



# **Remediation Action Plan**

Proposed Development at:  
79 Barrenjoey Road, Mona Vale, NSW 2103

February 2020

Report Distribution: Remediation Action Plan  
Address: 79 Barrenjoey Road, Mona Vale NSW 2103  
NEO Report No.: RAP - MV  
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## TABLE OF CONTENTS

|                                                                 |    |
|-----------------------------------------------------------------|----|
| EXECUTIVE SUMMARY .....                                         | 5  |
| 1. INTRODUCTION.....                                            | 7  |
| 1.1 BACKGROUND.....                                             | 7  |
| 1.2 PROPOSED DEVELOPMENT .....                                  | 8  |
| 1.3 REGULATORY FRAMEWORK.....                                   | 8  |
| 1.4 PROJECT OBJECTIVES .....                                    | 10 |
| 1.5 SCOPE OF WORKS .....                                        | 10 |
| 2. SITE INFORMATION.....                                        | 11 |
| 2.1 SITE IDENTIFICATION .....                                   | 11 |
| 2.2 SITE DESCRIPTION .....                                      | 12 |
| 2.3 SURROUNDING LAND USE.....                                   | 13 |
| 2.4 GEOLOGY .....                                               | 13 |
| 2.5 HYDROLOGY.....                                              | 13 |
| 2.6 ACID SULFATE SOILS.....                                     | 14 |
| 2.7 SURFACE WATER RECEPTORS.....                                | 15 |
| 3. PREVIOUS INVESTIGATIONS .....                                | 15 |
| 3.1 CONTAMINATION IDENTIFICATION.....                           | 17 |
| 3.1.1 AREA OF ENVIRONMENTAL CONCERN 1 - SOIL .....              | 17 |
| 3.1.2 AREA OF ENVIRONMENTAL CONCERN 2 - GROUNDWATER .....       | 19 |
| 3.1.3 AREA OF ENVIRONMENTAL CONCERN 3 - ACID SULFATE SOIL ..... | 20 |
| 3.1.4 AREA OF ENVIRONMENTAL CONCERN 4 – SOIL VAPOUR .....       | 21 |
| 4. REMEDIATION CRITERIA .....                                   | 21 |
| 5. CONCEPTUAL SITE MODEL .....                                  | 23 |
| 5.1 POTENTIAL CONTAMINATION.....                                | 23 |
| 5.2 CONTAMINATION SOURCES, EXPOSURE PATHWAYS & RECEPTORS.....   | 23 |
| 5.3 ADDRESSING DATA GAPS.....                                   | 25 |
| 6. REMEDIATION STRATEGY.....                                    | 26 |
| 6.1 REMEDIATION OBJECTIVE .....                                 | 26 |
| 6.2 NSW EPA HIERARCHY OF OPTIONS FOR SITE REMEDIATION .....     | 26 |
| 6.3 REMEDIATION OPTIONS.....                                    | 27 |
| 6.3.1 AVAILABLE REMEDIATION & MANAGEMENT STRATEGIES .....       | 27 |
| 6.3.2 EXCAVATION & OFF-SITE DISPOSAL .....                      | 27 |
| 6.3.3 TREATMENT.....                                            | 28 |
| 6.3.4 ON-SITE CAPPING .....                                     | 28 |
| 6.4 RATIONAL FOR SELECTION OF REMEDIATION STRATEGY .....        | 29 |
| 6.4.1 PREFERRED REMEDIATION STRATEGY .....                      | 30 |

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| 6.4.2 SUPERVISION .....                                                 | 31 |
| 7. REMEDIAITON GOALS .....                                              | 32 |
| 7.1 STAGE ONE – SITE PREPARATION .....                                  | 32 |
| 7.2 STAGE TWO - REMEDIATION .....                                       | 33 |
| 7.3 STAGE THREE - VALIDATION .....                                      | 34 |
| 7.4 LICENSED LANDFILL FACILITY .....                                    | 34 |
| 7.5 GROUNDWATER & SURFACE WATER CONDITIONS .....                        | 35 |
| 8. DATA QUALITY OBJECTIVES .....                                        | 35 |
| 8.1 LIMITS OF DECISION ERROR .....                                      | 38 |
| 8.2 VALIDATION DATA .....                                               | 38 |
| 9. VALIDATION METHODOLOGY & SAMPLING PLAN .....                         | 38 |
| 9.1 SOIL VALIDATION METHODOLOGY .....                                   | 38 |
| 9.2 HOTSPOT EXCAVATIONS .....                                           | 39 |
| 9.3 STOCKPILE SAMPLING .....                                            | 40 |
| 9.4 LABORATORY QUALITY ASSURANCE & QUALITY CONTROL (QA/QC) .....        | 40 |
| 9.5 SOIL VALIDATION REPORTING .....                                     | 40 |
| 10. VALIDATION PROGRAM .....                                            | 41 |
| 10.1 CONTAMINATION REMEDIATION OF AREAS OF ENVIRONMENMTAL CONCERN ..... | 41 |
| 10.1.1 REMEDIAITON OF AEC 1 - SOIL .....                                | 41 |
| 10.1.2 REMEDIAITON OF AEC 2 - GROUNDWATER .....                         | 41 |
| 10.1.3 REMEDIAITON OF AEC 3 – ACID SULFATE SOIL .....                   | 42 |
| 10.1.4 REMEDIAITON OF AEC 4 – SOIL VAPOUR .....                         | 43 |
| 10.1 TEMPORARY STOCKPILE STAGING AREA VALIDATION .....                  | 45 |
| 10.2 IMPORTED SOIL MATERIAL VALIDATION .....                            | 45 |
| 10.3 DURATION OF REMEDIAITON & VALIDATION WORKS .....                   | 46 |
| 11. QUALTIY ASSURANCE / QUALITY CONTROL (QA/QC) .....                   | 46 |
| 11.1 LABORATORIES .....                                                 | 47 |
| 11.2 ACHEIVEMENT OF DATA QUALITY OBJECTIVE .....                        | 48 |
| 12. ENVIRONMENTAL MANAGEMENT PLAN .....                                 | 48 |
| 12.1 GENERAL .....                                                      | 49 |
| 12.2 SITE ACCESS .....                                                  | 49 |
| 12.3 WORKING HOURS .....                                                | 49 |
| 12.4 DEMOLITION & ASBESTOS MANAGEMENT .....                             | 49 |
| 12.5 STORMWATER & SOIL MANAGEMENT .....                                 | 50 |
| 12.6 TRAFFIC MANAGEMENT .....                                           | 50 |
| 12.7 DUST & ODOUR CONTROL .....                                         | 51 |
| 12.8 NOISE CONTROL .....                                                | 51 |

|                                                                                     |           |
|-------------------------------------------------------------------------------------|-----------|
| <b>12.9 WORK HEALTH &amp; SAFETY PLAN .....</b>                                     | <b>51</b> |
| <b>13. WASTE TRACKING &amp; DISPOSAL .....</b>                                      | <b>52</b> |
| <b>14. DUTIES OF ON-SITE ENVIRONMENTAL SCIENTIST .....</b>                          | <b>52</b> |
| <b>14.1 NON-COMPLIANCES .....</b>                                                   | <b>54</b> |
| <b>15. UNEXPECTED FINDS.....</b>                                                    | <b>54</b> |
| <b>16. CONTINGENCY MANAGEMENT .....</b>                                             | <b>55</b> |
| <b>16.1 UNDERGROUND STORAGE TANKS.....</b>                                          | <b>58</b> |
| <b>16.2 GROUNDWATER CONTINGENCY .....</b>                                           | <b>59</b> |
| <b>17. REGULATORY APPROVALS &amp; LICENCES.....</b>                                 | <b>59</b> |
| <b>17.1 DUTY TO REPORT .....</b>                                                    | <b>59</b> |
| <b>17.2 STATE OF THE ENVIRONMENT OPERATIONS (UPSS) REGULATION 2014 .....</b>        | <b>59</b> |
| <b>17.3 STATE ENVIRONMENTAL PLANNING POLICIES .....</b>                             | <b>59</b> |
| <b>17.4 NORTHERN BEACHES COUNCIL .....</b>                                          | <b>60</b> |
| <b>17.5 ASBESTOS REGULATIONS .....</b>                                              | <b>60</b> |
| <b>17.6 PROTECTION OF THE ENVIRONMENT OPERATIONS (WASTE) REGULAITONS 2005 .....</b> | <b>60</b> |
| <b>17.7 ADDITIONAL LICENSING .....</b>                                              | <b>61</b> |
| <b>18. CONCLUSION AND RECOMMENDATIONS .....</b>                                     | <b>62</b> |
| <b>19. REFERENCES .....</b>                                                         | <b>63</b> |
| <b>20. LIMITATIONS .....</b>                                                        | <b>65</b> |

## FIGURES

**Figure 1** Site Locality Plan

**Figure 2** Site Plan

**Figure 3** Soil Sampling Validation Locations (PB, 2012)

**Figure 4** Groundwater Monitoring Well Locations (PB, 2012)

## APPENDICES

**Appendix A** – Unexpected Finds Protocol

**Appendix B** – Photographic Log

## EXECUTIVE SUMMARY

NEO Consulting Pty Ltd (NEO) was engaged to conduct a Remediation Action Plan (RAP) on behalf of RCI Group (the client) for the property located at 79 Barrenjoey Road, Mona Vale, NSW 2103 (the site).

Previous available environmental investigations were prepared for the site under the following reports:

- Douglas Partners Pty Ltd, *Acid Sulfate Soil Management Plan, Proposed Mixed Use Development, 79 Barrenjoey Road, Mona Vale, Project 91501.01*, dated 4<sup>th</sup> April 2019;
- Parsons Brinckerhoff Australia Pty Ltd, *Environmental Management Plan, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale, NSW Site No. 22353*, dated July 2012; and
- GHD, *Site Audit Report, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale NSW (Site ID 22353)*, dated 3<sup>rd</sup> August 2012.

It is understood, on-site contamination has been reported to exist in the following forms;

- Hydrocarbons in residual on-site soils;
- Hydrocarbons in groundwater;
- Potential Acid Sulfate Soils (PASS); and
- Soil vapour.

The objectives of this RAP are to guide the sites remediation and validation process by providing a strategy and site operation outline for the following:

- Data gap closure to enable adequate site characterisation;
- Remediation of contaminated soil material and/or groundwater; and

- Validation of remediated areas to comply with applicable guideline criteria for the sites intended land use.

The current contamination status of on-site and off-site groundwater is not known and should be assessed in order to implement suitable remediation strategies (if required).

The EMP (PB, 2012) outlines suitable procedures for the management of hydrocarbon impacted soil and groundwater and must be followed in accordance with this RAP.

The ASSMP (DP, 2019) outlines suitable procedures for the management of ASS and must be followed in accordance with this RAP. Due to the high probability of ASS being disturbed during remedial works, the ASSMP recommends a supplementary ASS assessment to confirm on-site ASS conditions.

A Validation Report should be prepared for the site detailing the successful methodology of remediation and validation works to make the site suitable for its intended land use.

The property located at 79 Barrenjoey Road, Mona Vale, NSW 2103 (the site) can be made suitable for its intended land-use subject to implementing adequate remediation and validation works in accordance with this RAP.

## 1. INTRODUCTION

### 1.1 BACKGROUND

NEO Consulting Pty Ltd (NEO) was engaged to conduct a Remediation Action Plan (RAP) on behalf of RCI Group (the client) for the property located at 79 Barrenjoey Road, Mona Vale, NSW 2103 (the site).

As shown in **Figure 1**, the site is located approximately 24 km north/ north-west of the Sydney Central Business District, within the Local Government Area of Northern Beaches Council. The site covers an approximate area of 1,625m<sup>2</sup> and is identified as Lot A DP 405025 (refer to **Figure 2**).

This RAP report has been prepared to meet Condition 18b Contaminated Land Requirements for Development Application DA 2019/0479 and will outline the remediation procedures for the site to reduce the sites level of contamination to an acceptable standard for its intended redevelopment into a service station facility.

Previous available environmental investigations were prepared for the site under the following reports:

- Douglas Partners Pty Ltd, *Acid Sulfate Soil Management Plan, Proposed Mixed Use Development, 79 Barrenjoey Road, Mona Vale, Project 91501.01*, dated 4<sup>th</sup> April 2019;
- Parsons Brinckerhoff Australia Pty Ltd, *Environmental Management Plan, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale, NSW Site No. 22353*, dated July 2012; and
- GHD, *Site Audit Report, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale NSW (Site ID 22353)*, dated 3<sup>rd</sup> August 2012.

These documents should be read in conjunction with this report as they detail the presence of on-site contamination and appropriate remedial procedures in order to prepare the site for redevelopment. It is understood, on-site contamination has been reported to exist in the following forms;

- Hydrocarbons in residual on-site soils;
- Hydrocarbons in groundwater;
- Potential Acid Sulfate Soils (PASS); and
- Soil vapour.

## 1.2 PROPOSED DEVELOPMENT

NEO understand that the site is proposed to be developed to allow for the completion of a service station facility which may involve the following works:

- Tree removal;
- Remediation of contaminated areas of the property to meet applicable guideline criteria;
- Excavation works and the installation of underground petroleum storage systems (UPSS); and
- Civil works including the construction of concrete forecourt, carparking area, bowser canopy, retail store and landscaping.

Site photographs are included in the Photographic Log in **Appendix B**.

## 1.3 REGULATORY FRAMEWORK

The following regulatory framework and guidelines were considered during the preparation of this report:

- Department of Urban Affairs and Planning, NSW Environmental Protection Authority, *Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land*, 1998;

- National Environment Protection Measures (2013), *Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater*;
- National Environment Protection Measures, *Schedule B2 – Guideline on Site Characterisation*, 2013;
- NSW EPA, *Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme*, 2017 (3<sup>rd</sup> Edition);
- NSW Environmental Protection Authority, *Waste Classification Guidelines Part 1: Classifying Waste*, 2014;
- NSW Environmental Protection Authority, *Sampling Design Guidelines*, 1995;
- NSW Environmental Protection Authority, *Guidelines on the Duty to Report Contamination under Contaminated Land Management Act*, 1997;
- NSW EPA, *Technical Note: Investigation of Service Station Sites*, 2014;
- NSW Department of Environment and Conservation, *Guidelines for the Assessment and Management of Groundwater Contamination*, 2007;
- NSW Office of Environment & Heritage, *Guidelines for Consultants Reporting on Contaminated Sites*, 2011;
- Protection of the Environment Operations (Waste) Regulations, 2005;
- SafeWork NSW Code of Practice, *How to Safely Remove Asbestos*, 2016;
- SafeWork NSW Code of Practice, *How to Manage and Control Asbestos in the Workplace*, 2016;
- SafeWork NSW, *Managing Asbestos In or On Soil*, 2014;
- State Environment Protection Policy 55 (SEPP 55). *Remediation of Land Under the Environmental Planning and Assessment Act*, 1998;
- Western Australia Department of Health, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, 2009;

- Work Health and Safety Act, 2011; and
- Work Health and Safety Regulation, 2011.

## 1.4 PROJECT OBJECTIVES

The objectives of this RAP are to guide the sites remediation and validation process by providing a strategy and site operation outline for the following:

- Data gap closure to enable adequate site characterisation;
- Remediation of contaminated soil material and/or groundwater; and
- Validation of remediated areas to comply with applicable guideline criteria for the sites intended land use.

## 1.5 SCOPE OF WORKS

To achieve the above listed project objectives, the following scope of works were undertaken to produce this RAP.

- Review previous environmental investigations for the site, listed in **Section 1.1**;
- Establish remediation goals and criteria;
- Evaluate remediation technologies and select appropriate remediation strategies;
- Provide guidance on licences, an Environmental Management Plan, Work Health & Safety Plan and other relevant site plans required for the remedial works;

- Outline necessary site operations including excavation, stockpiling, management and disposal of soil materials and water, environmental controls and a contingency plan to manage additional identified contamination that may be identified during remediation and validation works;
- Advise processes for the unexpected finds of suspicious materials and an **Unexpected Finds Protocol** (refer to **Appendix A**);
- Address recommendations made in previous environmental investigations and outline additional investigations which may need to be undertaken for the site; and
- Establish a sampling, analysis and quality control plan for remediation works and validation works.

## 2. SITE INFORMATION

### 2.1 SITE IDENTIFICATION

The location of the site is shown in **Figure 1** with a detailed site plan shown in **Figure 2**.

**Table 1:** Site Details

|                                    |                                        |
|------------------------------------|----------------------------------------|
| <b>Site Address</b>                | 79 Barrenjoey Road, Mona Vale NSW 2103 |
| <b>Lot &amp; Deposited Plan</b>    | Lot A DP 405025                        |
| <b>Locality Map</b>                | <b>Figure 1</b>                        |
| <b>Site Plan</b>                   | <b>Figure 2</b>                        |
| <b>Sample and Remediation Plan</b> | <b>Figure 3 – Figure 4</b>             |
| <b>Site Photographs</b>            | <b>Appendix B</b>                      |
| <b>Site Area</b>                   | 1,625m <sup>2</sup>                    |

|                              |                                                        |
|------------------------------|--------------------------------------------------------|
| <b>Local Government Area</b> | Northern Beaches Council                               |
| <b>Current Land Use</b>      | Vacant/ unoccupied/ no known onsite structures present |
| <b>Surrounding Land Use</b>  | Commercial/ industrial, residential                    |
| <b>Previous Land Use</b>     | Commercial/ industrial                                 |

## 2.2 SITE DESCRIPTION

A NEO Environmental Scientist inspected the site on 8<sup>th</sup> February 2020. Observations noted during the inspection are summarised below.

At the time of the site inspection, the site contained the following structures and features:

- Grass covered the majority of the site with shrubs and small trees along the eastern, southern and western boundaries;
- Areas of exposed fill were visible within the central portion of the site. Exposed fill materials consisted of silt, clay and gravels;
- The site had an embankment sloping along the southern to western portions of the site, with a gradient of approximately 1:1;
- Three groundwater monitoring wells and soil vapour wells were visible on-site;
- There was no sign of UPSS infrastructure;
- A concrete slab was present in the northern portion of the site approximately 18m x 2.5m; and
- The site was secured with locked gates and fencing on its boundaries.

Refer to **Appendix B Photographic Log** for site photographs.

## 2.3 SURROUNDING LAND USE

**Table 2** below outlines the surrounding land uses neighbouring the site.

**Table 2:** Surrounding Land-Use.

| Direction from Site | Land-Use                                       |
|---------------------|------------------------------------------------|
| North               | Commercial/ industrial and residential beyond. |
| East                | Barrenjoey Road and residential beyond.        |
| South               | Commercial/ industrial and Barrenjoey Road.    |
| West                | Commercial/ industrial.                        |

## 2.4 GEOLOGY

The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, Edition 1, 1983) published by the Department of Minerals and Energy indicates the site to be underlain by Triassic age interbedded laminite, shale and quartz to lithic- quartz sandstone with clay pellet sandstone of the Narrabeen Group.

## 2.5 HYDROLOGY

A groundwater bore search was conducted on 13<sup>th</sup> February 2020 and 18 registered groundwater bores were detected within 500 m of the site. **Table 3** below summarises the 5 nearest groundwater wells to the site.

**Table 3:** Registered Groundwater Well Summaries

| Groundwater Well Reference | Direction from Site | Approximate Distance from Site (m) | Intended Purpose / Owner Type |
|----------------------------|---------------------|------------------------------------|-------------------------------|
| GW113212                   | East                | <50m                               | Monitoring Bore / Private     |
| GW113213                   | East                | <50m                               | Monitoring Bore / Private     |
| GW113211                   | East                | <50m                               | Monitoring Bore / Private     |
| GW108682                   | East                | >250m                              | Domestic                      |
| GW108558                   | East                | >250m                              | Domestic                      |

Given the distance and direction, registered groundwater monitoring wells GW113212, GW113213 and GW113211 are considered to be receptors of groundwater contamination sourced from the site (if any).

## 2.6 ACID SULFATE SOILS

To determine whether there is a potential for acid sulfate soils to be present at the site, a review of available Acid Sulfate Soils (ASS) risk maps was undertaken. The site is located within an area which suggests there is a high probability regarding the presence of ASS between 1-3m below ground level (bgl). This review is indicative only as a detailed investigation into ASS risk at the site was not included as part of the scope of this RAP.

The Acid Sulfate Soil Management Plan (ASSMP) prepared by DP (2019) indicates site redevelopment is likely to disturb ASS. In addition, a supplementary ASS assessment is recommended by DP (2019) prior to construction.

activities to confirm the ASS conditions. The ASSMP provides the procedures required to manage the impacts associated with the disturbance of ASS during remediation and redevelopment works for the site.

This document must be read in conjunction with this report.

## 2.7 SURFACE WATER RECEPTORS

Based on regional topography and the nearest surface water source, Cahill Creek 530m to the north-west, and the Pacific Ocean 600m to the east, groundwater flow direction is expected to seasonally fluctuate between the north-west and/ or east.

Given the distance to these surface water bodies, Cahill Creek and the Pacific Ocean are not considered to be receptors of soil, surface water and/or groundwater contamination sourced from the site (if any).

## 3. PREVIOUS INVESTIGATIONS

Previous environmental investigations for the site made available were recorded under the following reports:

- **Parsons Brinckerhoff Australia Pty Ltd, *Environmental Management Plan, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale, NSW Site No. 22353, dated July 2012.***

The Environmental Management Plan (EMP) prepared by PB (2012) outlines the necessary operational procedures to manage residual petroleum hydrocarbon impacts in on-site soils and groundwater to protect human health during redevelopment works and occupation of the site. The EMP reported the extent of impacts in relation to residual soil contamination, shallow and deep soil vapour concentrations and residual groundwater contamination.

PB (2012) concluded the following:

- A potential risk of vapour intrusion into buildings has been found to exist as a result of residual petroleum hydrocarbons impacting soil and groundwater. Any building constructed on site must incorporate a vapour barrier into the foundation slab;
  - A potential risk exists to intrusive maintenance workers and excavation workers at the site through ingestion and dermal contact in the event that impacted soil or groundwater is intercepted. Impacts are more likely to occur within the saturated zone (near or in groundwater) at approximately 5m bgl;
  - Work procedures must incorporate controls to minimise dermal contact with hydrocarbon impacted soil; and
  - An unacceptable vapour inhalation risk may exist for workers in trenches where depths exceed one metre. Task specific safety precautions would need to be implemented as part of work permitting for any trenching works, and work methods must take into consideration the potential for exposure to hydrocarbon vapours in deep trenches.
- **GHD, *Site Audit Report, Former Caltex Service Station, 79 Barrenjoey Road, Mona Vale NSW (Site ID 22353)*, dated 3<sup>rd</sup> August 2012.**

The Site Audit Report (SAR) prepared by GHD (2012) assessed environmental investigations for the site and concluded the following:

- The EMP prepared by PB (2012) is considered to be appropriate for the site; and
- There may be an unacceptable risk of exposure via dermal contact, ingestion of soils and groundwater, and vapour inhalation at depths greater than 1.5m.

The SAR considered the site was suitable for commercial/ industrial land use provided the site specific EMP is implemented, maintained and adhered to at all times.

- **Douglas Partners Pty Ltd, *Acid Sulfate Soil Management Plan, Proposed Mixed Use Development, 79 Barrenjoey Road, Mona Vale, Project 91501.01*, dated 4<sup>th</sup> April 2019.**

DP (2019) prepared an Acid Sulfate Management Plan (ASSMP) for the site. DP (2019) did not conduct ASS testing at the site, however it was reported that a preliminary ASS assessment has been conducted by EIS (2015). It is noted this report was not available at the time of preparing this RAP, however the summary of the preliminary ASS assessment report indicates that ASS testing indicated potential ASS conditions from approximately 3.8m bgl at the locations tested.

The ASSMP provides methods and strategies to minimise the potential for adverse impact associated with the disturbance of ASS during construction works associated with the development of the site.

DP (2019) recommended a supplementary ASS assessment prior to construction to confirm on-site ASS conditions. DP (2019) concluded the proposed site development is likely to disturb contaminated soils and groundwater within the site in addition to ASS. The site development and management of ASS and groundwater should be conducted with due regard to site contamination conditions, ASS conditions and the requirements of the EMP.

The above-mentioned reports provide crucial information regarding the necessary remediation, validation and management processes for the site and must be read in conjunction with this RAP.

### 3.1 CONTAMINATION IDENTIFICATION

The above-mentioned environmental investigation reports identified contamination sourced from the site which form areas of environmental concern (AEC). The AECs for the site are outlined below.

#### 3.1.1 AREA OF ENVIRONMENTAL CONCERN 1 - SOIL

Some residual petroleum hydrocarbon soil impacts remain on the site in the form of volatile (petrol fraction) and semi-volatile (diesel fraction) hydrocarbons. The highest concentrations were located in the central portion of the site coinciding with former location of the underground fuel infrastructure and the bowzers.

**Table 3** below was extracted from the EMP report prepared by PB (2012) and summarises soil samples which exceeded site validation criteria. Refer to **Figure 3** for detailed locations of samples.

**Table 3:** Soil Sample Validation Exceedances

| Sample Location | Depth (m) | Analyte Exceedance                                                                                    |
|-----------------|-----------|-------------------------------------------------------------------------------------------------------|
| Ex09B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Ethylbenzene, Total Xylenes                                          |
| Ex10S           | 2.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               |
| Ex10W           | 4.5       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Ethylbenzene, Total Xylenes |
| Ex10B           | 5.0       | C <sub>6</sub> -C <sub>9</sub>                                                                        |
| Ex11W           | 4.5       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene                     |
| Ex11B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene                     |
| Ex14W           | 4.8       | C <sub>6</sub> -C <sub>9</sub>                                                                        |
| Ex14B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               |
| Ex16S           | 3.5       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               |
| Ex16B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               |
| Ex18B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene                     |
| Ex20B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               |
| Ex21B           | 5.0       | C <sub>6</sub> -C <sub>9</sub>                                                                        |
| Ex22B           | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Ethylbenzene, Total Xylenes                                          |
| Ex22B1          | 5.0       | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene                     |

### 3.1.2 AREA OF ENVIRONMENTAL CONCERN 2 - GROUNDWATER

PB (2012) reported residual groundwater contamination to be present at the site. The volatile (petrol fraction) and semi-volatile (diesel fraction) hydrocarbon impacted groundwater was identified as flowing in a south-western direction, extending beyond the site boundary by approximately 100m. The highest concentrations of hydrocarbon impacted groundwater was detected within the central portion of the site, coinciding with the former location of the UPSS. Groundwater levels were recorded as between 3-5m during investigations prior to June 2012.

The groundwater plume was considered to be contracting as a result of biosparge groundwater remediation system which operated at the site between 2003 and early 2011. Natural processes of monitored natural attenuation (MNA) can also be attributed to the breakdown of the hydrocarbon plume.

Site workers performing intrusive and/or excavation works are expected to be at risk of dermal contact and ingesting impacted groundwater if intercepted during development works.

**Table 4** below was extracted from the EMP report prepared by PB (2012) and summarises groundwater samples which exceeded adopted investigation criteria. Refer to **Figure 4** for detailed locations of groundwater monitoring wells.

**Table 4:** Summary of Groundwater Results

|                                  | Sample locations exceeding adopted investigation levels |                                          |                                          |
|----------------------------------|---------------------------------------------------------|------------------------------------------|------------------------------------------|
| Analyte                          | April 2011 GME                                          | Aug 2011 GME                             | Nov 2011 GME                             |
| C <sub>6</sub> -C <sub>9</sub>   | -                                                       | -                                        | -                                        |
| C <sub>10</sub> -C <sub>36</sub> | -                                                       | -                                        | -                                        |
| Benzene                          | MW101                                                   | MWBS3; MW102;<br>MW104                   | MW104                                    |
| Toluene                          | -                                                       | -                                        | -                                        |
| Ethyl benzene                    | -                                                       | MW103A; MW105                            | MW103A                                   |
| Xylenes                          | -                                                       | -                                        | -                                        |
| m & p xylene                     | -                                                       | MW103A                                   | MW103A                                   |
| o- xylene                        | -                                                       | MW103A                                   | MW103A                                   |
| Naphthalene                      | MWBS3                                                   | MWBS3; MW102;<br>MW103A; MW104;<br>MW105 | MWBS3; MW102;<br>MW103A; MW104;<br>MW105 |
| Benzo(a)pyrene                   | -                                                       | -                                        | -                                        |

### 3.1.3 AREA OF ENVIRONMENTAL CONCERN 3 - ACID SULFATE SOIL

ASS risk maps indicate a high probability of the presence ASS within site soils at depths of approximately 1-3m bgl. The lateral extent of ASS soils at the site are expected to extend across the entire area of the site.

DP (2012) reported the preliminary ASS assessment by EIS (2015) indicated potential ASS conditions from a depth of approximately 3.8m bgl.

### 3.1.4 AREA OF ENVIRONMENTAL CONCERN 4 – SOIL VAPOUR

PB (2012) reported shallow soil vapour samples from 4 of the soil vapour bores installed to a depth of 1m exceeded vapour screening levels, representing a risk for occupants of future buildings should vapour barriers or equivalent controls on vapour intrusion not be implemented.

Soil vapour sample results, however, showed no unacceptable health risk, from vapour inhalation, for maintenance workers trenching to depths of 1 m or less.

Soil vapour samples from 3m bores exceeded vapour screening levels, indicated a potential vapour intrusion risk for occupiers of future buildings if vapour barriers were not incorporated into foundation designs.

The vapour sample results from the shallow 1m bores and the deep 3m bores originated from residual soil and groundwater hydrocarbon contamination.

## 4. REMEDIATION CRITERIA

### Health Investigation Levels (HIL)

To assess the contamination status of soils at a site, the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (Amendment 2013) is used. The site will be assessed against the NEPM contamination criteria 'HIL D – Commercial/ industrial' the most suitable criteria relevant to the sites intended land use.

### Health Screening Levels (HSLs)

For selection of the appropriate health screening criteria, an assessment of the in-situ soil profile should be undertaken. The SAR by GHD (2012) indicates the HSL criteria for sand is most appropriate.

### Asbestos

Health screening for asbestos in soil, which is based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and will be compared to the most suitable criteria 'HIL D – Commercial/ Industrial' (refer to **Table 5** below).

**Table 5:** Health Screening Levels – Commercial/ Industrial D Criteria for Asbestos.

| Form of Asbestos             | Soil Asbestos Investigation<br>Criteria- Commercial/<br>Industrial (%w/w)             |
|------------------------------|---------------------------------------------------------------------------------------|
| Bonded ACM                   | 0.05                                                                                  |
| FA and AF (Friable Asbestos) | 0.001                                                                                 |
| Visible asbestos             | No visible asbestos for surface<br>soil. Top 100mm of soil is to<br>be asbestos free. |

### Off-Site Transport of Waste

Soil material requiring off-site disposal must be analysed against the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*.

## 5. CONCEPTUAL SITE MODEL

In accordance with NEPM (2013) *Schedule B2 – Guideline on Site Characterisation* and to aid in the assessment of data collection for the site, a Conceptual Site Model (CSM) assesses plausible pollutant linkages between potential contamination sources, migration pathways and receptors. The CSM provides a framework for the review of the reliability and useability of the data collected and to identify data gaps in the existing site characterisation. The CSM can be seen in **Table 6** below.

### 5.1 POTENTIAL CONTAMINATION

Based on the findings of the previous site investigations by PB (2012), GHD (2012) and DP (2019) a desktop review of the site, neighbouring properties, and nearby ecological receptors, the chemicals of potential concern (COPC) at the site were considered to be:

Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), and Heavy Metals.

### 5.2 CONTAMINATION SOURCES, EXPOSURE PATHWAYS & RECEPTORS

Potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this assessment are summarised along with a qualitative assessment of the potential risks posed by complete exposure pathways in **Table 6**.

**Table 6:** Conceptual Site Model

| Potential Sources of Contamination                                      | Potential Receptor                                   | Potential Exposure Pathway                                             | Complete Connection | Risk | Justification                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------|---------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contaminated soil from importation of uncontrolled fill across the site | Site occupants, neighbours, workers, general public. | Dermal contact, inhalation/ingestion of particulates.                  | Yes (Current)       | Low  | Direct contact with potentially contaminated soils is limited due to site being secured. On-site workers will be required to follow health & safety procedures and wear appropriate PPE. EMP (PB, 2012) recommends installation of vapour barrier into building foundation slabs. |
|                                                                         |                                                      |                                                                        | No (Future)         | Low  | If present, impacted soils and groundwater are likely to be remediated and/or disposed of off-site.                                                                                                                                                                               |
| Hydrocarbons in soil material                                           | Ecosystem of Cahill Creek and Pacific Ocean          | Migration of impacted sediment, groundwater and surface water run-off. | Yes (Current)       | Low  | Cahill Creek and the Pacific Ocean are not considered to be receptors of groundwater/ surface water contamination sourced from the site (if any). However, sediment controls will be installed to limit surface water run-off.                                                    |
| Hydrocarbons in groundwater                                             |                                                      |                                                                        | No (Future)         | -    | If present, impacted soils/ groundwater are likely to be remediated and/or disposed of off-site.                                                                                                                                                                                  |
| Soil vapour                                                             | Underlying aquifer                                   | Leaching and migration of contaminants through                         | Limited (Current)   | High | Due to expected source of contamination within or close to groundwater table, leachability of COPC and migration of COPC is likely to be high.                                                                                                                                    |

|  |  |                           |             |     |                                                                                                          |
|--|--|---------------------------|-------------|-----|----------------------------------------------------------------------------------------------------------|
|  |  | groundwater infiltration. | No (Future) | Low | If present, contaminated soil and/or groundwater is likely to be remediated and/or disposed of off-site. |
|--|--|---------------------------|-------------|-----|----------------------------------------------------------------------------------------------------------|

Based on the CSM in **Table 6**, potential contamination sources and receptors have been identified. The possibility of contamination exists in the following receptors:

- Site occupants, neighbours, workers, general public; and
- Underlying aquifer (groundwater).

### 5.3 ADDRESSING DATA GAPS

Based on the CSM in **Table 6** and previous environmental investigations, the following data gaps still exist for the site:

- The contamination status of soil materials beneath the concrete slab in the northern portion of the site;
- The classification of soils for off-site disposal in accordance with the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*;
- The current contamination status of on-site groundwater; and
- Current ASS conditions for the site as reported by DP (2019).

## 6. REMEDIATION STRATEGY

### 6.1 REMEDIATION OBJECTIVE

The remediation program objective is to remove secondary sources of contamination from the site in order to reduce the risk posed to site occupants, neighbours, workers, general public, the underlying aquifer (groundwater) and classify the site suitable for its intended land-use.

Due to the presence of hydrocarbons in soil and groundwater, and an unacceptable risk of vapour inhalation, it is recommended remediation works be carried out by a civil contractor experienced in environmental remediation and under the supervision of a suitably qualified person, experienced in the assessment and remediation of contaminated sites.

The RAP must be adhered to by all personnel and sub-contractors involved in the remediation program. There must be a hard copy of the RAP accessible on site for all remediation personnel.

### 6.2 NSW EPA HIERARCHY OF OPTIONS FOR SITE REMEDIATION

The NSW EPA hierarchy of options for site remediation and/or management are listed below:

- If practical, on-site treatment of the contamination so that it is depleted, and the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is depleted, and the associated risk is reduced to an acceptable level.

If the above is not practical:

- Consolidation and isolation of the soil on-site by containment with a properly designed barrier;
- Removal of contaminated material to an appropriately licensed facility to receive such waste, and if necessary, replacement with appropriate materials; and/ or
- Where the assessment indicates remediation would have no overall environmental benefit or would have an adverse effect, implementation of an appropriate management strategy.

## 6.3 REMEDIATION OPTIONS

### 6.3.1 AVAILABLE REMEDIATION & MANAGEMENT STRATEGIES

There are different remediation and management strategies for use on contaminated sites applicable to the contamination identified in **Section 3**. A review of the available soil remediation methods and management strategies indicated that the following strategies may be applicable to the remediation of soil material at concentrations exceeding applicable guideline criteria:

- Excavation and off-site disposal of contaminated soil to an appropriately licensed landfill facility;
- Treatment (on-site or off-site);
- Managing the risks posed by contaminants by preventing any direct exposure pathway between the known and potential contaminated soil and users of the proposed development, through implementing physical barriers such as concrete/ synthetic material liners (geofabric)/ clean soil capping; and
- Further assessment of soil contamination and health risks.

### 6.3.2 EXCAVATION & OFF-SITE DISPOSAL

This method involves the excavation of contaminated materials and disposal of these materials off-site to an appropriately licensed landfill facility. Excavated materials must be classified according to the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. Depending on the level of contamination, excavated materials may need to be pre-treated to reduce or immobilise contaminants prior to off-site disposal.

### 6.3.3 TREATMENT

Soil treatment strategies depend on the type of contaminant identified and where the soil is in-situ or ex-situ. Most applied strategies are applied to ex-situ soils through excavation of the contaminated soil material. In-situ treatments usually require a longer timeframe for completion than ex-situ strategies. Most of the treatment strategies which require the soil material to be excavated can be undertaken on or off-site, subject to obtaining licences.

### 6.3.4 ON-SITE CAPPING

Capping can be a suitable strategy for managing health risks associated with soil contamination by preventing any direct exposure pathway between contaminated soil and site users. Capping is used to isolate areas in the subsurface from the surrounding uncontaminated environment. A physical barrier such as concrete, asphalt, synthetic material liners (geo-fabric), and/or clean soil may be installed to cap the contaminated material. A cap is employed to remove exposure to the contaminated soils, where the contaminated soils are not mobile and there is no contact with groundwater and/or groundwater is not contaminated.

A Site Management Plan is required with any capping strategy. The Site Management Plan identifies the personnel responsible for adhering to the plan, and includes commitments for on-going monitoring and maintenance of the cap as well as control of future excavations, which must be minimised or if required, the appropriate occupational health and safety procedures are adopted and permits acquired before works are carried out.

## 6.4 RATIONAL FOR SELECTION OF REMEDIATION STRATEGY

Considerations in selecting and implementing a suitable remediation strategy for a site include:

- Proven strategy: the remediation method should have a proven track record of success;
- Reliability: The remediation method should succeed in meeting the site remediation goals in the short and long term;
- Regulatory Approvals: The remediation method must be supported by the relevant regulatory authorities;
- Cost: Financial budgets provide an indication as to the likelihood of implementing a particular remediation strategy;
- Implementation Time: Timeframes associated with implementing particular strategies will govern the likelihood of their application;
- Land-Use Restrictions: If contaminated soil material is left on-site, the regulatory authority may place restrictions on the land use and/or require notification of the contamination on the property title;
- Liabilities: Maintenance and monitoring of an applied remediation strategy which does not involve complete removal of all contaminated materials from the site will necessitate some form of on-going maintenance and/or monitoring to ensure the long-term integrity of the remediation strategy. Any remediation strategy that does not involve the complete removal of all contaminants from the site will result in future liability for the landowner;
- Contractor Experience: The effectiveness and success of a remediation strategy partially depends on the experience of contractors implementing the applied remediation strategy;
- Space Requirements: Some remediation strategies require large amounts of space to spread soil and will only be feasible if sufficient land is available. In addition, if contaminated materials come into direct

contact with (or are spread across) clean soils, the clean soils may also be subject to remediation once contaminated materials have been removed;

- Disturbance to Operations: Remediation for the site is likely to cause disruption to usual operations undertaken at the site;
- Human Health Risks: Remediation workers, site users and the general public may be exposed to hazards posed by contamination during the remediation (i.e. through dust generation or vapour inhalation); and
- Availability of Landfill Facilities: Excavation and off-site disposal of contaminated materials are only feasible if the appropriately licensed landfill facility capable to receive such waste is a reasonable distance from the site.

#### 6.4.1 PREFERRED REMEDIATION STRATEGY

For this site, the remediation and management strategies listed in **Section 6.3** are capable of resolving the contamination issue and are available to the client. It is understood the client has decided against on- and off- site treatment of contaminated materials for the following reasons:

- The site requires a reduction in soil volume as excavation is required for the intended development;
- The cost of reuse and treatment of the contaminated soils in order to make the materials suitable for their intended land use, is considered to be substantially expensive;
- On-site capping of the contaminated material would result in the contaminated material remaining on-site until development works allow for the material to be dealt with and on-going management of the contaminated material would be required; and
- Any remediation strategy that does not involve the complete removal of all contaminants from the site will result in future liability for the landowner.

A NSW EPA remediation strategy of reducing the level of on-site contaminated soil material is to remove contaminated soil material to an appropriately licensed landfill facility, known as 'excavate and dispose'. This method of remediation has been deemed most suitable for the site for the following reasons:

- The costs associated with off-site disposal to landfill are considerably less than treatment costs;
- The method fits in with the proposed development design, as a net reduction of soil is understood to be required;
- The method is proven to be suitable for the type of contaminants identified at the site and most likely to be approved by regulatory bodies;
- The method can be completed in a shorter timeframe than other considered remediation methods;
- The potential for groundwater impact and vapour/ odour issues is reduced as the secondary contamination source is removed from site;
- No storage and/or treatment problems; and
- 'Excavate and dispose' requires limited (if any) on-going monitoring and maintenance.

#### 6.4.2 SUPERVISION

It is recommended an experienced Environmental Scientist be appointed to the project to ensure:

- The on-site presence of hydrocarbon impacted soil, groundwater and soil vapour is managed in the most appropriate manner;
- The coordination of the stages for remediation and validation are appropriately implemented; and
- Any deviations from the works outlined in this RAP are documented and approved as required under OE&H (2011) *Guidelines for Consultants Reporting on Contaminated Sites*.

Completion of remediation works without the supervision of a qualified Environmental Scientist may result in additional requirements imposed by a third party to confirm the contamination, remediation and/or validation status of the site.

Any soil and/or waste materials removed or acquired to the site without sufficient classification may lead to regulatory action. This could result in project delays and additional costs imposed on the client.

## 7. REMEDIATION GOALS

The remediation goal is to make the site suitable for its proposed development by removing secondary sources of contamination from the site in order to reduce the risk posed to site occupants, neighbours, workers, general public, the underlying aquifer (groundwater) and classify the site suitable for its intended land-use. This is possible by remediating previously identified AECs outlined in **Section 10** and located on **Figure 3 – Figure 4**, in accordance with relevant Australian standards and guidelines. It is noted, this RAP may need to be revised and re-issued subject to the findings of additional investigations, visual inspections, any unexpected finds and/or remediation strategy changes requested by the client.

### 7.1 STAGE ONE – SITE PREPARATION

- Typically, a Hazardous Materials (HAZMAT) Survey must be undertaken for the site, prior to any demolition or excavation works being undertaken. However, at the time of the site inspection on 8<sup>th</sup> February 2020 no site structures (mobile or permanent) were present on site;
- A groundwater investigation for the site should be implemented. This would involve the gauging and sampling of on-site groundwater monitoring wells. Samples are to be collected from the 3 on-site groundwater monitoring wells and submitted to a NATA accredited laboratory for analysis of chemicals of potential concern (COPC). A report detailing the findings of the groundwater investigation should be prepared for the site, outlining any additional remediation strategies necessary (if any);
- Signs and environmental controls must be implemented according to relevant Australia standards and guidelines;

- The concrete slab in the northern portion of the site is to be removed in order to allow for data gap closure and visual inspection for contamination of the soil materials beneath .

## 7.2 STAGE TWO - REMEDIATION

The EMP (PB, 2012) and ASSMP documents are to be implemented for the remediation of the site

AECs to be remediated are outlined in **Section 3**. AEC 2 and AEC 3 must be further assessed prior to remediation works commencing in order to understand the current contamination status of groundwater and presence of ASS for appropriate implementation of remediation strategies.

It is understood the client has chosen the method of 'excavate and dispose' as the most suitable method of remediation for the hydrocarbon impacted soils.

The remediation method of excavate and dispose is outlined below.

- In-situ soils are to be excavated and stockpiled in an appropriately designated stockpile staging area (further discussed in **Section 10.1**);
- The volume of material requiring management will be confirmed via site observations by the on-site Environmental Scientist and validation sample analysis;
- If contaminated soils must be stockpiled prior to off-site disposal, this must be done so in accordance with relevant Australian standards and guidelines. Procedures for handling on-site stockpiles are outlined in **Section 10** and **Section 12**; and
- Contaminated soils must be managed for off-site disposal to an appropriate licensed landfill facility and in accordance with NSW EPA (2014) *Waste Classification Guidelines*.

## 7.3 STAGE THREE - VALIDATION

Soil validation samples from the various surfaces of remedial excavations will be collected and analysed at the following approximate frequencies as a minimum:

- Base of excavation: 1 sample per 25m<sup>2</sup>, or one per floor <25m<sup>2</sup>;
- Walls of excavation: 1 sample per 5 linear metres, or one per wall <5 linear metres.;
- Stockpiled materials: refer to **Section 9.3**; and
- Final ground surface: 1 sample per 100m<sup>2</sup>.

AECs will be validated with the appropriate QA/QC sampling procedures (refer to **Section 11**). If contaminated materials are found during remediation works, these must be further delineated and remediated in the same process as mentioned above and until field observations and validation sample analysis indicate compliance with applicable guideline criteria.

A Validation Report will be prepared detailing the remedial works undertaken and confirming the remediation goals have been achieved.

## 7.4 LICENSED LANDFILL FACILITY

The soil excavated as part of the 'excavate and dispose' method of remediation must be deposited at an appropriately licensed landfill facility. Approval from the facility is required prior to the transport of such material.

Disposal of contaminated liquids requires the engagement of a licensed contractor capable of working with such waste.

All weighbridge receipts must be retained by the Principal Contractor for future reference and supplied to the on-site Environmental Scientist.

## 7.5 GROUNDWATER & SURFACE WATER CONDITIONS

A review of current groundwater conditions on the site has not been undertaken and require investigation which may permit remediation with longer term management plans.

Any dewatering activities must be done so in accordance with relevant Australian standards and guidelines.

In the event groundwater contamination is encountered, remedial strategies include: **Multi-Phase Vacuum Extraction (MPVE)**, pump and treat, **In-situ Chemical Oxidation (ISCO)**, **Enhanced Bioremediation** and/or **Monitored Natural Attenuation (MNA)**.

These methods of remediation will be discussed with the client and will involve variations to this RAP.

## 8. DATA QUALITY OBJECTIVES

In accordance with the US EPA (2006) Data Quality Assessment and the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme*, the process of developing Data Quality Objectives (DQO) was used to determine the appropriate level of data quality needed for the specific data requirements of the project. The DQO process that was applied for this assessment is documented below.

- Step 1: State the problem.

The subject site is contaminated as a result of previous and current land use which has impacted the sites land-use suitability. As outlined in previous environmental investigations by PB (2012), GHD (2012) and DP (2019), soil contamination areas require remediation. These locations are identified in **Section 10** and **Figure 3 – Figure 4**.

- Step 2: Identify the decision.

The site can be made suitable for its intended land use with the requirement for remediation and/or management if necessary.

- Step 3: Identify inputs into the decision.
  - Identification of issues of potential environmental concern;
  - Appropriate identification of COPC;
  - Systematic soil sampling and analysis programs of shallow soil across the site;
  - Visual inspection of systematic shallow soil samples for staining and presence of hydrocarbon odours with hand-held photoionisation detector (PID);
  - Appropriate Quality Assurance / Quality Control to enable an evaluation of the reliability of the analytical data; and
  - Screening sample analytical results against appropriate assessment criteria for the intended land use.

- Step 4: Define the boundaries of the site.

The project boundary is defined as the area within the site boundary of the proposed development, refer to **Figure 2**.

- Step 5: **Table 7** Summarises developing decision rules.

**Table 7:** Decision Rules

| Decisions                                                                                                        | Decision Rule                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Do risks to on-site receptors from contaminated soil and groundwater exist?                                      | Control measures are required to manage the risk.                                                                                                                                                                                                                                   |
| Are there contaminant combinations present on site?                                                              | More than one type of contaminant on-site is present.                                                                                                                                                                                                                               |
| Are the visually appealing issues?                                                                               | Visually identifiable contamination has been noted to be present on-site.                                                                                                                                                                                                           |
| Is on-site contamination capable of migrating off-site?                                                          | The potential for contamination to migrate off-site is possible (i.e. surface water run-off, groundwater migration, windblown dust particles).                                                                                                                                      |
| Is the site suitable for its intended land-use?                                                                  | Soil, groundwater and soil vapour samples compared to applicable guideline criteria suggest the site is not suitable for its intended land-use.                                                                                                                                     |
| Have contaminated and/ or excess soil materials been disposed of at an appropriately licensed landfill facility? | Fill and soil analytical data will be compared to applicable guideline criteria. Documentation from the facility is required to facilitate the decision. The intention is for contaminated fill and soil material to be disposed of at an appropriately licensed landfill facility. |

## 8.1 LIMITS OF DECISION ERROR

The decision makers tolerable limits on decision errors are used to establish quality goals for limiting uncertainty in the data.

In order for decisions to be made with confidence, the data collected and generated applicable to this project must be considered appropriate. Limits of this project have been applied in accordance with the NSW EPA, NEPM (2013), appropriate indicators of quality (Data Quality Indicators), and standard operating procedures.

## 8.2 VALIDATION DATA

Validation data is collected to confirm the following:

- The effectiveness of the implemented remediation methods and strategies;
- Any contaminated soils on site are sufficiently removed, contained and/or capped;
- Any imported soils to be used as clean backfill are classified as appropriate for the sites intended land-use; and
- Record the site as being suitable for its intended land-use.

The proposed validation soil sampling program is outlined in **Section 9**.

# 9. VALIDATION METHODOLOGY & SAMPLING PLAN

## 9.1 SOIL VALIDATION METHODOLOGY

Soil samples will be collected directly from the excavator bucket, placed in laboratory prepared 250mL soil jars, labelled appropriately and placed on ice in an esky for transport under chain of custody (COC) to a NATA accredited laboratory for the analysis of the COPC. All reusable equipment in the sampling process must be decontaminated between each excavation with Decon90 and potable water, including the excavator bucket.

Following excavation of contaminated soils to target dimensions, one floor sample (base) and four wall (i.e. north, east, south and west walls) samples are required to be collected for each hotspot excavation. If hotspots increase in size due to wall collapse, accumulation of an adjacent hotspot, and/or chasing-out of contamination due to visually identifiable contamination, the minimum samples required are listed below.

- Floor samples: one sample per 25m<sup>2</sup>, or one per floor <25m<sup>2</sup>; and
- Wall samples: one sample per 5 linear metres, or one per wall <5 linear metres.

Refer to **Section 7.3** for further details.

## 9.2 HOTSPOT EXCAVATIONS

The remediation activities of the contaminated soils identified in **Section 10** will be considered validated once the following objectives have been met:

- Remediation excavations will continue to beyond the boundary of contamination impact and the validation samples analytical data fall within the applicable guideline criteria; and
- Any imported soil materials to be used for backfilling are required to be suitable for the sites intended land-use and will require validation and appropriate certification for confirmation.

### 9.3 STOCKPILE SAMPLING

Stockpile sampling will be done so in accordance with the NEPM (2013), *Schedule B2, Guideline on Site Characterisation*, outlined in **Table 8**.

**Table 8:** Stockpile Sampling Frequencies

| Stockpile Volume (m <sup>3</sup> ) | Number of Samples |
|------------------------------------|-------------------|
| <75                                | 3                 |
| 75-100                             | 4                 |
| 100-125                            | 5                 |
| 125-<150                           | 6                 |
| 150-<175                           | 7                 |
| >200                               | 8                 |

### 9.4 LABORATORY QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

The NATA accredited laboratory contracted to conduct analytical reporting on the samples collected will conduct in-house QA/QC procedures involving spike recoveries, blanks, intra-laboratory duplicates and analysis.

### 9.5 SOIL VALIDATION REPORTING

All fieldwork, sample analysis, remediation findings, conclusions and recommendations will be provided in a final Validation Report for the site. The Validation Report will be prepared in accordance with the NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme* (3<sup>rd</sup> Edition) and will confirm the site has been remediated as per project objectives and is suitable for its intended land-use.

## 10. VALIDATION PROGRAM

The validation program is undertaken as confirmation that remedial works are complete and successful in making the site suitable for its intended land-use.

Following the excavation of each hotspot location, a photographic record of the floor and walls (i.e. excavations) and/ or ground surface (i.e. beneath stockpiles) will be collected for reference in the Validation Report.

If levels of contamination in validation samples exceed applicable guideline criteria, excavation in the area of that exceeding sample must be continued until new validation sample analytical results are below applicable guideline criteria indicating compliance (i.e. if the western wall of a hotspot excavation exceeds applicable criteria, the wall must be excavated further west and re-sampled, until field observations and validation sample analysis indicate criteria compliance).

### 10.1 CONTAMINATION REMEDIATION OF AREAS OF ENVIRONMENTAL CONCERN

#### 10.1.1 REMEDIATION OF AEC 1 - SOIL

The remediation of on-site soils will involve the 'excavate and dispose' method. This method involves the excavation of contaminated materials and disposal of these materials off-site to an appropriately licensed landfill facility. Excavated materials must be classified according to the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. This is further discussed in **Section 6** and the EMP (PB, 2012).

Depending on the level of contamination, excavated materials may need to be pre-treated to reduce or immobilise contaminants prior to off-site disposal.

#### 10.1.2 REMEDIATION OF AEC 2 - GROUNDWATER

The current contamination status of on-site groundwater is unknown and should be assessed to establish the correct remediation strategy. PB (2012) reported hydrocarbon concentrations within the contamination plume

between 2002 and 2012 had significantly decreased. It is assumed the concentrations reported during groundwater monitoring events in 2011 have further decreased over a similar time frame to current, however this must be further investigated prior to remediation works.

If contamination levels exceed applicable guideline criteria, groundwater remediation strategies can be may include:

- Multi-Phase Vacuum Extraction (MPVE). MPVE is an in-situ process that extracts both liquids and vapours from the subsurface by lowering the groundwater table, exposing the upper portion of the saturated zone to vapour extraction and extracting light non-aqueous phase liquid (LNAPL);
- Pump and treat. Groundwater pump and treat technology is a method which uses groundwater wells and submersible pumps to extract impacted groundwater from the subsurface. The extracted groundwater is treated and discharged to local storm water, sewer and/or trade waste systems;
- In-situ Chemical Oxidation (ISCO). ISCO is an in-situ treatment technology involving the direct injection of an oxidising agent such as sodium pomegranate, ozone, hydrogen peroxide, sodium persulfate, with additional amendments to reduce contamination concentrations;
- Enhanced Bioremediation. Enhanced Bioremediation can be achieved through the application of a suitable remediation amendment directly into the open excavation to increase biodegradation of hydrocarbons in shallow groundwater; and/or
- Monitored Natural Attenuation (MNA). MNA is the monitoring of naturally occurring physical, chemical and biological processes to demonstrate via multiple lines of evidence that one or a combination of remediation processes reduce the mass, concentration, flux and/or toxicity of groundwater contamination plumes to an acceptable level within an acceptable timeframe.

### 10.1.3 REMEDIATION OF AEC 3 – ACID SULFATE SOIL

The remediation of ASS at the site is to be completed in accordance with the ASSMP prepared by DP (2019). The ASSMP provides methods and strategies to minimise the potential for adverse impact associated with the disturbance of ASS during construction works associated with the development works.

#### 10.1.4 REMEDIAITON OF AEC 4 – SOIL VAPOUR

The remediation of contaminated site soils and groundwater will aid in the reduction of site soil vapour concentrations. During and after remediation works, soil vapour levels will be assessed to confirm the effectiveness of the remediation methods used on site soils and groundwater.

**Table 9** below summarise each hotspot, the contaminant(s) requiring remediation, each on-site location and validation sampling required.

**Table 9:** Hotspots Requiring Remediation

| Hotspot Reference     | Depth (m) | Validation Sampling Type                                      | Analyte Requiring Remediation                                                                         | On-site Location (refer to Figure 3)       |
|-----------------------|-----------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Ex09B<br>(base/floor) | 5.0       | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Ethylbenzene, Total Xylenes                                          | North, central portion. Base of Ex9.       |
| Ex10S<br>(south wall) | 2.0       | Test pit – 1 set wall samples (refer to <b>Section 7.3</b> )  | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>                               | West, southern portion. South wall of Ex10 |
| Ex10W<br>(west wall)  | 4.5       | Test pit – 1 set wall samples (refer to <b>Section 7.3</b> )  | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Ethylbenzene, Total Xylenes | West, southern portion. West wall of Ex10. |
| Ex10B<br>(base/floor) | 5.0       | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub>                                                                        | West, southern portion. Base of Ex10.      |

|                        |     |                                                               |                                                                                   |                                             |
|------------------------|-----|---------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------|
| Ex11W<br>(west wall)   | 4.5 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene | West, southern portion. West wall of Ex11.  |
| Ex11B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene | West, southern portion. Base of Ex11.       |
| Ex14W<br>(west wall)   | 4.8 | Test pit – 1 set wall samples (refer to <b>Section 7.3</b> )  | C <sub>6</sub> -C <sub>9</sub>                                                    | West, central portion. West wall of Ex14.   |
| Ex14B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>           | West, central portion. Base of Ex14.        |
| Ex16S<br>(south wall)  | 3.5 | Test pit – 1 set wall samples (refer to <b>Section 7.3</b> )  | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>           | South, central portion. South wall of Ex16. |
| Ex16B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>           | South, central portion. Base of Ex16.       |
| Ex18B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene | North, central portion. Base of Ex18.       |
| Ex20B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub>           | South, central portion. Base of Ex20.       |
| Ex21B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub>                                                    | Central portion. Base of Ex21               |
| Ex22B<br>(base/floor)  | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Ethylbenzene, Total Xylenes                      | East portion. Base of Ex22.                 |
| Ex22B1<br>(base/floor) | 5.0 | Test pit – 1 set floor samples (refer to <b>Section 7.3</b> ) | C <sub>6</sub> -C <sub>9</sub> , Total C <sub>10</sub> -C <sub>36</sub> , Benzene | East portion. Base of Ex22.                 |

The volume of in-situ soils requiring remediation will be confirmed via site observations and validation sample analysis.

## 10.1 TEMPORARY STOCKPILE STAGING AREA VALIDATION

If contaminated soil materials are to be temporarily stockpiled on-site, impermeable heavy-duty plastic sheeting is to cover the ground surface where the stockpile is to be staged, in an allocated location on-site. Once the stockpile has been disposed of off-site the soil directly beneath the location of the stockpile will be sampled to confirm cross-contamination has not occurred. Sampling of stockpiles and their underlying ground surfaces will be sampled as outlined in **Section 7.3**.

Provision should be made to allow for expansion of the stockpile staging area should this be required during the works.

## 10.2 IMPORTED SOIL MATERIAL VALIDATION

If soil materials are required to be imported onto the site, it must be classified as Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM) soils and will also be analysed in accordance with the requirement of the NSW EPA (2014) *Waste Classification Guidelines* at a rate of one sample per 25m<sup>3</sup> by a NATA accredited laboratory.

Should excavated soil materials be identified as potentially suitable for on-site reuse, the following procedures must be undertaken:

- The subject soil material must be capable of being physically separated from other on-site potentially contaminated material and appropriately stockpiled using the methods outlined above;
- Classification sampling and NATA accredited laboratory analysis is to be undertaken on the subject soil material at a rate of 1 sample per 25m<sup>3</sup>; and
- Subject to analytical results indicating compliance within applicable guideline criteria, isolated 'clean' materials may be reused on-site.

Prior to any soil materials being imported on-site, VENM/ ENM classification documentation must be submitted for review to the on-site Environmental Scientist.

### 10.3 DURATION OF REMEDIAITON & VALIDATION WORKS

Based on the proposed scope of remediation and validation works for the site, it can be expected the works will take approximately 4 to 6 weeks following receipt of all regulatory approvals. This timeframe does not include the reporting of works which could be expected to be completed approximately 6 weeks after completion of the remediation and validation works.

## 11. QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

The Quality Assurance/ Quality Control (QA/QC) procedures ensure the data collected is sufficiently accurate, precise, and reproducible to be used for the Validation Report. QA/QC should be done so in accordance with NEPM (2013) and relevant Australian standards and guidelines.

The frequency for QA/QC samples are summarised in **Table 10**.

**Table 10:** QA/QC Frequencies

| Soil |                  | Intra-laboratory<br>(blind duplicate) | Inter-laboratory<br>(blind triplicate) | Rinsate                   | Spikes and Blanks          |
|------|------------------|---------------------------------------|----------------------------------------|---------------------------|----------------------------|
|      | Sample Frequency | 1 in 20                               | 1 in 20                                | 1 set per day of sampling | 1 set per batch of samples |

samples are to be collected using laboratory prepared glass jars with Teflon lid inserts. Standard identification labels are to be used which state the following: project reference, sample reference, sample depth, date, sampler/ personnel.

All reusable sampling equipment is to be decontaminated between sampling locations to prevent cross-contamination. Decontamination involves:

- Washing equipment with potable water;
- Scrubbing equipment in a solution of Decon90; and
- Rinsing equipment in demineralised water and wiping dry with a clean lint free cloth.

## 11.1 LABORATORIES

All samples will be couriered to a NATA accredited laboratory under suitable chain of custody (COC). The COC will clearly state the project reference, sample reference, analytes to be tested, date, sampler/ personnel, project manager and all relevant contact details.

All samples are to be placed within an iced esky once collected and remain below 4°C at all times. Asbestos samples are not required to be kept on ice.

Inter-laboratory QA/QC samples are to be forwarded from the primary laboratory to a secondary NATA accredited laboratory for analysis.

The primary laboratory will conduct in-house routine QA/QC procedures including:

- Reagent blanks;
- Spike recoveries;
- Intra-laboratory duplicates;
- Calibration standards;
- Quality Control (QC) statistical data; and
- Control standards and recovery plans.

## 11.2 ACHIEVEMENT OF DATA QUALITY OBJECTIVE

Based on the analysis of quality control samples (i.e. duplicates and in-house QA/QC procedures), the following data quality objectives are required to be achieved:

- Conformance within specified holding times;
- Accuracy of spiked samples will be in the range of 60-140%;
- Field and laboratory duplicate samples will have a precision average of +/- 30-50% relative percentage difference (RPD); and
- Field duplicate samples will be collected at a frequency of 10% (i.e. 1 inter-laboratory sample and 1 intra-laboratory sample for every 20 field samples collected).

An assessment of the overall data quality should be represented in the final Validation Report in accordance with NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme*.

## 12. ENVIRONMENTAL MANAGEMENT PLAN

The following Environmental Management Plan (EMP) outlines general site operating procedures for the remediation works. This EMP may be subject to change by the Principal Contactor, the Removal Contractor and/or the Environmental Scientist. The EMP will be monitored by an Environmental Scientist who will be on-site during all remediation and validation works. The EMP is outlined below and will detail the following:

- Site access;
- Working hours;
- Stormwater and soil management;
- Traffic management;
- Dust and odour control;

- Noise control; and
- Work health and safety.

All remediation and validation works must be carried out in accordance with relevant Australian standards and guidelines.

## 12.1 GENERAL

The Principal Contractor should have a thorough understanding of the contents of the RAP, associated EMP (PB,2012) and ASSMP (DP, 2019), Work Health & Safety Plans and should ensure all workers and sub-contractors involved in the remediation and validation works understand the contents of these documents.

## 12.2 SITE ACCESS

The remediation contractor is responsible for securing the site with adequate barriers and warning signs to prevent unauthorised access. All workers must sign in daily and visitors must sign a visitor logbook outlining the purpose of the visit, representing company and time-on/ time-off site.

## 12.3 WORKING HOURS

Site operating hours for remediation and validation works will be between 7:00am and 5:00pm Monday to Friday and 8:00am to 1:00pm on Saturdays. No site works are to be undertaken on Sundays and Public Holidays.

## 12.4 DEMOLITION & ASBESTOS MANAGEMENT

All demolition works are to be carried out in accordance with relevant SafeWork NSW Codes of Practice. Any asbestos identified within the building materials should be managed in accordance with relevant SafeWork NSW

Codes of Practice. During the event of unanticipated asbestos discoveries, stop all work and refer to the **Unexpected Finds Protocol in Appendix A.**

## 12.5 STORMWATER & SOIL MANAGEMENT

Appropriate measures must be taken to ensure that potentially contaminated sediment and water does not leave the site. This could include, but is not limited to:

- Stormwater flowing through the site should be avoided, if possible, stormwater should be diverted to runoff outside the site;
- Construction of stormwater diversion channels and linear drainage sumps with catch pits in the remediation area to divert and isolate stormwater from any contaminated areas;
- Discharge of any groundwater and/or surface water to drains or water bodies must meet the appropriate discharge consent conditions under relevant Australian standards and guidelines; and
- Installation of sediment traps such as sediment fencing should be installed where stormwater may flow off-site.

Soil material to be stockpiled on-site must be done in such a way that the material is well contained and surrounded with adequate erosion controls such as sediment fencing. If stockpiles are to remain on-site for an extended period, they must be covered with geo-fabric or heavy-duty plastic to avoid erosion. Stockpiles must be maintained to allow for identification with adequate signage.

## 12.6 TRAFFIC MANAGEMENT

All vehicular traffic is to use only the routes approved by the Council to and from the approved landfill. All loads are to be covered and wetted to ensure no material or dust escape the load. Prior to leaving site, each truck must be inspected for cleanliness. If trucks have sediment on the wheels, chassis and/or body they must be washed down within the designated wash bay until confirmed 'clean'. No sediment track marks are to be visible on public roads.

## 12.7 DUST & ODOUR CONTROL

Dust and odour shall be monitored during the remediation and validation works and must be managed by the Principal Contractor. Management options include, but are not limited to:

- Water carts to wet dust-prone surfaces;
- Mist cannons/ dust suppression sprinklers on stockpiles and excavation activities which generate dust;
- Covering stockpiles with plastic sheeting/ geo-fabrics;
- Restricting stockpile heights to a maximum height of 2m above ground level;
- Ceasing remediation and validation works during extreme weather events such as high winds and heavy rain; and
- Odorous materials may be placed in a bunded area and covered with impermeable plastic sheeting.

If odours are reported on site, the on-site Environmental Scientist will use a photoionisation detector (PID). If the PID readings exceed >30ppm appropriate breathing masks must be worn by site workers. If reading exceed >300ppm odour suppressants must be employed.

## 12.8 NOISE CONTROL

Noise and vibration will be restricted to a reasonable level. All machinery on-site must ensure noise levels do not exceed statutory levels. Working hours are restricted to the above mentioned. 30 days prior to remediation and validation works commencing, every owner and occupier of land within 100m of all site boundaries are to be notified.

## 12.9 WORK HEALTH & SAFETY PLAN

The remediation contractor is responsible for implementing a site-specific Work Health & Safety Plan (WHS Plan) prior to remediation and validation works in accordance with relevant Australian standards and guidelines. The WHS Plan must identify hazards and assess risks which may be imposed on site workers, occupants and the public. The WHS Plan should detail subjects such as vehicle decontamination, suitable Personal Protective Equipment (PPE) and safety controls. The WHS Plan must be read and understood by site workers as part of their compulsory site induction, prior to beginning any remediation and validation works.

## 13. WASTE TRACKING & DISPOSAL

All transport and disposal of waste must be done so in accordance with relevant Australian standards and guidelines. All licenses and approvals required for disposal of the material will be obtained prior to removal of the materials from the site.

Details of all soils removed from the site must be documented by the Principal Contractor. Weighbridge dockets, landfill receipts and consignment disposal confirmation are to be provided to the on-site Principal Contractor and Environmental Scientist.

A truck log will be kept by the Principal Contractor detailing disposed loads against on-site origin.

All soil material to be removed from the site must be classified in accordance with NSW EPA (2014) *Waste Classification Guidelines*. No soil material is to leave the site without such classification.

## 14. DUTIES OF ON-SITE ENVIRONMENTAL SCIENTIST

The duties of the on-site environmental scientist include:

- Ensure the Remediation Action Plan, EMP (PB,2012), ASSMP (DP, 2019) Work Health & Safety Plan, Environmental Management Plan and any other plans or processes are strictly followed;
- Supervise all contaminated material excavations, handling, stockpiling and loading;

- Supervise the environmental compliance of contractors and site workers;
- In the event asbestos containing materials (ACM) are suspected of being present on-site, undertake asbestos air monitoring in accordance with SafeWork NSW Codes of Practice when ACM contaminated hotspots or suspected ACM contaminated soils are to be excavated, handled, stockpiled and/or loaded for transport;
- If strong odours are reported, regularly monitor the open excavation with a PID;
- Inspect sediment and stormwater controls;
- Inspect the roadway in the vicinity of the site for soil materials being tracked off-site;
- Report non-compliances to the principal environmental representative who will report to the appropriate regulatory body;
- Conduct validation sampling in accordance with the validation program as requested by the principal environmental representative; and
- Maintain a daily site log which will keep record of the following:
  - o Date;
  - o Contractors and sub-contractors on-site;
  - o Weather conditions in a daily site log, including direction and velocity of wind and rain activity;
  - o Locations of asbestos air monitors;
  - o Odour occurrences;
  - o PID readings;
  - o Details of materials excavated;
  - o Details of any unexpected finds;

- Accidents, near-misses and/or incidents;
- Details of environmental incidents;
- Any matter relating to environmental and/or health issues; and
- Site visitors.

## 14.1 NON-COMPLIANCES

If any works are suspected of not following procedures outlined in the RAP, WHS Plan or any other document which governs the remediation and validation work procedures, this will be reported immediately to the on-site Environmental Scientist. The Environmental Scientist has the authority to cease all remediation and validation works until the issue is resolved.

## 15. UNEXPECTED FINDS

In the event that any unexpected materials, contamination and/or underground storage tanks (USTs) are discovered, all remediation and validation works must cease, the on-site Environmental Scientist is to be notified and refer to the **Unexpected Finds Protocol** in **Appendix A**.

If during remediation or validation works, significant contamination and/or odours are discovered, works in that area must cease immediately, the on-site Environmental Scientist must be notified, and management of cross-contamination must be established. If required, the administering authority will be notified within 2 working days of a significant unexpected discovery and informed of the remediation actions taken.

The sampling strategy for unexpected material which could potentially be contaminated will be designed by the on-site Environmental Scientist in accordance with Australian standards and guidelines. The objective of the strategy will be to determine the nature of the material, whether it is hazardous, and if so, apply appropriate guideline criteria for its classification, remediation and/or validation.

The sampling frequency for the unexpected materials will meet the following minimum requirements:

- Excavation Floor:
  - 1 sample per 25m<sup>2</sup>, with a minimum of 3 samples collected; and
  - Samples will be analysed for COPC as determined by the on-site Environmental Scientist.
- Excavation Wall:
  - 1 sample every 5m (from each horizon/ material type, within the impacted area); and
  - Samples will be analysed for COPC as determined by the on-site Environmental Scientist.

The on-site Environmental Scientist will be required to document and report all discoveries of unexpected materials.

## 16. CONTINGENCY MANAGEMENT

Because subsurface conditions can vary over limited distance, the remediation and validation plan must be dynamic and capable of adapting to any unexpected condition and materials. Unexpected conditions and materials can result in harm to human and environmental health and must be managed appropriately. **Table 11** below summarises conditions and materials which may be discovered during remediation and validation works.

**Table 11:** Contingency Plan

| Unexpected Condition/<br>Material                        | Remedial Action                                                                                                                                                                                                                                      |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Excessive dust                                           | Use mist cannons over dust generating activities; employ water cart to wet site roads.                                                                                                                                                               |
| Excessive Rain                                           | Maintain stormwater diversion channels and drainage sumps; maintain site roads and cover high traffic areas with gravel; cover stockpiles with heavy-duty plastic and surround with sediment fencing; shut down site until stormwater is manageable. |
| Excessively wet materials                                | Leave in-situ; if already stockpiled, dewater; surround with sediment fencing.                                                                                                                                                                       |
| Sediment pond water for discharge, analytical exceedance | Perform in-situ water treatment methods until acceptable analytical levels are reported. Arrange off-site disposal by appropriately licensed contractor.                                                                                             |
| Excessive odours                                         | On-site Environmental Scientist is to continually monitor with PID; Principal Contractor is to upgrade PPE if necessary.                                                                                                                             |
| Excessive noise                                          | Identify source of noise, inspect equipment and repair accordingly; provide noise silencers if necessary.                                                                                                                                            |
| Complaint management                                     | Notify Principal Contractor and on-site Environmental Scientist. Report complaints as per internal/ WHS Plan procedures.                                                                                                                             |

|                                                                                                                      |                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                      |                                                                                                                            |
| Sediment fence failures                                                                                              | Cease works and repair; change sediment control method (haybales, geo-fabric).                                             |
| Oil/ fuel spill                                                                                                      | Cease work, refer to WHS Plan; utilise spill kit; move source to above impermeable surface (plastic sheeting/ waste drum). |
| Chemical spill                                                                                                       | Cease work, refer to WHS Plan; utilise spill kit; notify on-site Environmental Scientist immediately.                      |
| Equipment/ machinery failures                                                                                        | Maintain spare parts; maintain alternate rental options; shut down affected operations until repairs are made.             |
| Discovery of cultural and/or building heritage items                                                                 | Cease work, contact on-site Environmental Scientist immediately.                                                           |
| Discovery of drummed material                                                                                        | Cease work, contact on-site Environmental Scientist immediately.                                                           |
| Discovery of Underground Storage Tank (UST)                                                                          | Cease work, contact on-site Environmental Scientist immediately.                                                           |
| Excavation extends below water table into soil materials confirmed to consist of Potential Acid Sulfate Soils (PASS) | Cease work, contact on-site Environmental Scientist immediately.                                                           |

|                                    |                                                                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asbestos Containing Material (ACM) | Excavations must cease immediately. Notify on-site Environmental Scientist immediately. Employ appropriate PPE, wet the area to limit dust generation, cover with heavy duty plastic and create a 10m exclusion zone around excavation.                                                                        |
| Non-spadeable sludge/ slurry       | Contact on-site Environmental Scientist; employ appropriate PPE; segregation and bunding of discovered material; use of odour suppressant; cover with heavy duty plastic; Environmental Scientist to employ appropriate sampling of material; off-site disposal will require appropriate waste classification. |

## 16.1 UNDERGROUND STORAGE TANKS

Any discovered USTs within the site should be removed in accordance with relevant Australian standards, guidelines and the POEO (2014) UPSS Regulation. Due to the hazardous nature of petroleum storage tanks, it is recommended an experienced contractor be responsible for the excavation and disposal processes.

Once the UST and associated stained and/or odorous soils have been removed, validation processes must be implemented by the on-site Environmental Scientist including but not limited to in-situ sampling of the walls and floor of the excavation. Samples must be collected as per standard procedures outlined below and submitted to a NATA accredited laboratory under appropriate COC. The minimum target analytes include BTEX, TRH, PAH and heavy metals.

The minimum sampling requirements for UST and associated system areas include:

- 1 sample per spill box;
- 1 sample per tank line;
- 1 sample per vent pipe area;

- 3 samples per UST sand backfill per pit; and
- 2 floor samples and 8 wall samples (2 samples per wall) of each tank pit.

## 16.2 GROUNDWATER CONTINGENCY

If groundwater is discovered during the remediation and validation works, an assessment into the impact on the proposed development is recommended.

# 17. REGULATORY APPROVALS & LICENCES

## 17.1 DUTY TO REPORT

Under Section 60 of the Contaminated Land Management Act 1997, the owner of land which has become contaminated, whether before or during the owner's ownership, must notify the EPA in writing.

## 17.2 STATE OF THE ENVIRONMENT OPERATIONS (UPSS) REGULATION 2014

UPSS regulation states that if a UPSS is decommissioned, a report prepared by a suitably qualified Environmental Scientist must be prepared in accordance with NSW EPA guidelines and submitted to the relevant authorities within 60 days of decommissioning or completion of remediation.

## 17.3 STATE ENVIRONMENTAL PLANNING POLICIES

The State Environmental Planning Policy No 55 (SEPP 55) – Remediation of Land sets the regulatory framework for contaminated land and remediation works for NSW. SEPP 55 defines the requirements for remediation work to be carried out. The remediation works to be carried out at the site meet Category 2 criteria.

## 17.4 NORTHERN BEACHES COUNCIL

All remediation and validation works are to be undertaken in accordance with Northern Beaches Council Development Control Plans and any other requirements issued by Northern Beaches Council.

## 17.5 ASBESTOS REGULATIONS

Asbestos must be managed in accordance with the Work Health and Safety Act (2011), the Work Health and Safety Regulation (2011), How to Safely Remove Asbestos: Code of Practice, SafeWork NSW Codes of Practice and NSW EPA (2014) *Waste Classification Guidelines*.

Asbestos removal must be completed under the supervision of a NSW Licensed Asbestos Assessor (LAA) and by a licensed asbestos removalist (Removal Contractor) appropriately licensed to carry out Class A (friable) or Class B (non-friable) removals.

SafeWork NSW must be notified by the Removal Contractor 5 days before the asbestos removal work is scheduled to commence.

Asbestos air monitoring should be undertaken at the site while asbestos removal works and/ or excavation works within areas suspected to be contaminated with asbestos are being completed. The Removal Contractor is required to notify SafeWork NSW if respirable asbestos fibre levels reach or exceed 0.02 fibres/ mL. Asbestos air monitoring must be undertaken in accordance with SafeWork NSW Codes of Practice.

If a structure or plant is suspected of containing asbestos and must undergo immediate demolition, notification to SafeWork NSW must be made. This is to be done by the Principal Contractor, Environmental Scientist and/or the Removal Contractor.

## 17.6 PROTECTION OF THE ENVIRONMENT OPERATIONS (WASTE) REGULATIONS 2005

Section 42 of the POEO (Waste) Regulations 2005, details the special requirements relating to asbestos waste and must be followed when dealing with asbestos waste activities and transporting.

The necessary requirements for the transport of various types and occurrences of asbestos include:

- Bonded (non-friable) asbestos must be securely packed at all times (i.e. double- wrapped in heavy-duty plastic);
- Friable asbestos must be kept in a sealed container;
- Asbestos contaminated soils must be wetted down; and
- All asbestos waste including asbestos contaminated soils must be transported as a covered load in in a leak-proof vehicle.

All asbestos waste must be disposed of according to relevant Australian standards and guidelines, including:

- Only appropriately licensed landfill facilities are allowed to receive asbestos waste;
- The person transporting the asbestos waste must notify the landfill facility manager that the load contains asbestos;
- Unloading the asbestos waste must be done so that no dust is generated and employ dust suppression techniques;
- Once deposited at the licensed landfill facility, asbestos waste is to be stored in an environmentally safe manner.

## 17.7 ADDITIONAL LICENSING

Transporters of contaminated waste are required to be appropriately licensed to transport such wastes.

Waste classification documentation and landfill facility receipts must be kept on file for the site validation program.

Appropriate dewatering licenses must be obtained if water is to be discharged from the site.

The Principal Contractor should prepare an appropriate Construction Environmental Management Plan (CEMP), WHS Plan and other plans required by Northern Beaches Council Development Application.

## 18. CONCLUSION AND RECOMMENDATIONS

The current contamination status of on-site and off-site groundwater is not known and should be assessed in order to implement suitable remediation strategies (if required).

The EMP (PB, 2012) outlines suitable procedures for the management of hydrocarbon impacted soil and groundwater and must be followed in accordance with this RAP.

The ASSMP (DP, 2019) outlines suitable procedures for the management of ASS and must be followed in accordance with this RAP. Due to the high probability of ASS being disturbed during remedial works, the ASSMP recommends a supplementary ASS assessment to confirm on-site ASS conditions.

A Validation Report should be prepared for the site detailing the successful methodology of remediation and validation works to make the site suitable for its intended land use.

The property located at 79 Barrenjoey Road, Mona Vale, NSW 2103 (the site) can be made suitable for its intended land-use subject to implementing adequate remediation and validation works in accordance with this RAP.

## 19. REFERENCES

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- WaterNSW, [waternsw.com.au](http://waternsw.com.au).
- Western Australia Department of Health, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, 2009.
- Work Health and Safety Act, 2011.
- Work Health and Safety Regulation, 2011.

## 20. LIMITATIONS

The findings of this report are based on the Scope of Work. NEO performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental consulting profession. No warranties, express or implied are made.

The results of this assessment are based upon the information documented and presented in this report. All conclusions and recommendations regarding the site are the professional opinions of NEO personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, NEO assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of NEO, or developments resulting from situations outside the scope of this project.

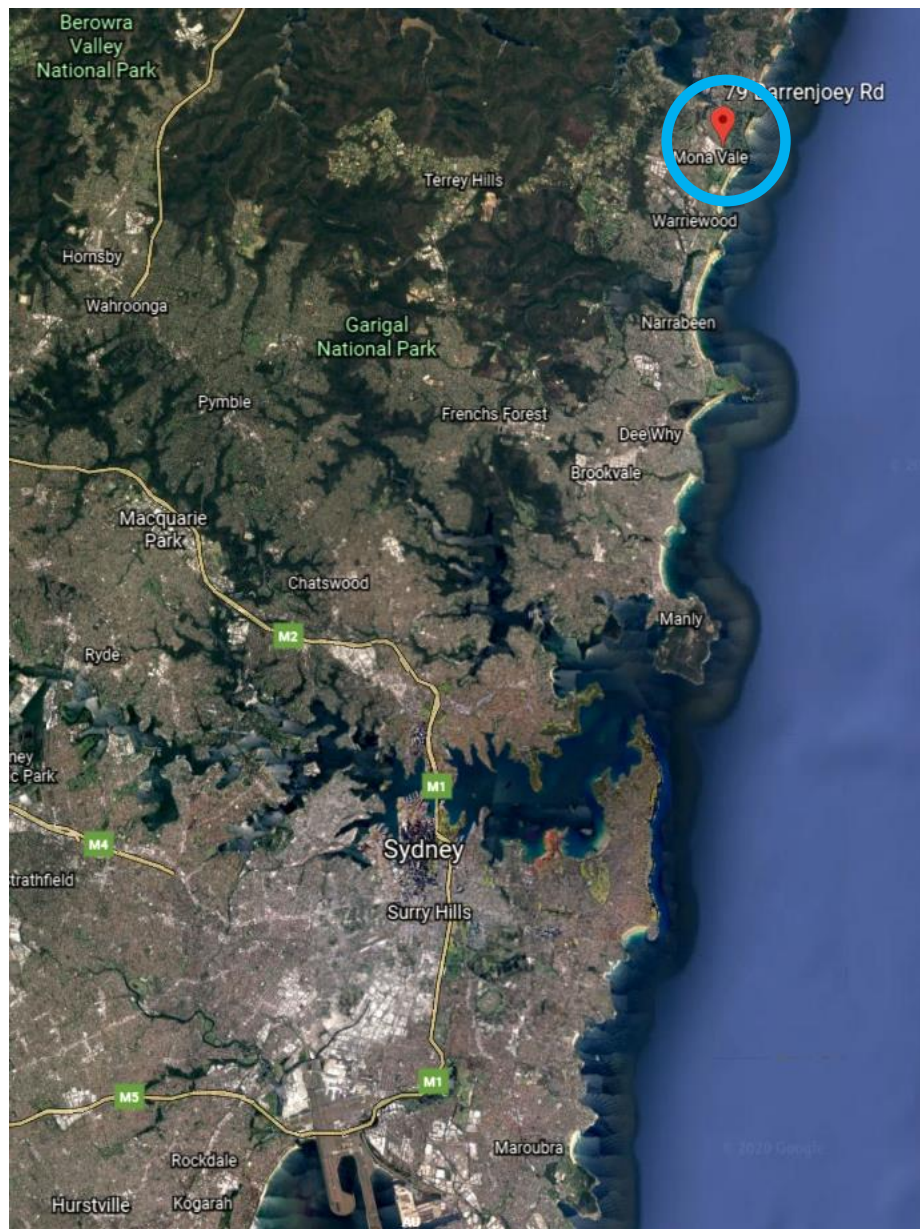
Subject to the Scope of the Work, NEO assessment is strictly limited to assessing soil and groundwater at the site. Soil and groundwater samples were analysed for common contaminants and/or indicators of contamination only. The absence of targeted contaminants of concern in soil and groundwater samples cannot be interpreted as a guarantee that such materials, or other potentially toxic or hazardous compounds, do not exist at the site.

The results of this assessment are based on the site conditions identified at the time of the site inspection and validation sampling. NEO will not be liable to revise the report to account for any changes in site characteristics, regulatory requirements, assessment criteria or the availability of additional information, subsequent to the issue date of this report.

NEO is not engaged in environmental consulting and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes.

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# Figures



Site  
location

Source: Google  
Earth 2019

|          |                                        |
|----------|----------------------------------------|
| Figure 1 | Locality Map                           |
| Project  | 79 Barrenjoey Road, Mona Vale NSW 2103 |



 Site boundary

|          |                                 |
|----------|---------------------------------|
| Figure 2 | Site Plan                       |
| Project  | 79 Barrenjoey Rd, Mona Vale NSW |

Source: SixMaps  
2020





Site boundary

#### LEGEND

- SITE BOUNDARY
- BASE OF EXCAVATION
- EXTENT OF SHEET PILING OR SHORING
- EXTENT OF EXCAVATIONS



|          |                                  |
|----------|----------------------------------|
| Figure 3 | Soil Sample Validation Locations |
| Project  | 79 Barrenjoey Rd, Mona Vale NSW  |



|          |                                       |
|----------|---------------------------------------|
| Figure 4 | Groundwater Monitoring Well Locations |
| Project  | 79 Barrenjoey Rd, Mon Vale NSW        |

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# **Appendix A**

## **Unexpected Finds Protocol**

# UNEXPECTED FINDS PROTOCOL

In the event that contaminated soils and/or groundwater (suspected or known), asbestos containing material (ACM) or underground storage tanks (USTs) are discovered during remediation or validation works, all works are to cease and notification must be made to NEO Consulting Pty Ltd (NEO) until further instruction is given. All on-site workers must be made familiar with this Unexpected Finds Protocol.

Once unexpected finds have been discovered the steps below must be followed.

## STOP WORK AND ISOLATE

All works must cease immediately. All workers are to be made aware of the incident and leave the immediate area of the potentially hazardous material. A 10m exclusion zone around the area of the potentially hazardous material is to be established and no worker is to enter the exclusion zone.

## CONTACT

As soon as reasonably practical, NEO must be notified. The nature of the discovery must be clearly detailed. All workers are to await the instruction of NEO. NEO will investigate the nature the discovery.

## INSTALL WARNING SIGNS & PPE

The exclusion zone is to display warning signs appropriate to the nature of the discovery. Workers must employ appropriate Personal Protective Equipment (PPE) including but not limited to, appropriate coveralls and P2 respiratory masks.

## AIR MONITORING

If asbestos is suspected to be present, asbestos air monitoring must be employed to determine the extent of contamination. An adequate number of asbestos air monitors are to be set up on the exclusion zone under the instruction of NEO.

## REMEDiate

The contaminated area will be evaluated by NEO and appropriate remediation techniques will be employed. The remediation and removal processes must be undertaken by a suitably licensed contractor.

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# **Appendix B**

## **Photographic Log**



Photograph 1: View of the site from Barrenjoey Rd.



Photograph 2: View from Barrenjoey Rd, looking south-west.  
Groundwater monitoring wells visible.



Photograph 3: Eastern portion of the site, looking north. Grass cover and vegetation visible.



Photograph 4: Eastern Portion of the site, looking south. Grass cover, vegetation, exposed fill material and groundwater monitoring wells visible.



Photograph 5: Southern portion of the site. Dense vegetation overgrowth and grass cover. Embankment sloping towards south-west.



Photograph 6: Northern portion of the site, looking west.



Photograph 7: Western portion of the site, looking south. Embankment sloping west with a gradient of approx. 1:1. Dense vegetation cover.



Photograph 8: Southern portion of the site. Embankment sloping south-west with a gradient of approx. 1:1. Dense vegetation cover.



Photograph 9: Southern portion of the site, looking north-east. Grass cover and vegetation visible.



Photograph 10: Exposed fill material in central portion of the site. Silt, Clay, Gravels.