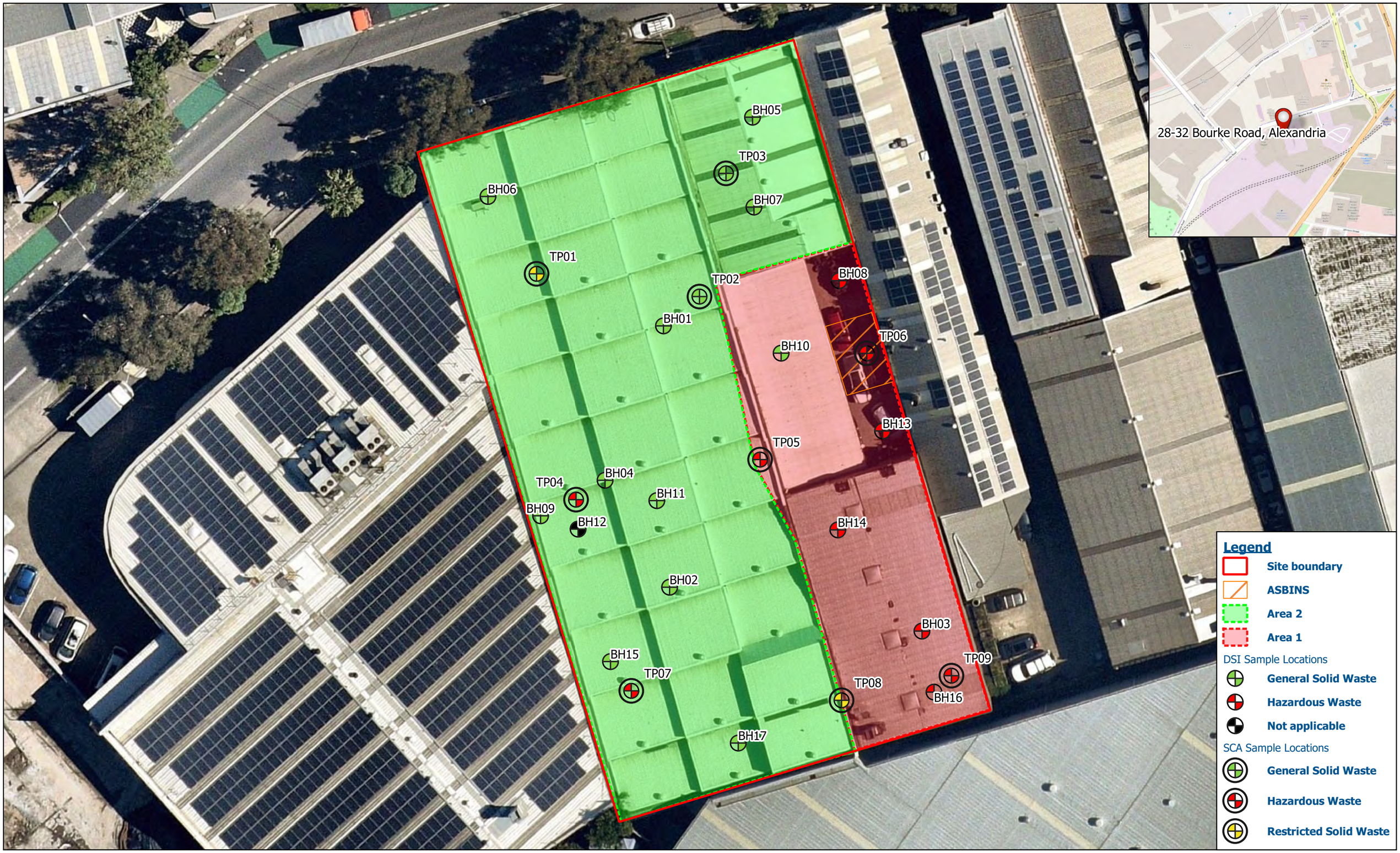
N

0 10 20 30 40 m

Approximate Scale Only

Coordinate System: WGS 84
Drawn by: HB Checked by: LM
Scale of regional map not shown
Source: Nearmap / OpenStreetMap

APPROVED COMPANY ISO 9001 Quality Management Systems
APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems
APPROVED COMPANY ISO 14001 Environmental Management Systems
QMS Certification Services QMS Certification Services QMS Certification Services



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Framework Remediation Action Plan
28-32 Bourke Road, Alexandria, NSW, 2015

Figure 2 - Contamination Areas

Job No: EP2515
Date: 09/06/2022
Drawing Ref: EP2515.002 Fig. 2
Version No: v1

N

0 6 12 18 24 m

Approximate Scale Only

Coordinate System: WGS 84
Drawn by: HB Checked by: AT
Scale of regional map not shown
Source: Nearmap / OpenStreetMap

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services
APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems QMS Certification Services
APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

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Framework Remediation Action Plan
28-32 Bourke Road, Alexandria, NSW

Figure 3 - SCA, DSI and Proposed Sample Locations

Job No: EP2515
Date: 27/05/2022
Drawing Ref: EP2515.002 Fig. 3
Version No: v1

N

0 6 12 18 24 m

Approximate Scale Only

Coordinate System: WGS 84
Drawn by: HB Checked by: LM
Scale of regional map not shown
Source: Nearmap / OpenStreetMap

APPROVED COMPANY ISO 9001 Quality Management Systems
APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems
APPROVED COMPANY ISO 14001 Environmental Management Systems
QMS Certification Services QMS Certification Services QMS Certification Services

Appendix A

UNEXPECTED FINDS PROTOCOL

Unexpected Finds Protocol (UFP)