

# INFORMATION REGARDING ENVIRONMENTAL AUDIT REPORTS

August 2007

## VICTORIA'S AUDIT SYSTEM

An environmental audit system has operated in Victoria since 1989. The *Environment Protection Act 1970* (the Act) provides for the appointment by the Environment Protection Authority (EPA Victoria) of environmental auditors and the conduct of independent, high quality and rigorous environmental audits.

An environmental audit is an assessment of the condition of the environment, or the nature and extent of harm (or risk of harm) posed by an industrial process or activity, waste, substance or noise. Environmental audit reports are prepared by EPA-appointed environmental auditors who are highly qualified and skilled individuals.

Under the Act, the function of an environmental auditor is to conduct environmental audits and prepare environmental audit reports. Where an environmental audit is conducted to determine the condition of a site or its suitability for certain uses, an environmental auditor may issue either a certificate or statement of environmental audit.

A certificate indicates that the auditor is of the opinion that the site is suitable for any beneficial use defined in the Act, whilst a statement indicates that there is some restriction on the use of the site.

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Web: www.epa.vic.gov.au/envaudit

Email: environmental.audit@epa.vic.gov.au

BlueSphere
ENVIRONMENTAL

# Environmental Audit Report
# (Transaction No. 8005833)

## 328 Bay Road
## Cheltenham VIC 3192

**Prepared for:**

**Chandos Bay Pty Ltd**

**9 April 2020**

# Environmental Audit Report (Transaction No. 8005833)

# 328 Bay Road Cheltenham VIC 3192

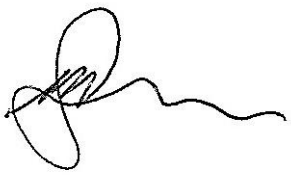
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| 1 | BlueSphere Environmental Pty Ltd<br>Project File | | |

This audit report is issued subject to the limitations noted in **Section 13**.

**Prepared by:**
BlueSphere Environmental Pty Ltd
113 Ferrars Street
South Melbourne VIC 3205

ABN: 33 095 162 893
ACN: 146 980 761



**Michael Seignior**

Environmental Auditor

Appointed pursuant to the *Environment Protection Act 1970*

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# List of Abbreviations

**Table 1 List of Abbreviations**

| Abbreviation | Definition |
|---|---|
| ACM | Asbestos Containing Material |
| AGST | Above-Ground Storage Tank |
| AHD | Australian Height Datum |
| AI(I) | Agriculture and Irrigation (Irrigation) |
| AI(SW) | Agriculture and Irrigation (Stock Watering) |
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| ARMCANZ | Agriculture and Resource Management Council of Australia and New Zealand |
| AS | Australian Standard |
| ASC | Assessment of Site Contamination |
| BGL | Below Ground Level |
| B(a)P | Benzo(a)pyrene |
| BTEX | Benzene, toluene, ethylbenzene, xylenes |
| CoC | Chain of Custody |
| CF | Chloroform |
| CHC | Chlorinated Hydrocarbon |
| CoPC | Contaminant of Potential Concern |
| CUTEP | Clean Up to the Extent Practicable |
| DCE | Dichloroethene |
| DCM | Dichloromethane |
| DDT | Dichlorodiphenyltrichloroethane |
| DELWP | Department of Environment, Land, Water and Planning |
| DO | Dissolved Oxygen |
| DS | Drum Storage |
| DSI | Detailed Site Investigation |
| EC | Electrical Conductivity |
| EIL | Ecological Investigation Level |
| EMP | Environmental Management Plan |
| EPA | Environment Protection Authority (Victoria) |
| ESL | Ecological Screening Level |
| GDA | Geocentric Datum of Australia |
| GME | Groundwater Monitoring Event |
| GQMP | Groundwater Quality Management Plan |

## Table 1 List of Abbreviations

| Abbreviation | Definition |
|---|---|
| GQRUZ | Groundwater Quality Restricted Use Zone |
| HHRA | Human Health Risk Assessment |
| HIL | Health Investigation Level |
| HSL | Health Screening Level |
| IWRG | Industrial Waste Resource Guidelines |
| ICW | Industrial and Commercial Water |
| IAS | Indoor Acid Store |
| LNAPL | Light non-aqueous phase liquid |
| LTV | Long Term Trigger Value |
| m | Metres |
| mg/kg | Milligrams per kilograms |
| mg/L | Milligrams per Litre |
| NA | Not Applicable |
| NAPL | Non-aqueous phase liquid |
| NATA | National Association of Testing Authorities |
| NEPC | National Environment Protection Council |
| NEPM | National Environment Protection Measure |
| NHMRC | National Health and Medical Research Council |
| NTS | Non-Toxic Store |
| ORP | Oxidation Reduction Potential |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| PCBs | Polychlorinated biphenyls |
| PCE | Tetrachloroethene |
| PID | Photoionisation Detector |
| PMCL | Prevention and Management of Contamination of Land |
| PW | Potable Water |
| RBC | Risk Based Criteria |
| RPD | Relative Percentage Difference |
| SEPP | State Environment Protection Policy |
| SSA | Sandringham Sandstone Aquifer |
| STV | Short-term Trigger Value |
| SW | Stock Watering |
| SWL | Standing Water Level |
| TCE | Trichloroethene |

**Table 1 List of Abbreviations**

| Abbreviation | Definition |
|---|---|
| TDS | Total Dissolved Solids |
| TEQ | Toxicity Equivalent Quotient |
| TIT | Triple Interceptor Pit |
| TRH | Total Recoverable Hydrocarbons |
| TOCV | Traditional Owners Cultural Values |
| VC | Vinyl Chloride |
| VOC | Volatile Organic Compound |
| WBR | Water Based Recreation |
| WDE | Water Dependant Ecosystems |
| WHO | World Health Organisation |

# Executive Summary

This environmental audit report and accompanying Statement of Environmental Audit (see **Appendix A**) were prepared by Mr Michael Seignior of BlueSphere Environmental Pty Ltd (BlueSphere), an Environmental Auditor appointed pursuant to the *Environment Protection Act 1970* (the Act). The Statement of Environmental Audit was prepared in response to a request by Chandos Bay Pty Ltd (Chandos Bay), to undertake an environmental audit of the property located at 328 Bay Road, Cheltenham, Victoria (herein referred to as the Site), which is owned by Chandos Bay.

The audit was conducted in accordance with section 53X of the Act and in a manner consistent with relevant guidelines issued by the Environment Protection Authority (EPA), in particular, the Environmental Auditor (Contaminated Land): Guidelines for Issue of Certificates and Statements of Environmental Audit (EPA Publication 759.3, December 2015).

Information relating to the Site and environmental audit is provided in **Table 2** below.

**Table 2 Summary of Audit Information**

| Aspect | Description |
|---|---|
| Auditor | Mr Michael Seignior |
| Auditor Account Number | 75703 |
| Auditor appointment end date | 09/08/2019 to 8/02/2021 |
| Audit type | 53X |
| Date EPA notified of audit | 19 June 2018 |
| Audit service order number | 8005833 (CARMS 74971-5) |
| Name of person requesting audit | Mr Andrew Johnson |
| Relationship of person requesting audit to site | Director, Chandos Bay Pty Ltd (Site owner) |
| Name of premises owner | Chandos Bay Pty Ltd |
| Date of auditor engagement | 18 June 2018 |
| Completion date of the audit | 9 April 2020 |
| Reason for audit | Requirement of Clean Up Notice (ID: 90010025) |
| Audit Categorisation | Risk |
| Environmental Segments | Air, Land, Groundwater, Surface Water |
| If the audit was required by an EPA notice, licence or other, please provide EPA reference number | Clean Up Notice ID: 90010025 |

**Table 2 Summary of Audit Information**

| Aspect | Description |
|---|---|
| Current land use zoning | Commercial 2 Zone (C2Z) |
| EPA Region | Southern Metro |
| Municipality | Bayside City Council |
| Dominant – Lot on plan | Lot 1 on Plan of Subdivision PS802507 |
| Additional – Lot on plan(s) | - |
| Site / Premise name | 328 Bay Road, Cheltenham |
| Building / complex sub-unit No. | - |
| Street / Lot – Lower No. | - |
| Street / Lot – Upper No. | 328 |
| Street Name | Bay |
| Street type (road, court, etc.) | Road |
| Street suffix (North, South, etc.) | - |
| Suburb | Cheltenham |
| Postcode | 3192 |
| GIS Coordinate of Site centroid<br>Latitude (GDA94)<br>Longitude (GDA94) | <br>37.956456°S<br>145.041165°E |
| Site area (in square metres) | 3,469 $m^2$ |
| Members and categories of support team utilised (categories described are in accordance with EPA Publication 865.12) | Hydrogeology, remedial technologies and geotechnology – Dan Hirth<br>Hydrogeology – Darren Ellis<br>Human health and ecological risk assessment - Dr Rory Lane |
| Further work or requirements | Implementation of the Environmental Management Plan (EMP) and Groundwater Quality Management Plan (GQMP) provided in **Appendix A** |
| Nature and extent of continuing risk | Asbestos contaminated fill (in the form of fragments of bonded asbestos containing material) remains on the Site and will be managed by an EMP, groundwater contamination exists beneath the Site and will be managed by a groundwater quality restricted use zone (GQRUZ) and GQMP |
| Outcome of the audit | Statement |

**Table 2 Summary of Audit Information**

<table>
<tr><th>Aspect</th><th>Description</th></tr>
<tr><td>Has EPA determined CUTEP at this site</td><td>Yes</td></tr>
<tr><td>Has the Auditor determined CUTEP at this site?</td><td>No</td></tr>
<tr><td>Has a GQRUZ been identified at the site/beyond the site by EPA?</td><td>Yes<br>Site and downgradient area is identified as a GQRUZ</td></tr>
<tr><td>Does NAPL remain at the Site?</td><td>No</td></tr>
<tr><td>Please indicate which of the Protected Beneficial Uses of groundwater are precluded due to pollution</td><td>
<table>
<tr><th>Protected Use</th><th>Precluded</th></tr>
<tr><td>Water Dependent Ecosystems</td><td>NA</td></tr>
<tr><td>Potable Water Supply (Desirable)</td><td>Yes</td></tr>
<tr><td>Potable Mineral Water Supply</td><td>NA</td></tr>
<tr><td>Agriculture and Irrigation (Irrigation)</td><td>Yes</td></tr>
<tr><td>Agriculture and Irrigation (Stock Watering)</td><td>Yes</td></tr>
<tr><td>Industrial and Commercial</td><td>Yes</td></tr>
<tr><td>Water Based Recreation</td><td>Yes</td></tr>
<tr><td>Traditional Owners Cultural Values</td><td>NA</td></tr>
<tr><td>Buildings and Structures</td><td>No</td></tr>
<tr><td>Cultural and Spiritual Values</td><td>Yes</td></tr>
<tr><td>Geothermal Properties</td><td>NA</td></tr>
</table>
NA – not applicable
</td></tr>
<tr><td>Historical land use</td><td>Lot 1 of former Nuplex Industries Australia Pty Ltd (Nuplex) chemical storage and handling facility (commercial)</td></tr>
<tr><td>Current land use</td><td>Commercial (Dan Murphy’s store)</td></tr>
<tr><td>Proposed Future Land Use</td><td>Commercial (Dan Murphy’s store)</td></tr>
<tr><td>Surrounding land use – north</td><td>Bay Road, then commercial (Rietmans Business Park). A car wash is located to the north-east.</td></tr>
<tr><td>Surrounding land use – south</td><td>Lots 2, 3 and 4 of the former Nuplex facility, then further commercial properties. Active groundwater remediation is currently being undertaken on Lot 2.</td></tr>
</table>

**Table 2 Summary of Audit Information**

| Aspect | Description |
|---|---|
| Surrounding land use – east | Chandos Street, then commercial (Laminex facility) |
| Surrounding land use – west | Hamlet Street, then various commercial and light industrial facilities. |
| Proposed land use zoning | Commercial 2 Zone (C2Z) |
| Nearest surface water receptor – name | Port Phillip Bay |
| Nearest surface water receptor – direction | South-west |
| Likely point of groundwater discharge | Port Phillip Bay |
| Site aquifer formation | Sandringham Sandstone Formation |
| Groundwater flow direction | South-west |
| Groundwater TDS range (mg/L) | 87 – 3,262 mg/L |
| Groundwater segment | A1 |
| Are there multiple aquifers impacted by pollution at the site? | No |
| Perched groundwater depth – upper (metres below ground level (m bgl)) | 0.5 m (ephemeral) |
| Perched groundwater depth – lower (m bgl) | Not measured |
| Regional groundwater depth – upper (m bgl) | 8.5 |
| Regional groundwater depth – lower (m bgl) | 19.0 |
| Number of bores within 2 km | 383 |
| Closest extractive use (distance in m) | 213 m south (domestic and stock) |
| Zone of groundwater plume influence (m from site boundary) | 76 m |
| Year groundwater last monitored | 2019 |

**Table 2 Summary of Audit Information**

| Aspect | Description |
|---|---|
| Have you attached electronic copies of Current Groundwater Analytical Results presented as a summary table? | Yes. Refer to Appendix F (Appendix D CUTEP Tables) |

Whilst this Executive Summary has endeavoured to accurately summarise the key points of the audit report, the latter shall take precedence and the Executive Summary must be read in conjunction with the full audit report (BlueSphere Environmental Pty Ltd, Environmental Audit Report, 328 Bay Road, Cheltenham, Victoria 3192, Report No. 8005833) and the Statement of Environmental Audit.

# 1 Introduction

Mr Michael Seignior of BlueSphere Environmental Pty Ltd (BlueSphere), an Environmental Auditor appointed pursuant to the Environment Protection Act 1970 (the Act), was requested by Mr Andrew Johnston of Chandos Bay Pty Ltd (Chandos Bay) to undertake an environmental audit of the property located at 328 Bay Road, Cheltenham, Victoria, formally referred to as Lot 1 on PS802507 (herein referred to as the Site), which is owned by Chandos Bay. The Site location is provided on **Figure F1** attached.

The Site historically formed the northern part of the former Nuplex Industries (Aust) Pty Ltd (Nuplex) property, which comprised Lots 1 to 4 of PS 802507, which are also shown on **Figure F1**.

The environmental audit was conducted in accordance with Section 53X of the Act and in a manner consistent with relevant guidelines issued by the Environment Protection Authority (EPA), in particular, the Environmental Auditor (Contaminated Land): Guidelines for Issue of Certificates and Statements of Environmental Audit (EPA Publication 759.3, December 2015).

General information relating to the Site is summarised in **Table 3** below.

**Table 3 Site Information**

| Item | Detail |
|---|---|
| Current land use zoning | Commercial 2 Zone (C2Z) |
| Municipality | Bayside City Council |
| Lot on plan | Lot 1 PS802507 |
| Site / premises name | 328 Bay Road |
| Suburb | Cheltenham |
| Postcode | 3192 |
| GIS coordinate of site centroid<br>Latitude (GDA94)<br>Longitude (GDA94) | <br>37.956456°S<br>145.041165°E |
| Site area (in square metres) | 3,469 $m^2$ |
| Proposed current and future use | Dan Murphy's Liquor Store (commercial) |

The current Certificate of Title is provided as **Appendix B**.

## 1.1 Previous Auditor Engagement

Mr Timothy Russell (formerly an employee of Peraco Pty Ltd, now an employee of Maple Auditing Pty Ltd) was previously appointed as the environmental auditor for the Site. However, the audit was terminated by him shortly before the appointment of Michael Seignior.

# 2 Audit Framework Methodology

This environmental audit has been undertaken in accordance with the following:

- Part IXD section 53X of the Act, under which an 'environmental audit' is defined as "*a total assessment of the nature and extent of any harm or detriment caused to, or the risk of any possible harm or detriment which may be caused to, any beneficial use made of any segment of the environment by any industrial process or activity, waste, substance (including any chemical substance) or noise*".
- 'Environmental Auditor (Contaminated Land) Guidelines for Issue of Certificates and Statements of Environmental Audit (EPA Publication 759.3)', which provide detail regarding specific auditing requirements that ensure compliance with the relevant section of the Act.

An environmental audit taken to completion may result in the issue of a Certificate of Environmental Audit ('Certificate') or, if the auditor determines that a Certificate cannot be issued, he/she must issue a Statement of Environmental Audit ('Statement'). A Certificate indicates that the auditor is of the opinion that the site is suitable for any beneficial use and therefore there is no restriction on use of the site due to its environmental condition. When undertaking an environmental audit, the auditor must first satisfy him/herself as to whether the environmental condition of the land is suitable to issue a Certificate. A Statement indicates that the auditor is of the opinion that there is, or may be, some restriction to the use of the site due to its environmental condition.

This environmental audit has been conducted with full consideration of requirements set out in relevant pieces of legislation. Specifically:

- *Environment Protection Act 1970*;
- State environment protection policy (Prevention and Management of Contamination of Land) (SEPP (PMCL));
- State environment protection policy (Waters) (SEPP (Waters));
- State environment protection policy (SEPP (Air Quality Management));
- Environment Protection (Industrial Waste Resource) Regulations 2009; and
- Industrial Waste Management Policy (Waste Acid Sulfate Soils).

Specific guidelines and standards that were used to assess the adequacy of investigations and clean-up works conducted and the contamination status of the Site (i.e. the audit criteria) were as follows:

- Australian and New Zealand Environment and Conservation Council & the Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) 2000, Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality. It is acknowledged that updated Australian & New Zealand Guidelines for Fresh & Marine Water Quality (NWRC, 2018) are being developed at the time of preparation of this audit report; however, no material changes have been published at this time.
- Australian Standard AS4482.1-2005: Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 1: Non-volatile and Semi-volatile Compounds.
- Australian Standard AS 4482.2-1999. Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances.
- Environment Protection Authority, 2006, Hydrogeological Assessment (Groundwater Quality) Guidelines (EPA Publication 668).
- Environment Protection Authority, April 2000, Groundwater Sampling Guidelines (EPA Publication 669).

- Environment Protection Authority, June 2009, Sampling and Analysis of Waters, Wastewaters, Soils and Wastes (EPA Publication IWRG701).
- Environment Protection Authority, June 2009, Soil Sampling (EPA Publication IWRG702).
- Environment Protection Authority, April 2016, The Cleanup and Management of Polluted Groundwater (EPA Publication 840.2).
- Environment Protection Authority, December 2016, Environmental Auditor Guidelines for Appointment and Conduct (EPA Publication 865.12).
- Environmental Protection Authority, August 2007, Environmental Auditor Guidelines for Conducting Environmental Audits (EPA Publication 953.2).
- Environment Protection Authority, December 2015, Environmental Auditor Guidelines – Provision of Environmental Audit Reports, Certificates and Statements (EPA Publication 1147.2).
- Department of Health (WA), May 2009, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.
- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288 (ASC NEPM).

In order to conduct this environmental audit in accordance with the above, the auditor:

- Reviewed and evaluated relevant Site assessment reports and additional background information to gain an understanding of the environmental condition of the Site and the completeness/adequacy of the Site assessment. Information sources (predominantly consultant reports) are described in **Section 3.1**.
- Identified the beneficial use(s) of land and groundwater requiring protection as defined by relevant SEPPs.
- Reviewed and provided comments on the scope of investigation works provided by the Site assessor.
- Visited the Site on several occasions during various phases of work, in order to inspect first-hand activities being undertaken and actual Site conditions. These Site visits are described in **Section 3.4**.
- Undertook groundwater verification sampling and analysis to confirm groundwater quality reported by assessment consultants. Verification results are described in **Section 6.3.4.**
- Assessed the harm, detriment or risk posed by the condition of the Site to beneficial uses to be protected.
- Liaised with EPA, the Site owner and/or its representatives and the appointed assessment consultants as required.
- Consulted with and sought advice from his expert support team, as and when required (refer to **Section 3.3**).
- Prepared a Clean Up So Far as Reasonably Practicable submission to EPA to address groundwater contamination that is extending beyond the Site boundary (refer to **Section 9**).
- Prepared this environmental audit report and Statement of Environmental Audit (**Appendix A**) and concluded as to the suitability of the Site in its final condition at the date of completing the audit, for its proposed use.

# 3 Information Sources

## 3.1 Consultant Reports

The assessment consultants (ARC Environmental Pty Ltd (ARC) and Resolve Environmental Pty Ltd (Resolve)) provided the primary sources of information for the auditor to form an opinion regarding the environmental condition of the Site. In addition, two risk assessment reports prepared for the Site and utilised by the Auditor are also listed below.

Details of the reports utilised are listed in **Table 4**, below.

**Table 4 Summary of Reports Reviewed by the Auditor**

| Author | Date | Report Title | Reference |
|---|---|---|---|
| GHD Pty Ltd | September 2016 | Site Investigation Report, 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd | GHD 2016 |
| ARC Environmental Pty Ltd | 1 May 2017 | Preliminary Site Investigation, 322-328 Bay Road, Cheltenham, Victoria, Revision 1.0, prepared for Chandos Bay Pty Ltd | ARC 2017 |
| Environmental Earth Sciences VIC | May 2018 | Solute Fate & Transport Assessment at 322-328 Bay Road, Cheltenham, Victoria, May 2018, prepared for Chandos Bay P/L, Version 1 | EES 2018 |
| Environmental Risk Sciences Pty Ltd | 8 November 2018 | Risk-Based Criteria, Former Nuplex Chemical Storage Facility, Cheltenham, VIC, prepared for ARC Environmental and Evolution Environmental Consulting | EnRiskS 2018 |
| Resolve Environmental Pty Ltd | 17 September 2019 | Detailed Site Investigation, Remediation & Validation Report, Lot 1, Chandos Bay, 328 Bay Road, Cheltenham | Resolve 2019 |

GHD 2016, ARC 2017, EES 2018 and EnRisks 2018 are provided as Appendices X, U, T and R respectively of Resolve 2019 which is provided in **Appendix C** of this report.

In addition to the above, the auditor also reviewed various work plans and draft reports produced by the assessment consultants. The auditor provided regular written feedback to the assessment consultant regarding the adequacy of this information for the purposes of completing this environmental audit. The auditor considers that all items raised were satisfactorily adopted by the consultant and finalised in the final versions of the reports listed above.

## 3.2 Historical Reports

Numerous reports have been prepared for the former Nuplex property (the extent of which is shown on **Figure F1)** which incorporates the Site, since at least 2001. A list of the reports that were provided and reviewed as part of the audit are provided in **Table 5** below. The relevant findings from these reports were incorporated into ARC 2017 and Resolve 2019. In view of this, these reports have not been discussed individually for this audit.

Table 5 Historical Reports

| Author | Date | Report Title |
|---|---|---|
| Lane Piper Pty Ltd | 8 September 2011 | Environmental Audit Report (s53V), 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd |
| GHD Pty Ltd | June 2015 | Draft Soil and Groundwater Remediation Feasibility Study, 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd |
| GHD Pty Ltd | June 2015 | Site Investigation Report, 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd |
| GHD Pty Ltd | March 2014 | Nuplex Industries (Aust) Pty Ltd, 18-22 Hamlet Street, Cheltenham, Groundwater Monitoring 2014 |
| GHD Pty Ltd | May 2013 | Updated Health Risk Assessment, 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd |
| GHD Pty Ltd | May 2013 | Nuplex Industries (Aust) Pty Ltd, Hamlet Street Cheltenham, Soil Gas/Vapour Monitoring Report |
| GHD Pty Ltd | April 2013 | Nuplex Industries (Aust) Pty Ltd, 18-22 Hamlet Street Cheltenham, Groundwater Monitoring Event - February/March 2013 |
| GHD Pty Ltd | June 2011 | 18-22 Hamlet Street Cheltenham, January 2011 Groundwater Monitoring Letter Report, prepared for Nuplex Industries (Aust) Pty Ltd |
| GHD Pty Ltd | December 2010 | Nuplex Industries (Aust) Pty Ltd, Report for 18-22 Hamlet Street Cheltenham, Additional Soil and Groundwater Investigation |
| GHD Pty Ltd | March 2009 | Nuplex Industries (Aust) Pty Ltd, Report for 18-22 Hamlet Street, Cheltenham, Victoria, Vapour Health Risk Assessment |
| GHD Pty Ltd | March 2009 | Nuplex Industries (Aust) Pty Ltd, Draft Report for 18-22 Hamlet Street, Cheltenham, Fate and Transport Modelling |
| GHD Pty Ltd | December 2008 | Nuplex Industries (Aust) Pty Ltd, Report for 18-22 Hamlet Street, Cheltenham, Soil and Groundwater Investigation |

## 3.3 Consultation with Expert Support Team Members

In conducting this environmental audit, the auditor used the following members of his nominated specialist team (in accordance with EPA Publication 865.12):

- Dr Rory Lane (BlueSphere Environmental Pty Ltd), in the field of human health and ecological risk assessment relating to Site contamination;
- Mr Darren Ellis (BlueSphere Environmental Pty Ltd), in the field of hydrogeology; and
- Mr Daniel Hirth (BlueSphere Environmental Pty Ltd), in the fields of hydrogeology and remedial technologies and geotechnology.

Additional support and assistance in conducting the audit were also provided by the following BlueSphere personnel:

- Louise McMahon – Associate Environmental Scientist;
- Stefan Voorham – Environmental Engineer; and
- Jake Hopkins – Environmental Engineer.

## 3.4 Site Inspections

The auditor and/or his representatives inspected the Site on the following dates over the course of the audit:

**Table 6 Summary of Site Inspections**

| Date | Personnel | Activities |
|---|---|---|
| 4 July 2018 | Michael Seignior<br>Daniel Hirth<br>Louise McMahon | General Site inspection with Andrew Johnston of Chandos Bay and representatives of ARC |
| 10 July 2018 | Louise McMahon<br>Stefan Voorham | Auditor verification groundwater sampling and observation of the soil vapour pin installation and sampling procedures completed by ARC |
| 7 August 2018 | Louise McMahon | Groundwater well gauging |
| 29 August 2018 | Louise McMahon | Observation of the Site following demolition of warehouse buildings and removal of concrete hardstand |
| 31 August 2018 | Louise McMahon | Observe test pit sampling following removal of concrete hard stand |
| 8 November 2018 | Louise McMahon | Observe current Site condition |
| 17 June 2019 | Jake Hopkins | Auditor verification groundwater sampling from newly installed MW59 |
| 26 August 2019 | Michael Seignior | Observations of Site conditions – Site development had been completed and commercial operation had commenced (Dan Murphy's liquor store). |
| 16 October 2019 | Louise McMahon | Observe thickness of clean fill material imported onto the Site |

# 4 Environmental Setting and Site History

## 4.1 Topography

The topography at the Site is predominantly flat with a slight slope to the west to south-west. The topographical map for the Site indicates the Site is located at approximately 38 m AHD. Groundwater well survey details show that the elevation decreases from 38.89 m AHD in the north-eastern corner of the Site at MW20 to 38.46 m AHD in the south-western corner at MW21. Regional topography slopes towards Port Phillip Bay which is located approximately 2.7 km south-west of the Site.

## 4.2 Surface Water

The nearest natural surface water body is Port Phillip Bay located 2.7 km south-west of the Site. There are numerous man-made lakes located at golf courses and reserves in the near vicinity of the Site, however, Port Phillip Bay is considered to be the discharge point for groundwater beneath the Site.

## 4.3 Regional Geology and Hydrogeology

### 4.3.1 Structure and Stratigraphy

The Geological Survey of Victoria (1:63,360 Ringwood map sheet 1981) indicates the regional surficial geology is Upper Tertiary-aged Sandringham Sandstone, and Quaternary-aged swamp deposits, sand hills and ridges. This is depicted on Figure 1 below with the approximate location of the Site outlined.

Based on a review of the available literature (Vandenberg 1997; Leonard 1979 and 2006; Abele 1977; Thompson and Harris 1972, Geoscience Australia 2016), the regional geology can be summarised as follows (from shallowest to deepest):

- Quaternary age undifferentiated lagoon (lake) and swamp deposits, comprising silt and clay, with minor amounts of peat and rarely dolostone; and sand dunes and ridges.
- Early Pliocene to Late Miocene age Sandringham Sandstone Group non-marine sands, sandy clay, silt, gravel; locally altered to quartzite ("grey billy") and porcellanite. The Red Bluff Sand Formation comprises part of the Sandringham Sandstone Group, which consists of sandstone, conglomerate: pale yellow and brown; fine to coarse-grained, massive to well bedded; cross bedded; local ironstone; The Red Bluff Sand Formation is Pliocene to Miocene age.
- Late Miocene to Oligocene age Gellibrand Marl Formation marine shelf deposits: clay, marl and worm-burrowed calcarenite, fine to medium grained quartz and detrital calcareous fossil fragments in clay matrix, moderately sorted, massive to well bedded.
- Oligocene to Eocene age Werribee Formation sand, sandy and silty clay, with pyritic and lignitic bands.

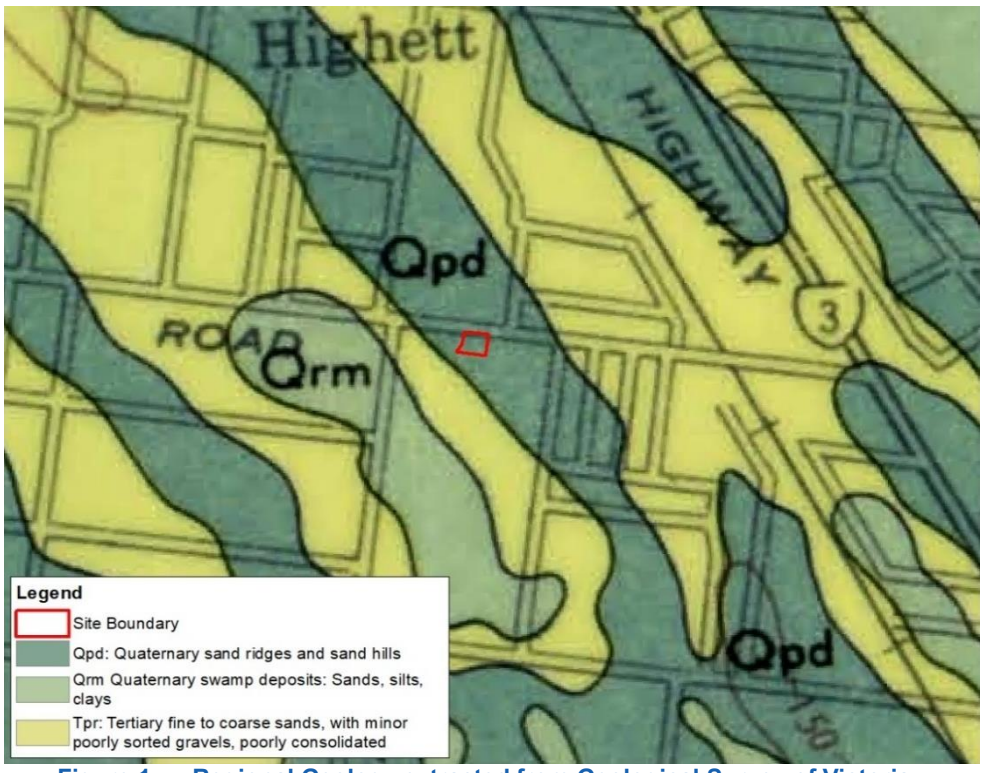



**Figure 1 Regional Geology extracted from Geological Survey of Victoria (1:63,360 Ringwood Map sheet, 1981)**

### 4.3.2 Aquifer and Aquitards

The Site is located within the Port Phillip Basin. The upper most aquifer beneath the Site is the Sandringham Sandstone Aquifer (referred to herein as the SSA). This aquifer is described as consisting of sand, gravel and clay and generally ranges in thickness from 0 to 19 m below ground level (BGL) regionally (Department of Environment, Land, Water and Planning (DELWP) 2019). Multiple water bearing zones exist within the SSA (comprising the upper and lower SSA). The SSA is underlain by the Gellibrand Marl Formation, occurring between the depths of 19 and 63 m BGL, and the Werribee Formation Aquifer, occurring between 63 and 67 m BGL (DELWP 2019).

The SSA is unconfined to semi-confined. Leonard (1992) reports that the SSA and Gellibrand Marl Formation are regionally hydraulically connected and behave as a single aquifer system and there is typically downward percolation from the SSA into the Gellibrand Marl Formation. Regionally the depth to groundwater in the SSA is approximately 6 to 10 m BGL. The regional groundwater flow direction is to the south-west towards Port Phillip Bay which is located approximately 2.7 km from the Site.

### 4.3.3 Groundwater Quality and Use

The DELWP Groundwater Resource Report indicates the salinity of the groundwater beneath the Site is expected to be <500 mg/L total dissolved solids (TDS). Regionally, groundwater salinity within the water table aquifer has been reported as ranging between 730 and 1,800 mg/L TDS (Resolve 2019). While TDS values measured on-Site ranged between 87 and 3,262 mg/L. The measured TDS concentrations would conservatively classify the groundwater as Segment A1 (using the lowest measured TDS concentration) in accordance with the SEPP (Waters).

Resolve reported an absence of salinity data for the Upper Mid-Tertiary Aquitard (Gellibrand Marl) and salinity values that range between 1,001 mg/L to 3,500 mg/L TDS for the underlying Werribee Formation.

A search undertaken in July 2018 of the DELWP Water Management Information System and Visualising Victoria's Groundwater online tool (Appendix A of Resolve 2019) identified 280 registered groundwater bores within a 2 km radius of the Site. A review of data undertaken on the

20 August 2019 identified 383 registered groundwater bores within 2 km of the Site. Of the identified groundwater monitoring bores:

- 36 were registered for stock and domestic use;
- 27 for irrigation;
- 3 for industrial;
- 137 for groundwater investigation;
- 11 for underground disposal; and
- 117 for groundwater observation purposes.

The remaining bores are listed as miscellaneous or unknown use.

The closest bore registered for domestic and stock use (Bore ID: WRK059611) is located along Chandos Street approximately 213 m south of the Site and was installed in 2011. It is not clear which business the bore is associated with. Given the fairly recent installation and depth (65 m), Resolve considered it possible that it is being used for the registered purpose.

## 4.4 Local Geology

The 1:63,360 geological map of the area (Geological Survey of Victoria, 1981) indicates that the Site is directly underlain by Quaternary sand ridges and sand hills, which in turn overlies Red Bluff Sand sediments of the Sandringham Sandstone Group. Bore logs from the Site indicate that this predominantly comprises clayey sand and sandy clay.

Site geology is provided in Resolve 2019 with general observations confirmed by the auditor. Site geology is broadly consistent with what would be expected from the region and is summarised in **Table 7** below. A cross-section depicting the Site geology is provided in **Figure F2** (note that the alignment of this cross-section is east-to-west rather than west-to-east).

**Table 7 Site Specific Geology**

| Approximate Depth (From/to) m BGL | Soil Type | Lithological Description / Observations |
|---|---|---|
| 0.0 – 0.15 | Concrete/asphalt | The surface is covered with a concrete slab beneath the constructed building and asphalt in car parking areas. Garden beds are present around the boundary and within the car parking area. |
| 0.15 – 0.7 (deeper in areas of former facilities) | Fill | Gravelly SAND, SAND and sandy GRAVEL, pale grey to dark grey and brown, medium dense to dense, fine to coarse grained. |
| 0.7 – 4.0 | Sandy Clay | Grey brown to reddish brown with orange and red/brown mottling, medium stiff to very stiff, low plasticity, homogeneous. |
| 4.0 - 7.0 | Clayey Sand | Red brown and light brown to grey, medium dense to dense, fine to coarse grained. Pale yellow brown from 3.3 m BGL. |
| 7.0 – 19.5 | Sand | Yellow brown and reddish brown, medium dense, fine to coarse grained. |
| 19.5 – 20.5 | Sandy Silt | Low plasticity, some clay |
| 20.5 – 23.5 | Silty Sand | Light brown, fine grained |

Table 7 Site Specific Geology

| Approximate Depth (From/to) m BGL | Soil Type | Lithological Description / Observations |
|---|---|---|
| 23.5 – 25.5 | Silty sand /Sandy Silt | Olive brown/dark grey, fine grained, moisture decreasing with depth |

## 4.5 Local Hydrogeology

The hydrogeology at the Site, as observed from the various groundwater monitoring events (GMEs) conducted to date, is broadly consistent with what would be expected based on the regional setting.

The groundwater assessment program for both on and off-Site monitoring wells was limited to the SSA. The deepest groundwater well installed directly down-gradient of the Site to a depth of 25 m BGL (i.e. MW59) intercepted grey sandy silts, however, the expected clays of the Gellibrand Marl formation were not intercepted.

The watertable at the Site is typically at an elevation of 8.5 to 10.5 m BGL within the SSA. A discontinuous perched aquifer was also identified on-Site at a depth of approximately 0.5 to 1.0 m BGL in the Quaternary-aged sand hills and ridges, where the water is held above the clayey lithology of the upper SSA. The perched aquifer is likely ephemeral, present only following times of high rainfall.

The overall groundwater flow within the SSA is interpreted to be towards the south-west within the Site vicinity, consistent with the regional flow regime. However, the water table gradient is very flat and highly susceptible to external influences such as leaking services. The hydraulic gradient at the Site is conservatively estimated to be 0.002. Inferred groundwater contours are presented in **Figure F3.**

Field measured TDS concentrations reported on Site ranged between 87 mg/L to 3,262 mg/L (refer to Section 7.1.2 of Resolve 2019).

### 4.5.1 Site Groundwater Monitoring Network

Throughout the various stages of groundwater assessment at the Site, there have been up to 14 groundwater monitoring wells, both on and off-Site, available to characterise local groundwater conditions. Details of the well network as at the conclusion of the assessment program is documented in Appendix W of Resolve 2019, by which time a number of wells had been lost or destroyed as a result of construction activities. The monitoring well network utilised for the GMEs during the audit is shown on **Figure F4**.

The monitoring well network included eight on-Site wells, one off-Site up-gradient well and five off-Site down-gradient wells. In addition, there were five wells located on-Site which were decommissioned prior to the investigations for the audit commencing. There is also a broader monitoring well network associated with the adjacent properties to the south which make up the remainder of the former Nuplex facility.

## 4.6 Usage of Site and Surrounding Land

### 4.6.1 Current Site Usage and Other Relevant Features

The Site comprises Lot 1 of the former Nuplex chemical storage facility. The Site has recently been subject to redevelopment and is now used for a liquor retail outlet (Dan Murphy's), comprising commercial building, sealed car park area and peripheral unsealed garden beds. No basements are constructed on the Site. The current Site layout is shown in **Figure 2** below.



**Figure 2 Current Site Layout (Source: Nearmap, Image from 28 January 2020)**

Development of the Site was able to be completed prior to completion of the environmental audit as it was not a requirement of the Planning Permit (provided in **Appendix D**). The environmental audit of the Site is a requirement of a Clean Up Notice (provided in **Appendix E**).

### 4.6.2 Historical Usage

#### 4.6.2.1 On-Site

The historical uses of the Site are discussed in Section 3 of ARC 2017 and are summarised in **Table 8** below.

**Table 8 Historical Site Use**

| Year | Site Use |
|---|---|
| Circa 1930s to 1945 | The Site formed part of a 10 acre parcel of land owned by a grazier, it is assumed to have been used for this purpose. |
| 1945 to 1960 | The Site was owned by a builder. |
| 1960 to 1974 | The Site was used by the same owner as previous for furniture manufacture. |
| 1974 to 1983 | A real estate developer owned the Site and there is anecdotal evidence that the Site was used for boat/yacht storage/building/repairs. |
| 1983 to 1992 | The ownership of the Site was consolidated with the other three lots of the property owned by Searle Australia in 1983. Searle Australia used the property for chemical handling, storage and distribution. |
| 1992 to 1997 | Ownership of the Site was transferred to Clyde Industries and used for the same purpose. |

**Table 8 Historical Site Use**

| Year | Site Use |
|---|---|
| 1997 to 2002 | Asia Pacific Specialty (APS) Chemicals purchased the property in 1997 to use for the same purpose. |
| 2002 until 2016 | Nuplex Industries Australia Pty Ltd purchased the Site and continued its use for chemical handling, storage and distribution until it ceased operation in 2016. |

Warehouses were present on the Site between at least 1960 and 2018. The northern warehouse was referred to as the non-toxic store and was used by Nuplex for Class 5.1 (oxidising) & Class 9 (organic peroxides) chemical storage. The eastern warehouse was referred to as the indoor acid store and was used by Nuplex for Class 8 chemical storage (corrosive substances).

A former drum storage area occupied the majority of the south-western and south-central portions of the Site where cracked and leaking drums were reportedly stored on a gravel surface prior to the late 1970s/early 1980s. Historical documents indicate that the western portion of the Site (bordering Hamlet Street) where the drum storage area was located appeared to have been unsealed until approximately 1981. Drums containing trichloroethene (TCE), trichloroethane, dichloromethane (DCM) and chloroform (CF) were historically imported onto the Site. Associated with the drum storage area was a chloroform flocculation area, two former above-ground storage tanks (AGSTs), triple interceptor tank (TIT) and a disposal pit for waste lead acid batteries.

The former layout of the Site is shown in Figure 2 of Resolve 2019. An extract of that figure is shown below.

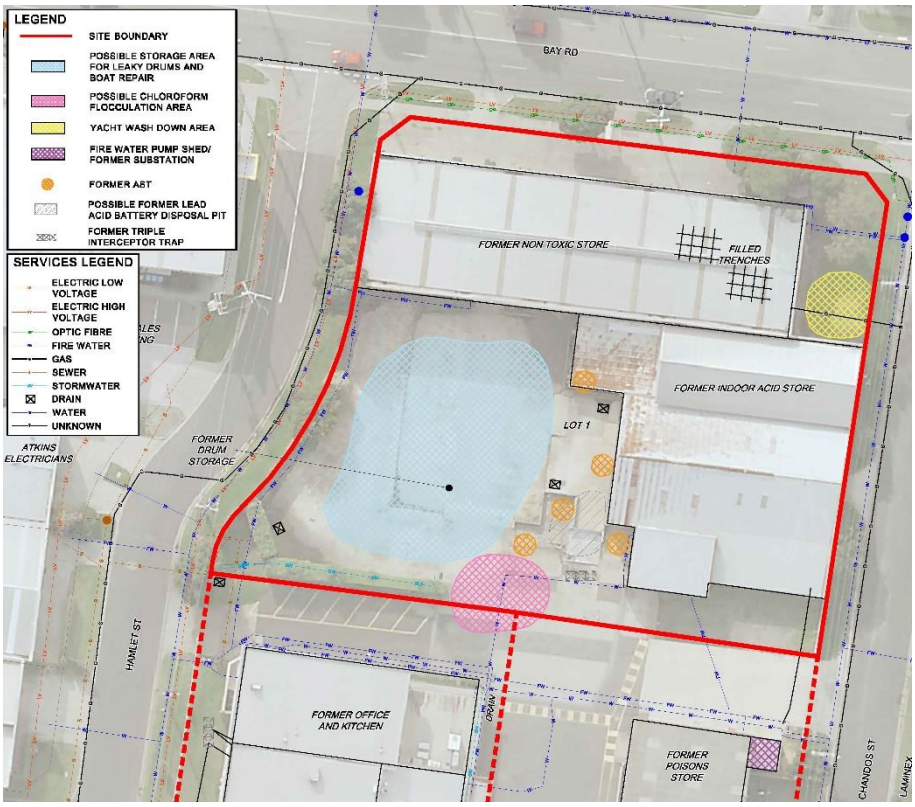



**Figure 3 Former Site Layout (Source: Resolve 2019, Figure 2)**

#### 4.6.2.2 Off-Site

Based on the historical aerial photographs provided in Section 3.1.2 of ARC 2017, the area adjacent to the Site appeared to be used for grazing/agricultural uses until circa 1950s when a mix of commercial and industrial properties began construction in the area. By the late 1950s residential properties had been developed approximately 50 m to the north-east and 150 m to the east with further commercial and industrial buildings constructed, including what is now the Laminex facility directly east of the Site across Chandos Street. The buildings on the remainder of the former Nuplex facility (Lots 2, 3 and 4) were constructed between 1957 and 1974.

## 4.7 53V Environmental Audit

A 53V environmental audit for the entire Nuplex property (i.e. Lots 1 to 4) was completed in September 2011 by Mr Anthony Lane (EPA CARMS No. 62617-1). It was concluded that insufficient investigations had been undertaken at the time in the area subject to this audit to determine whether groundwater contamination sources were present on the Site (former Lot 1 of the facility).

Recommendations were made for further investigations across the Nuplex property and for a revised monitoring well network. The auditor concluded that the beneficial uses of land were found to be protected for commercial and industrial uses assuming the current configuration of buildings remained largely unaltered, however, there were potential risks from vapour impacts for underground maintenance workers, or if the property were to be redeveloped.

## 4.8 Environmental Audits Completed in the Site Vicinity

### 4.8.1 53X Environmental Audits

Three environmental audit reports have been completed within 500 m of the Site; these are:

- 7-13 Graham Road, Highett (130 m north) (EPA Ref. 36024-1 and -2);
- 33 Jack Road Cheltenham (310 m south) (EPA Ref. 72448-1); and
- 1136-1138 Nepean Highway, Highett (450 m north-east) (EPA Ref. 37308-2).

The findings of the audit reports have been summarised in Section 2.2.10 of ARC 2017. Although none of these properties are considered to be sources of off-Site contamination at the Site, the groundwater investigations undertaken as part of the audits of the Jack Road and Nepean Highway properties provide relevant information relating to regional groundwater conditions which was utilised in **Section 6.3.2** (no groundwater investigation was undertaken as part of the Graham Road audit).

In addition to the audits listed above, it is understood that the remaining three lots of the former Nuplex facility are also currently subject to audit and that a Groundwater Quality Restricted Use Zone (GQRUZ) has been declared for Lot 3. Reports for these audits were not publicly available at the time this audit report was completed.

## 4.9 Proposed Future Use

The Site has recently undergone redevelopment and is currently used for commercial activities as a liquor retail outlet (Dan Murphy's). It is expected that the land will continue to be used for commercial purposes for the foreseeable future.

# 5 Beneficial Uses

## 5.1 Land

### 5.1.1 Regulatory Framework

The SEPP (Prevention and Management of Contamination of Land), 2002 (amended 2013), hereafter referred to as the 'SEPP (PMCL)', sets out the regulatory framework for the prevention and management of contaminated land within the State of Victoria. The goal of the policy is:

> "*to maintain and where appropriate and practicable improve the condition of the land environment sufficient to protect current and future beneficial uses of land from the detrimental effects of contamination by:*
>
> *(a) preventing contamination of land; and*
>
> *(b) where pollution has occurred, adopting management practices that will ensure:*
>
> *(i) unacceptable risks to human health and the environment are prevented; and*
>
> (ii) *pollution is cleaned up or otherwise managed to protect beneficial uses.*"

The SEPP (PMCL) identifies land use categories and protected beneficial uses for each of these categories. Land (soil) is considered polluted where current and/or future protected beneficial uses for the relevant land use categories are precluded. Beneficial uses of land are considered precluded when relevant soil quality objectives set out in the SEPP (PMCL) for those beneficial uses have been exceeded.

### 5.1.2 Likely Land Uses

The following categories of use of the land environment are identified in the SEPP (PMCL):

- Parks and reserves: consisting of parks and forested areas as identified in any Victorian or Commonwealth legislation or subordinate legislation or any regions designated by the Authority or department of natural resources and environment;
- Agricultural: consisting of rural areas involved in agricultural or horticultural practices;
- Sensitive Use: consisting of land used for residential use, a childcare centre, pre-school, or primary school. A sensitive use may occur in an area of high density (where development makes maximum use of available land space and there is minimal access to soil) or in other lower density areas (where there is generally substantial access to soil);
- Recreation/Open Space: consisting of general open space and public recreation areas;
- Commercial: consisting of a range of commercial and business activities; and
- Industrial: consisting of utilities and a range of industrial activities.

The Site was historically used for commercial purposes and is intended to continue to be used for commercial uses in the future. This land is currently zoned as 'Commercial 2 Zone' and is classified as "Commercial" under the SEPP (PMCL).

As one of the intents of the audit is to determine suitability of the Site for all beneficial uses of land, soil contaminant concentrations were compared against the criteria relevant for low/high density residential, recreational and commercial/industrial land use.

### 5.1.3 Protected Beneficial Uses

All protected beneficial uses of land must be considered when undertaking a contaminated land environmental audit and when determining whether to issue a Certificate or Statement of Environmental Audit for a site. In accordance with the SEPP (PMCL) they are:

- Maintenance of ecosystems (natural, modified and highly modified);
- Human health;
- Buildings and structures;
- Aesthetics; and
- Production of food, flora and fibre.

### 5.1.4 Soil Quality Objectives

The ASC NEPM provides a range of Ecological Investigation Levels (EILs) and Health Investigation Levels (HILs) for the assessment of contaminated land. In accordance with the SEPP (PMCL), soil quality objectives for protected beneficial uses were primarily sourced from the NEPM. The specific objectives used for each protected beneficial use identified in **Section 5.1.3** are described in the following sections and adopted soil quality objectives are presented in Section 7.2.1 of Resolve 2019 (**Appendix C**).

#### 5.1.4.1 Maintenance of Ecosystems

The SEPP (PMCL) states that "*contamination must not adversely affect the maintenance of relevant ecosystems*" and the indicator level must not be greater than any regional ecological investigation level developed in accordance with the NEPM.

Schedule B(1) of the NEPM provides a range of investigation levels for the protection of ecosystems, referred to as EILs. The NEPM states the following investigation levels for the protection of ecosystems:

- Generic EILs for arsenic, lead, (dichlorodiphenyltrichloroethane) DDT and naphthalene.
- A methodology for derivation of site-specific EILs for nickel, chromium (III), copper and zinc using the methodology defined in the NEPM. The methodology derives site-specific values using soil characteristics.
- The EILs do not currently discern between natural, modified and highly modified ecosystems, as defined in the SEPP (PMCL).
- Ecological Screening Levels (ESLs) have been derived for benzene, toluene, ethylbenzene and xylenes (BTEX), benzo(a)pyrene (B(a)P) and petroleum hydrocarbon fractions.

To meet the requirements for the audit, EILs/ESLs for urban residential/public open space use (80% species protection) and commercial/industrial use (60% species protection) have been adopted. Calculated site-specific EILs for nickel, chromium (III), copper and zinc, are presented in Appendix Q of Resolve 2019. To calculate the EILs, Resolve utilised data from the entire Nuplex facility to obtain average concentrations for physicochemical properties. In addition, Site-specific EILs have been calculated utilising the data obtained from the Site only.

The average concentrations of physicochemical properties of the samples collected from Lot 1 of the former Nuplex facility (the Site) are provided in **Table 9**, below. The averages were utilised in the EIL calculations. The calculated Site-specific EILs for natural soil are provided in **Table 10**.

**Table 9 Physicochemical Properties**

| Parameter | Average of Site Data |
|---|---|
| % Clay | 37.75 |

**Table 9 Physicochemical Properties**

| Parameter | Average of Site Data |
|---|---|
| pH | 6.75 |
| Cation exchange capacity (meq/100g) | 6.8 |
| Total organic carbon (%) | 0.16 |

**Table 10 Site-specific EILs**

| Parameter | Adopted Urban residential and public open space EIL Concentrations (mg/kg) | Adopted Commercial and industrial EIL Concentrations (mg/kg) |
|---|---|---|
| Arsenic | 100 | 160 |
| Chromium (III) | 630 | 1,000 |
| Copper | 60 | 80 |
| DDT | 180 | 640 |
| Lead | 1,100 | 1,800 |
| Naphthalene | 170 | 370 |
| Nickel | 70 | 120 |
| Zinc | 340 | 500 |

The NEPM also provides ESLs for total petroleum hydrocarbons (TPH), BTEX and B(a)P. The ESLs depend on soil type (coarse or fine grain soil) and land use scenario. Conservatively, the ESLs for coarse grained soil have been adopted for both urban residential/public open space and commercial/industrial land uses.

#### 5.1.4.2 Human Health

The SEPP (PMCL) states that "*contamination must not cause an adverse effect on human health*…"

Schedule B(1) of the NEPM provides a range of investigation levels for the protection of human health, referred to as HILs, and provides Health Screening Levels (HSLs) for BTEX, naphthalene and petroleum hydrocarbons. HILs and HSLs are provided for four exposure settings based on land use. These are:

- Setting A – Residential with garden / accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), also includes children's day care centres, preschools and primary schools.
- Setting B – Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats.
- Setting C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as

urban bushland and reserves) which should be subject to a site-specific assessment where appropriate.

- Setting D – Commercial / industrial such as shops, offices, factories and industrial sites.

It is emphasised that HILs/HSLs are not intended for use as default remediation trigger criteria, but rather intended to prompt an appropriate site-specific assessment of risk when they are exceeded.

Based on the commercial development at the site, the HILs/HSLs for Setting D have been adopted for this assessment. However, as all land use scenarios must be considered to satisfy the requirements of the Environmental Audit, the results have also been compared to Setting A to C.

Resolve adopted NEPM HSLs for asbestos in soils for bonded asbestos containing material (ACM) and friable asbestos. Given the prevalence of ACM found to be present in the surface soils (as described in subsequent sections of this audit report), and given the hazardous nature of asbestos exposure, management measures to minimise exposure to fill material was subsequently adopted (also described in subsequent sections).

### Site-Specific Risk-Based Criteria

In order to facilitate the completion of the environmental audit, a human health risk assessment (HHRA) was completed by EnRisks (EnRiskS 2018). A primary output of this assessment was the derivation of Site-specific risk-based criteria for soil and groundwater for the proposed commercial and open space land uses, which does not include a basement. A copy of the risk assessment is provided in Appendix R of Resolve 2019 (**Appendix C**).

The auditor, together with his nominated expert support person in the field of human health and ecological risk assessment (Dr Rory Lane), reviewed the EnRisks risk assessment. On the basis of this review, the auditor is satisfied that the risk assessment methodology was sound.

Risk-based criteria (RBC) were derived for the contaminants of potential concern (CoPC) either found to be present or considered to be potentially present in soil to address potential risks to human health due to the vapour inhalation exposure pathway. The auditor is satisfied that the risk assessment methodology was sound and the RBC were suitably protective.

The RBC for soil are summarised in Section 7.2.1 of Resolve 2019 and are reproduced in **Table 11**. These CoPC are discussed further in **Section 6**.

**Table 11 Risk-Based Criteria for Soil**

| CoPC | Commercial/Industrial RBC (mg/kg) | | Open Space RBC (mg/kg) |
|---|---|---|---|
| | Slab on grade: warehouses | Slab on grade: multistorey offices | |
| Trichloroethene | 3 | 0.008 | 60 |
| Tetrachloroethene | 350 | 1 | 5,800 |
| Dichloroethene, 1,2-cis | 16 | 0.06 | 270 |
| Dichloroethene, 1,2-trans | 81 | 0.3 | 2,000 |
| Carbon tetrachloride | 3 | 0.009 | 93 |
| Chloroform | 180 | 0.6 | 2,700 |
| Chlorobenzene | 6,500 | 20 | 39,000 |
| Dichloroethane, 1,1- | 270 | 1 | 5,500 |
| Dichloroethylene, 1,1- | 110 | 0.4 | 4,100 |
| Trichloroethane, 1,1,1- | 5.3 | 16 | 140,000 |
| Trichloroethane, 1,1,2- | 250 | 0.8 | 1,400 |
| Trichlorofluoromethane | 480 | 2 | 20,000 |

**Table 11 Risk-Based Criteria for Soil**

| CoPC | Commercial/Industrial RBC (mg/kg) | | Open Space RBC (mg/kg) |
|---|---|---|---|
| | Slab on grade: warehouses | Slab on grade: multistorey offices | |
| Vinyl chloride | 1 | 0.004 | 11 |
| Dichloroethane, 1,2- | 26 | 0.1 | 220 |
| Dichloroethane, 1,2- | 26 | 0.1 | 220 |

In addition, EES completed a Solute Fate & Transport Assessment for the Site in May 2018. An output of this assessment was the derivation of Site-specific vapour criteria for both slab on grade and three level basements for warehouses and residential properties. A copy of this assessment is provided in Appendix T of Resolve 2019 (**Appendix C**).

The auditor, together with his nominated expert support person in the field of human health and ecological risk assessment (Dr Rory Lane), reviewed EES' Site-specific vapour criteria and on the basis of this review, the auditor is satisfied that the risk assessment methodology was sound.

#### 5.1.4.3 Management Limits

In addition to appropriate consideration and application of the HSLs and ESLs, the NEPM provides 'Management Limits' for petroleum hydrocarbon compounds from fuel sources which reflect their nature and properties, including the consideration of:

- formation of observable light non-aqueous phase liquids (LNAPL);
- fire and explosive hazards; and
- effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons.

The application of these limits requires consideration of site-specific factors such as depth of building basements and services and depth to groundwater.

#### 5.1.4.4 Buildings and Structures

The SEPP (PMCL) states, "*Contamination must not cause the land to be corrosive to or adversely affect the integrity of structures or building materials*". The potential for the condition of soils at the Site to adversely impact upon buildings includes:

- Elevated sulfate concentrations or acidic (low pH) soil conditions which are detrimental to some concrete structures.
- Ingress of contaminants into subterranean service lines (such as ingress into water supply pipelines).

No soil quality objectives are referenced for the protection of this beneficial use within the SEPP (PMCL). In order to assess whether this beneficial use is being protected at the Site, reference to the Australian Standard 2159-2009 'Piling Design and Installation' has been made.

#### 5.1.4.5 Aesthetics

The SEPP (PMCL) states "*Contamination must not cause the land to be offensive to the senses of human beings*".

The SEPP (PMCL) does not provide soil quality objectives for this beneficial use. In accordance with the NEPM, aesthetics is to be considered on a subjective basis by considering characteristics such as the presence of offensive odours, discoloured soils etc.

#### 5.1.4.6 Production of Food, Flora and Fibre

The SEPP (PMCL) states "*Contamination of land must not:*

*a) Adversely affect produce quality or yield; and*

b) *Affect the level of any indicator in food, flora and fibre produced at the site (or that may be produced) such that the level of that indicator is greater than that specified by the Australia New Zealand Food Authority, Food Standards Code*."

The SEPP (PMCL) does not provide soil quality objectives for this beneficial use. In their absence, EILs/ESLs have been adopted to assess protection of this beneficial use.

As discussed above Site specific EILs were calculated and are presented in **Section 5.1.4.1** and in Section 7.2.1 and Appendix Q of Resolve 2019.

## 5.2 Groundwater

### 5.2.1 Regulatory Framework

The State Environment Protection Policy (Waters), 2018 (SEPP (Waters)), is subordinate legislation to the *Environment Protection Act 1970* and sets out the regulatory framework for the protection of surface water and groundwater in the State of Victoria. The objectives of the policy are to:

- *"achieve the level of environmental quality required to protect the beneficial uses of waters; and,*
- *ensure that pollution to waters from both diffuse and point sources is managed in an integrated way to deliver the best outcome for the community as a whole; and,*
- *protect and improve environmental quality through consistent, equitable and proportionate regulatory decisions that focus on outcomes and use the best available information."*

The SEPP (Waters) defines a range of protected beneficial uses for defined segments of the groundwater environment. The segments are based on background groundwater salinity as measured by TDS.

The Authority (i.e. the EPA) may determine that a protected beneficial use does not apply to groundwater if any of the following apply:

*"(a) there is insufficient aquifer yield to sustain the beneficial use;*

*(b) the application of groundwater, such as for irrigation, may be a risk to beneficial uses of land or the broader environment due to the soil properties;*

*(c) the beneficial use specified in the definition of water dependent ecosystems and species relates to stygofauna and troglofauna;*

*(d) the background level of an environmental quality indicator would not provide for the protection of the beneficial use."*

Groundwater is considered to be polluted where the objectives (e.g. concentration thresholds) for indicators (e.g. chemicals) of a beneficial use are exceeded, or where non-aqueous phase liquid is present.

Where groundwater has been polluted it must be cleaned up such that the protection of beneficial uses is restored, or so far as reasonably practicable and consistent with any relevant guidelines published or approved by the EPA.

### 5.2.2 Groundwater Segment and Beneficial Uses

As discussed in **Section 4.3.3**, groundwater at the Site is considered by the auditor to be conservatively classified as Segment A1, for groundwater with TDS 0 to 600 mg/L in accordance with SEPP Waters. This determination is consistent with observed TDS concentrations at the Site. The beneficial uses of groundwater to be protected under **Segment A1** (as defined under the SEPP Waters) are as follows:

- Water dependent ecosystems and species.
- Potable water supply (desirable);
- Potable mineral water supply;
- Agriculture and irrigation (irrigation);
- Agriculture and irrigation (stock watering);
- Industrial and commercial;
- Water-based recreation (primary contact recreation);
- Traditional Owner cultural values;
- Cultural and spiritual values;
- Buildings and structures; and
- Geothermal properties.

### 5.2.3 Groundwater Quality Indicators and Objectives

Groundwater quality indicators and objectives for the protection of beneficial uses are provided in Schedule 3 of the SEPP (Waters) and are derived principally from the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC and ARMACANZ 2000).

The specific objectives used for each relevant protected beneficial use identified in **Section 5.2.2** are described in the following sections and are presented in Section 7.2.2 in Resolve 2019.

It should be noted that Section 17(3)(a) of the SEPP (Waters) states that groundwater quality indicators and objectives specified will apply to all groundwater, except where the natural background level of a groundwater quality indicator is greater than the objective, in which case the natural background level will become the objective.

#### 5.2.3.1 Water Dependant Ecosystems and Species

The SEPP (Waters) specifies indicators and objectives in ANZECC/ARMCANZ (2000). Based on the inferred groundwater flow direction and potential surface water receptors (see **Section 4.3.2**), the Central East section of the Port Phillip Bay is considered a likely point of discharge for groundwater at the Site. The Site's likely natural groundwater discharge points fall within the Central East (Port Phillip Bay) segment of the SEPP (Waters).

While there are terrestrial groundwater dependant ecosystems identified in the Cheltenham area (BOM, 2019), the closest of these are located approximately 1.2 km south of the Site and are restricted to the vegetation in these areas. The indicators and objectives outlined below are considered to be applicable for these ecosystems.

The relevant environmental quality indicators for toxicants both require 95% species protection levels as set out in the ANZECC/ARMCANZ (2000) guidelines. Where high and moderate reliability trigger values for a 95% level of protection are not available in ANZECC/ARMCANZ (2000), low reliability trigger values have been used. These low reliability trigger values have been used as an indicative interim working level only in accordance with ANZECC/ARMCANZ (2000).

In accordance with Section 13.2 of EPA Publication 759.3, groundwater quality objectives for the protection of water dependent ecosystems should be applied to groundwater at the point of discharge to a surface water body.

#### 5.2.3.2 Potable Water Supply (Desirable)

The applicable water quality guidelines for the beneficial use of potable water supply are provided in NHMRC and NRMMC *Australian Drinking Water Guidelines, version 3.5 updated August 2018* (2011).

#### 5.2.3.3 Potable Mineral Water Supply

The beneficial use of mineral water supply is regulated under the *Australia New Zealand Food Standards Code – Standard 2.6.2 – Non-alcoholic beverages and brewed soft drinks* (FSANZ 2017), which reference the World Health Organisation *Guidelines for drinking-water quality, 4th edition* (2017). The SEPP (Waters) also identifies the requirement to meet the aesthetic guideline values of the NHMRC and NRMMC *Australian Drinking Water Guidelines* (2018).

However, this beneficial use is not considered to be applicable (and has therefore not been considered further as part of this environmental audit) as the Site is not located within an identified mineral springs water supply area and groundwater is not naturally effervescent.

#### 5.2.3.4 Agriculture and Irrigation (Irrigation)

Consistent with requirements set out in SEPP (Waters), objectives provided in Section 4.2 of ANZECC/ARMCANZ (2000) have been adopted for the irrigation beneficial use. The guidelines specify both Long Term Trigger Values (LTVs) and Short-Term Trigger Values (STVs) for water used for irrigation, defined as follows:

- LTV: the maximum contaminant concentration which can be tolerated assuming 100 years of irrigation.
- STV: the maximum contaminant concentration which can be tolerated for a shorter period of time (20 years).

For conservatism, LTVs were considered appropriate for assessment of this beneficial use.

#### 5.2.3.5 Agriculture and Irrigation (Stock Watering)

Consistent with requirements set out in SEPP (Waters), indicators and investigation levels from ANZECC (2000) have been adopted. Since the guideline considers numerous livestock types, the most conservative stock watering values within the ANZECC guidelines were selected. Where no criteria are available for organics, Australian Drinking Water Guidelines are adopted.

#### 5.2.3.6 Industrial and Commercial

The beneficial use of industrial and commercial water has a wide range of potential use requirements. Since no industrial or commercial groundwater use is occurring at or near the Site, it was considered that guidelines which are protective of cooling tower water is appropriate. The cooling water guidelines are sourced from Section 6.1.2 of the ANZECC *Australian Water Quality Guidelines for Fresh and Marine Waters* (1992).

#### 5.2.3.7 Water Based Recreation (Primary Contact Recreation)

The SEPP (Waters) states that the purpose of this beneficial use is to ensure that the surface water quality is suitable for primary contact recreation (e.g. swimming, diving, water skiing, caving and spas), secondary contact recreation (e.g. boating and fishing) and for aesthetic enjoyment.

The ANZECC (2000) – Recreational Water Quality and Aesthetics guidelines have been superseded by Guidelines for Managing Risks in Recreational Water (NHMRC 2008). In accordance with NHMRC (2008), guideline values were derived by multiplying the potable water supply health-based guideline value by a factor of 10. This approach assumes that 200 ml of water is ingested during recreational contact with water, which is one tenth of the daily water consumption rate typically used to estimate drinking water guidelines (i.e. 2000 ml/day). It is noted that this approach assumes that the CoPC does not present a risk via non-ingestion pathways, for example, via skin absorption, inhalation or act as a dermal irritant.

Where necessary, health-based drinking water criteria were utilised for calculation of primary recreational contact guidelines were obtained from the following sources:

- NHMRC, NRMMC 2011. Australian Drinking Water Guidelines, version 3.5 updated August 2018;
- Australian Guidelines for Water Recycling – Phase 2: Augmentation of Drinking Water Supplies (Environment Protection and Heritage Council (EPHC), 2008;

- World Health Organisation (WHO) (2017) Guidelines for Drinking Water Quality Fourth Edition, Addendum 1;
- Drinking Water Standards for New Zealand, New Zealand Ministry Health, New Zealand, 2008; and
- Guidelines for Canadian Drinking Water Quality (Health Canada, 2014).

#### 5.2.3.8 Traditional Owner Cultural Values

The application of water quality objectives that protects the cultural values of Traditional Owners is required to ensure that Traditional Owner cultural practices can continue. Values may include traditional aquaculture, fishing, harvesting and cultivation of freshwater and marine foods, fish, grasses, medicines and filtration of water holes.

While no traditional cultural uses have been identified in the vicinity of the Site, the adoption of ANZECC (2000) – Marine Ecosystems 95% Protection is considered to be protective of this beneficial use.

#### 5.2.3.9 Cultural and Spiritual Values

The application of water quality objectives that protects the cultural and spiritual needs of the community is required to ensure that cultural, spiritual and ceremonial practices can continue. These objectives include the cultural values held by communities (e.g. baptisms, water-based festivals and cultural celebrations).

While no cultural and spiritual values have been identified in the vicinity of the Site, NHMRC (2008) *Guidelines for Managing Risk in Recreational Water* and the hierarchy listed under water-based recreation is considered to be protective of the potential values.

#### 5.2.3.10 Buildings and Structures

The SEPP (Waters) states that groundwater must not become corrosive to structures or building materials, and that the relevant indicators include pH, sulfate, chloride, redox potential, salinity or any chemical substance or waste that may have a detrimental impact on the structural integrity of buildings or other structures.

Objectives of these indicators have been primarily sourced from Australian Standard 2159.2009 (Piling – Design and Installation), in which levels of pH, chloride and sulfate considered to represent mild and / or non-aggressive conditions for concrete or steel piles are specified.

#### 5.2.3.11 Geothermal Properties

The SEPP (Waters) states that no activity must affect the geothermal properties of groundwater; and the specific indicators include temperatures between 30 and 70 degrees Celsius.

However, this beneficial use is not considered to be applicable (and has therefore not been considered further as part of this environmental audit) as the Site groundwater has reported ambient temperatures below the requisite range.

#### 5.2.3.12 Other Sources of Groundwater Quality Objectives

The NEPM includes HSLs for vapour intrusion of petroleum hydrocarbons into buildings from groundwater. The HSL A, HSL B and HSL D were utilised for this assessment. In addition, site-specific risk-based criteria (RBC) were developed for the proposed land use (EnRisks 2018). The auditor, together with his nominated expert support person in the field of human health and ecological risk assessment (Dr Rory Lane), reviewed the EnRisks risk assessment and the groundwater RBC included therein. The auditor is satisfied that the risk assessment methodology was sound and the RBC were suitably protective.

The RBC for the groundwater vapour intrusion pathway are summarised in **Table 12** below.

**Table 12 Risk Based Criteria for Groundwater**

| Parameter | Commercial/Industrial RBC SL (mg/L) | | | | | Open Space RBC (mg/L) | Residential RBC (mg/L) |
|---|---|---|---|---|---|---|---|
| | Slab on grade: warehouses | Slab on grade: multistorey offices | Commercial basement carpark (X levels) | | | | |
| | | | 1 | 2 | 3 | | |
| Trichloroethene | 18 | 8 | 9 | 8 | 8 | S | 0.5 |
| Tetrachloroethene | 1,500 | 720 | 820 | 760 | 690 | S | 45 |
| Cis-1,2-Dichloroethene | 110 | 37 | 42 | 39 | 35 | 7,600 | 2 |
| Trans-1,2-Dichloroethene | 580 | 270 | 310 | 286 | 260 | S | 17 |
| Carbon Tetrachloride | 19 | 10 | 12 | 11 | 10 | S | 0.6 |
| Chloroform | 1,300 | 420 | 470 | 430 | 380 | S | 26 |
| Chlorobenzene | S | 3,500 | 3,900 | 3,600 | 3,200 | S | 220 |
| 1,1 - Dichloroethane | 2,100 | 830 | 940 | 870 | 790 | S | 53 |
| 1,1 Dichloroethylene | 750 | 420 | 490 | 460 | 420 | S | 27 |
| 1,1,1 - Trichloroethane | S | S | S | S | S | S | 1,100 |
| 1,1,2 - Trichloroethane | 1,100 | 150 | 160 | 140 | 110 | S | 10 |
| Trichlorofluoromethane | 1,500 | 940 | 1,100 | 1,000 | 940 | S | 59 |
| Vinyl Chloride | 7 | 4 | 4 | 4 | 4 | 790 | 0.2 |
| 1,2 - Dichloroethane | 160 | 30 | 32 | 28 | 24 | 6,000 | 2 |

*Notes:* *Values denoted with an "S" are derived RBCs that significantly exceed the solubility of the respective volatile organic compound (VOC)*
*The grey shaded cells denotes the adopted criteria*

### 5.2.4 Relevance of Protected Beneficial Uses

Beneficial uses of groundwater may be considered 'relevant' for the purpose of determining whether to issue a Certificate of Environmental Audit, by consideration of the following:

- Whether the beneficial use is either existing (i.e. groundwater is actually being used for that beneficial use in the vicinity of the subject site); or

- Whether the beneficial use is likely to be realised (e.g. groundwater is being used for that beneficial use in the same hydrogeological setting nearby or elsewhere in Victoria, or the existing and likely future land uses both at the site and its vicinity are compatible with the beneficial use).

In determining whether a beneficial use is 'likely' or 'existing', consideration should be given to both registered and unregistered bores. Where a bore is installed and registered for a use, in the absence of evidence to the contrary, that use must be considered existing. Only two protected beneficial uses of Segment A1 groundwater applicable to the Site have been considered as not applicable: potable mineral water supply and geothermal properties.

In the absence of evidence to the contrary, where a bore is registered for stock and domestic use, existing use for the highest protected beneficial use must be assumed.

In accordance EPA Publication 759.3, if groundwater at a site subject to environmental audit is polluted and if the precluded beneficial uses are relevant, then the auditor cannot issue a Certificate of Environmental Audit for the site. However, a Certificate of Environmental Audit may be issued if the precluded beneficial uses are not relevant and the site is not the source of groundwater pollution.

## 5.3 Surface Water

The beneficial uses of surface water are specified in the SEPP (Waters). For the nearest receiving environment for groundwater of Port Phillip Bay, the following beneficial uses for the Port Phillip Bay Segment apply:

- Water dependent ecosystems and species that are largely unmodified;
- Human consumption of aquatic foods;
- Aquaculture;
- Industrial and commercial;
- Water-based recreation (primary contact);
- Water-based recreation (secondary contact);
- Water-based recreation (aesthetic enjoyment);
- Traditional Owner cultural values;
- Cultural and spiritual values; and
- Navigation and shipping.

As there are no surface water bodies located at or in the immediate vicinity of the Site, the potential risk to the beneficial uses of the surface water have been assessed through consideration of risks to the beneficial uses of groundwater, which represents the pathway by which impacts from the Site could impact upon surface water.

## 5.4 Atmosphere

The protected beneficial uses for the air environment (including the atmosphere, climate, odour and aesthetics) are outlined in the SEPP (Air Quality Management) (SEPP (AQM)). The beneficial uses of the air environment are:

- Life, health and the well-being of humans;
- Life, health and the well-being of other forms of life, including the protection of ecosystem and biodiversity;
- Local amenity and aesthetic enjoyment;
- Visibility;
- The useful life and aesthetic appearance of buildings, structures, property and materials; and

- Climate systems that are consistent with human development, the life, health and well-being of humans, and the protection of ecosystems and biodiversity.

The criteria for assessing potential environmental impacts to the air environment have been assessed for this audit through consideration of the HSLs for vapour intrusion as they apply to soil vapour, soil and groundwater samples and the site-specific RBC.

# 6 Site Contamination

## 6.1 Potential Sources of Contamination

On the basis of historical information and assessment data provided in ARC 2017 and Resolve 2019, and observations made during Site inspections by the auditor, the primary sources of contamination from the Site and surrounding area are summarised in **Table 13**, below.

**Table 13 Potential Sources of Contamination**

| Location | Potential Sources / Activity | Contaminants of Potential Concern |
|---|---|---|
| On-Site | Historical boat and yacht building/storage and/or repairs | Metals/metalloids, suspended solids, solvents, ethylene glycol, TPH, BTEX, polycyclic aromatic hydrocarbons (PAHs), acids/alkalis, tributyl tin. |
| | Historical furniture repair/manufacturing | Metals/metalloids, resins, solvents, acrylic, alkyd, epoxy polymers, vinyl acetate, acrylic esters, ethyl propenoate, butyl propenoates, methyl 2-methylpropenoate. |
| | Former use for chemical handling/manufacturing, this includes the former indoor acid store in the eastern portion of the Site and outdoor drum storage area which occupied the south-western and central-western portions of the Site | Metals/metalloids, acids/alkalis, silanes, sulfur, solvents (aliphatic and aromatic hydrocarbons, aldehydes, alcohols, ketones, carboxylic acids, esters, glycols, non-halogenated and halogenated), chloromethane, DCM, phthalate esters, amines, polymers, resins, PAH, (polychlorinated biphenyls) PCB, phenolic compounds, chlorinated hydrocarbons (CHCs), cyanides, sodium salts, mineral acids. |
| | Former bulk petroleum and chemical storage, including former AGSTs in the central-southern portion of the Site | BTEX, total recoverable hydrocarbons (TRH), lead, phenols.<br>Methanol, ammonia, acetone, acids and alkalis.<br>Hydrochloric acid, sodium hydroxide, sodium hypochlorite. |
| | Former chloroform flocculation area in the central-southern boundary of the Site | Chloroform |
| | Former suspected lead battery disposal in the same location as the former AGSTs | Lead, sulfuric acid |
| | Former triple interceptor trap infrastructure in the south-central portion of the Site | Grease, oil, acids/alkalis, CHCs, petroleum hydrocarbons |
| Off-Site | Former chemical storage, distribution and manufacturing at the former Nuplex facility to the south of the Site | Metals/metalloids, acids/alkalis, silanes, sulfur, solvents (aliphatic and aromatic hydrocarbons, aldehydes, alcohols, ketones, carboxylic acids, esters, glycols, non-halogenated and halogenated), chloromethane, DCM, phthalate esters, amines, |

Table 13 Potential Sources of Contamination

| Location | Potential Sources / Activity | Contaminants of Potential Concern |
|---|---|---|
| | | polymers, resins, PAH, PCB, phenolic compounds, CHCs, cyanides, sodium salts, mineral acids. |
| | Laminex manufacturing facility for laminates | Polyvinyl acetate, phenol, formaldehyde, phthalate esters, PCBs, solvents (e.g. trichloroethene), metals, cresols, CHCs (e.g. 1,1,1-trichloroethane, cis1, 2-dichloroethene). |

The potential sources of contamination on Site are described in Section 4 of ARC 2017 and the locations of the former facilities on-Site are shown on **Figure F4**.

Potential off-Site sources included industrial sites such as the other lots of the former Nuplex facility and the Laminex facility. EPA Priority Sites and completed Environmental Audit sites are documented in Section 2.2 of ARC 2017.

## 6.2 Soil

### 6.2.1 Historical Soil Investigations

Historical site assessment works completed prior to the investigations for the audit are documented in ARC 2017. GHD conducted two soil investigations at the Site which are considered to be relevant for the audit. These included:

- A targeted soil investigation from eight (8) locations in the area of the former AGSTs, TIT and the location of the suspected former lead acid battery disposal pit in April 2008. Samples from six (6) of these locations were analysed; and
- Retrieval of soil samples from grid-based and targeted locations at the non-toxic store (NTS) (three (3) locations, including the potential backfilled trenches), indoor acid store (IAS) (two (2) locations) and drum storage area (12 locations) in April 2015 including locations to target the location of the suspected former lead acid battery disposal pit.

The results of these investigations are discussed in Section 9.4 and presented in Table 3 of Resolve 2019 (**Appendix C**). The sample locations are shown on **Figure F5** and a copy of GHD's report which includes the results of both investigations is provided in Appendix X of Resolve 2019.

The results of the historical investigations indicate that the contaminant concentrations in the soil were all low and below the adopted criteria with the exception of 1,2-DCE measured above the adopted RBC for vapour intrusion in two locations within the drum storage area. An asbestos fragment was identified within fill at one location during the 2008 investigation at a depth of approximately 0.25 mBGL in the vicinity of the former AGSTs and TIT. The sampling undertaken in the location of the suspected lead acid battery disposal pit during both investigations did not provide evidence of the existence of this pit.

Following the investigation works completed in April 2015, GHD concluded that based on analytical results and field observations, there was no indication of residual soil contamination within the Lot 1 area which would be expected to be acting as a source of vapours or ongoing groundwater contamination.

### 6.2.2 Soil Investigations from 2017 Onwards

Soil investigations undertaken for this audit have been performed by ARC Environmental, Evolution Environmental and Resolve from May 2017. Details of the soil investigations completed are provided in Sections 5 and 8 of Resolve 2019 and the soil sampling locations are shown on **Figure F5**. In addition, classification sampling was undertaken by Prensa Pty Ltd (Prensa) during redevelopment works at the Site. An overview of each phase is summarised in **Table 14**.

**Table 14 Overview of Soil Investigation Activities**

| Date | Soil Investigation Activities |
|---|---|
| May – August 2017 | Evolution and ARC Environmental conducted the following soil investigations: drilling of three (3) additional soil bores to meet the requirements for grid-based sampling across the Site and two (2) targeted soil bores were drilled to target the former yacht washdown area and a former AGST location west of the IAS.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |
| June 2017 | Evolution installed nested groundwater wells MW45A and MW45B to replace MW3 adjacent to the TIT. Soil samples were retrieved and analysed from both locations during the installation of the wells.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |
| 30 October 2017 | Evolution drilled two (2) targeted soil bores; one within the former drum storage area and one at a former AGST location within the IAS.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |
| 5 February 2018 | ARC Environmental progressed four (4) delineation soil bores within the drum storage area to assess the extent of the previously identified cis-1,2-DCE, two (2) additional grid-based samples in the IAS and NTS and two (2) targeted samples at the location of the backfilled trenches within the NTS. Evolution collected one (1) surface sample from the yacht wash down area.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |
| 15 February 2018 | ARC Environmental advanced three (3) confirmation soil bores (two in the drum storage area and one in the NTS) and two (2) targeted test pits in the location of the suspected former lead acid battery pit.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |
| 31 August 2018 | Following demolition of the buildings, ARC Environmental advanced two test pits (one beneath the former IAS and one beneath the former NTS) in locations where dark or stained soil was observed. Two (2) surface soil samples were also retrieved from beneath the IAS where potential ACM was observed at the surface. The auditor's assistant visited the Site on this day to inspect the area of stained soil and observe the sampling works.<br><br>This investigation is described in Section 5: Table 5-1 and Section 8.1.1: Table 8-1 of Resolve 2019. |

**Table 14 Overview of Soil Investigation Activities**

| Date | Soil Investigation Activities |
|---|---|
| 15 February 2019 | Classification sampling was undertaken by Prensa to facilitate excavation works during redevelopment of the Site for the Dan Murphy's store. Samples were retrieved from 33 locations across the Site. The soil was separated into two fill domains and natural soil. Domain 1 (380 $m^3$) was classified as Fill Material with asbestos; Domain 2 (10 $m^3$) was classified as Category C with asbestos and the natural soil was classified as Fill Material.<br><br>Prensa's letter report outlining the classification sampling is provided in Appendix H of Resolve 2019. |
| 16 October 2019 | Resolve Environmental performed investigative hand augering at 11 locations within garden bed areas to determine the depth of imported clean fill material. |

The outcomes of the soil assessment works at the Site can be broadly summarised as follows:

- Fill material was observed at all sample locations at the Site. The depth of fill ranged between 0.15 and 0.6 m BGL, where it overlaid natural sandy clay. The fill material was observed on numerous occasions by the auditor or auditor's assistant and predominantly comprised gravelly sands, sandy gravels and sandy material with inert industrial waste including bricks, ceramic and metal fragments. Black ash/charcoal/slag was also reported variably across the Site. One asbestos fragment was identified in the fill during GHD's 2008 soil investigation in the vicinity of the former AGSTs and TIT. Following demolition of the buildings and hardstand at the Site, asbestos was found to be widespread throughout the fill material. This is discussed further in **Section 6.2.5**.
- Laboratory analysis of the fill material reported TRH ($C_{16}$-$C_{34}$), copper and zinc concentrations above the EIL/ESLs for an urban residential land use, copper and zinc concentrations also exceeded the EIL for a commercial/industrial land use. A B(a)P Toxicity Equivalent Quotient (TEQ) concentration at one location exceeded the HIL A and B criteria for residential land uses, however, was below the HIL D criterion for a commercial/industrial use.
- CHC concentrations in the soil were below the adopted criteria, with the exception of cis-1,2-DCE and TCE concentrations within the drum storage area which exceeded the site-specific RBC for commercial (slab on grade: multi storey offices) use. A summary of the CHCs measured at the Site is provided in **Table 16** below. Concentrations of other volatile contaminants (including BTEX, TRH ($C_6$-$C_9$) and other volatile CHCs) were either not detected or not reported at levels considered to pose an unacceptable vapour risk.
- Formaldehyde was measured in one fill sample and three natural soil samples above the adopted USEPA RSL for residential soil. However, the concentrations were below the criterion for industrial soil.
- The chemical concentrations measured in the natural soil samples retrieved from the Site were either below laboratory detection limits or below the relevant criteria, with the exception of formaldehyde discussed above.
- The pH measured in fill samples at the Site ranged between 4.8 to 10.5 and in the natural soil ranged between 5.2 and 6.8, with the exception of two natural soil samples retrieved from the expected location of the former lead acid battery pit which recorded a pH of 3.7 and 3.8.
- Apart from the low pH measured in the natural soil, there were no other indications of the suspected lead acid battery pit. Samples from this area were also analysed for sulfate and lead (lead results are provided in laboratory report EM1803192 (Appendix P of Resolve 2019), however, have been omitted from Table 1 of Resolve 2019) with concentrations of these analytes either low or well below the adopted criteria for all land uses.

- Leachability testing was completed for one sample to assess the leachability of metals within the shallow fill material. The laboratory results indicated that there was low potential for leaching to occur with the fill horizon of the soil profile.

#### 6.2.2.1 Chlorinated Hydrocarbons in Soil

The CHC concentrations measured in soil samples retrieved from the Site are provided in Section 9.3.4 of Resolve 2019 and summarised in **Table 15** below. Although CHCs are considered to be contaminants of concern in the groundwater at the Site, the concentrations in soil were found to be relatively low.

**Table 15 Chlorinated Hydrocarbon Concentrations in Soil Prior to Remediation**

| Sample ID | Location | Contaminant | Concentration (mg/kg) | Adopted criteria[1] (mg/kg) |
|---|---|---|---|---|
| DS_ARC_TP01A_0.5<br>DS_ARC_TP01B_0.5<br>DS_ARC_TP01D_0.5 | Drum Store | DCE | **0.13**<br>**0.17**<br>**0.08** | 16/**0.06** |
| DS_SB01A_0.5 | Drum Store | TCE<br>PCE | **1.68**<br>0.09 | 3/**0.008**<br>350/1.0 |
| MW45A_0.1 | TIT | CF | 0.15 | 180/0.6 |
| MW45A_0.5 | TIT | CF<br>DCE | 0.08<br>0.06 | 180/0.6<br>16/0.06 |
| MW45A_15.0 | TIT | CF<br>DCE<br>TCE | 0.03<br>0.03<br>**0.03**[3] | 180/0.6<br>16/0.06<br>3/**0.008** |
| EEC_TIT3_3 | TIT | CF | 0.05 | 180/0.6 |

*Notes:* *1. Adopted criteria are Site-specific Risk-based criteria for Slab on Grade: warehouses/Slab on Grade: multistorey offices.*
*2. Values in **bold** represent exceedances of the adopted criteria.*
*3. As the RBC apply to the top 1 m of soil this concentration is not considered to present a risk at the Site and has not been considered further.*

### 6.2.3 Remediation of TIT and Associated Pipework

The remediation and validation of the former TIT infrastructure is outlined in Sections 8.1.2 and 9.6 of Resolve 2019. The former TIT infrastructure was remediated on 25 October 2017 under the supervision of Evolution Environmental. Photographs of the remediation of the TIT infrastructure are provided in Appendix J of Resolve 2019 and the extent of the excavation and locations of the validation samples are shown on Figure 6 of Resolve 2019.

Following removal of the TIT infrastructure and surrounding soil, validation samples were retrieved from each of the walls (at 1.5 m depth) and the base of the excavation which was 3 m deep and approximately 5.25 $m^2$ in area. The validation samples were analysed for TRHs and volatile organic compounds (VOCs). The contaminant concentrations in all samples were below the laboratory detection limits with the exception of chloroform (0.05 mg/kg) in one of the wall samples (EEC_TIT3_3) retrieved from 1.5 m depth. The results of the validation samples are provided in Table 2 of Resolve 2019 and field data sheets and laboratory certificates are provided in Appendices L and P of Resolve 2019, respectively. The chloroform concentration is well below the site-specific RBC and, therefore, validation of the TIT remedial excavation was considered to be satisfactory.

The TIT excavation was backfilled with stockpiled soil from Lot 2 of the former Nuplex facility. The soil was obtained during remedial excavation in the southern portion of the facility. The stockpiled soil was found to be uncontaminated and was classified as clean fill by Evolution Environmental prior to use. The classification report is provided in Appendix M of Resolve 2019. To confirm the condition of the backfill material, three samples were retrieved by Evolution Environmental once the soil was in-situ and analysed for BTEX and CHCs. The concentrations reported in these samples were below laboratory detection limits.

The excavated soil from around the TIT infrastructure was stockpiled on hardstand on-Site and later added to a larger contaminated soil stockpile located on Lot 2 which was removed from the facility as Category A contaminated soil. The soil from around the TIT infrastructure was not classified as Category A contaminated soil, however, it was disposed of with the more contaminated material for convenience. The TIT infrastructure and concrete rubble were also disposed of off-Site. Waste transfer certificates are provided in Appendix M of Resolve 2019.

The TIT pipework and surrounding packing sand were removed on 28 March 2018 under the supervision of ARC Environmental. This pipework exited the western portion of the TIT and ran along the southern Site boundary where it drained into the sewer present on Hamlet Street. The excavated trench was approximately 35 m in length, 2.5 m deep and 1 m wide and is shown on Figure 6 of Resolve 2019. The pipework and packing sands were added to existing stockpiles on Lot 2 of the former Nuplex facility and were later disposed of off-site. The trench was reinstated with the natural soils from above the pipework.

For safety reasons, soil sampling was undertaken along the length of the trench following reinstatement of the natural soil. The samples were retrieved with a geo-probe from the depth of the base of the trench as well as near surface and 1.5 m. The samples were analysed for CHC, TRH and BTEX and the contaminant concentrations were all measured below laboratory detection limits. The sample locations are shown on Figure 6 of Resolve 2019 and the results of the samples are provided in Table 2 of Resolve 2019.

Following remediation and validation of the TIT infrastructure, and associated pipework, the available evidence suggests that no significant residual contaminated soil remains in the vicinity of this facility.

### 6.2.4 Excavation of Drum Storage Area

The drum storage area was excavated on 3 March 2018 under the supervision of Evolution Environmental. The extent of the excavation is shown on Figure 6 of Resolve 2019 and photographs are provided in Appendix J of Resolve 2019. The resulting excavation was approximately 390 $m^2$ and 0.6 m deep. Where stained soil was observed, or in areas where previous CHC impacts had been identified, the excavation was progressed to 1 m, and 1.3 m in one location. The excavation encompassed sample locations DS_ARC_TP01A, DS_ARC_TP01B, DS_ARC_TP01D and DS_SB01A_0.5 where TCE and DCE concentrations were measured above the adopted criteria.

The excavated soil was stockpiled on hardstand on Lot 2 of the former Nuplex facility. The soil was subsequently classified as fill material and disposed of off-Site. The soil classification report is provided in Appendix M of Resolve 2019.

Evolution Environmental retrieved 11 validation samples from the base of the excavation on the day of the excavation and ARC Environmental retrieved 11 validation samples from the walls on 28 March 2018. The samples were analysed for VOCs and the results for all samples were below laboratory detection limits. The analytical results for the samples are provided in Table 2 of Resolve 2019.

Following remediation and validation of the drum storage area, the available evidence suggests that no significant residual contaminated soil remains in the vicinity of this facility.

The drum storage area was backfilled in September 2018 with clean fill material sourced from Epworth Freemasons Hospital (outlined in **Section 6.2.6**).

### 6.2.5 Asbestos

Following demolition of the Nuplex legacy buildings and removal of hardstand at the Site in August 2018, non-friable ACM was observed in soil in the north-eastern portion of the Site. Two surface soil samples were retrieved and analysed for asbestos. The laboratory results confirmed that ACM fragments were present within the soil, however, no fibres were identified. The ACM was removed, and an asbestos clearance certificate (provided in Appendix H of Resolve 2019) was obtained for the Site.

During Site preparation works for the construction of the Dan Murphy's store, further non-friable ACM was identified and removed. The asbestos clearance works included in-situ removal of the asbestos and excavation and stockpiling of impacted soil on the adjacent Lot 2 property for asbestos abatement. Approximately 405 $m^3$ of soil from the Site was classified as Category C waste for off-Site disposal.

The work area included exposed surface soils only, therefore, it is possible that ACM is present in subsurface soils at the Site. An Environmental Management Plan (EMP) has been prepared for the Site to manage ongoing risks associated with the likely presence of ACM at Site. This includes maintaining the clean fill thickness of 0.5 m within garden bed areas at the Site. A copy of the EMP is provided with the Statement of Environmental Audit in **Appendix A**. Clearance certificates and associated information are provided in Appendix H of Resolve 2019.

### 6.2.6 Importation of Clean Fill

Fill material obtained from two sources was used to facilitate redevelopment works at the Site. These are described in Sections 8.1.2 and 23 of Resolve 2019 and comprised the following:

- Melbourne Formation (Silurian) siltstone, Silty Clay from Epworth Hospital, 166 Clarendon Street, East Melbourne used to backfill the drum storage area excavation in September 2018.
- Melbourne Formation (Silurian) siltstone, Silty Clay sourced from 1245 and 1253 – 1259 Malvern Road, Malvern. This material was imported onto the Site from 27 to 29 March 2019 and used to raise the Site approximately 0.5 m to incorporate site drainage requirements.

Each of these sources of fill material were subject to sampling and analysis to confirm their contamination status/suitability. Laboratory analysis certificates and other relevant supporting documentation, including a site history summary for the Malvern Road property, is provided in Appendix M and Appendix Z of Resolve 2019.

On the basis of this information, the auditor is satisfied that the imported fill material was suitably clean for construction use at the Site.

### 6.2.7 Contamination Remaining

As the asbestos clearance certificates obtained for the Site only included the surface soils, all residual fill at the Site is assumed to contain asbestos. A summary of chemical concentrations within residual fill that exceed the adopted soil quality objectives following completion of investigation and remediation undertaken for the audit is provided in **Table 16** below. A number of these locations may have been excavated during asbestos clearance works, however, the elevated concentrations have been conservatively included below as no further sampling has been undertaken to determine this.

**Table 16 Exceedance Summary of Soil Remaining In-situ**

| Analyte | Concentration Range | Location of Concentration Exceedance | | Soil Investigation Level Exceeded (Beneficial Use/Guideline Value[1]) | |
|---|---|---|---|---|---|
| | mg/kg | Sample ID | | Type | mg/kg |
| Copper | <5 – 152 | IAS_EEC_SB102_0.2 | | EIL | **60/80** |

Table 16 Exceedance Summary of Soil Remaining In-situ

| Analyte | Concentration Range | Location of Concentration Exceedance | Soil Investigation Level Exceeded (Beneficial Use/Guideline Value[1]) | |
|---|---|---|---|---|
| | mg/kg | Sample ID | Type | mg/kg |
| Zinc | <5 – 1,060 | DS_EEC_SB101_0.3<br>IAS_EEC_SB102_0.2 | EIL | **340/500** |
| B(a)P TEQ | <0.5 – 5.6 | DS_EEC_SB101_0.3 | HIL A | **3** |
| | | | HIL B | **4** |
| TRH $C_{16}$-$C_{34}$ | <100 - 310 | NTS_ARC_TP201_0.1 | ESL | **300**/1,700 |
| Formaldehyde | <2 – 49 | DS_EEC_SB101_0.8<br>IAS_EEC_SB101_0.5<br>NTS_ARC_SB106_0.12<br>NTS_EEC_SB102_0.6 | USEPA RSL | **17**/73 |
| pH | 3.7 - 10.5 | DS_SB03A_0.5<br>IAS_EEC_SB101_0.5<br>LA_ARC_TP01_1.0<br>LA_ARC_TP01_2.5<br>NTS_TP01A_0.5 | Buildings and Structures (AS 2159-2009) | **<5.5** |

**Notes:** [1] *Guideline values are for residential use/commercial and industrial use*

### 6.2.8 Acid Sulfate Soils

According to the 'Atlas of Australian Acid Sulfate Soil' maintained by the Commonwealth Scientific and Industrial Research Organisation, the Site has a very low probability of occurrence of being within a zone comprising acid sulfate soils. Although there were three pH values lower than 5.5 (not including those associated with the suspected lead acid battery disposal pit), the majority of sample locations had pH close to neutral and therefore the low values are not considered to represent acid sulfate soils at the Site.

## 6.3 Groundwater

The following sections provide a summary of the groundwater investigations conducted and their findings. Groundwater was found to be polluted by chemicals that derived from on-Site sources and this pollution was found to extend off-Site. For this reason, in accordance with EPA Publication 759.3, the auditor has sought confirmation from the EPA that clean-up of groundwater has been achieved so for as reasonably practicable. Supporting information was compiled by the auditor in a clean-up so far as reasonably practicable (herein referred to as CUTEP) submission report, which is provided as **Appendix F**. Some of the information provided in that report is of a similar nature to that provided herein. The CUTEP process and its findings are discussed further in **Section 9**.

### 6.3.1 Groundwater Investigations

The following sections summarise the key findings of the groundwater assessments undertaken for the audit, which have informed the Auditor's opinion regarding the status of groundwater contamination at the Site. Groundwater quality at the Site and immediate surrounds has been assessed during a number of assessment phases since 2001. Details of the groundwater investigations completed are provided in Section 5 of Resolve 2019 with assessment works completed prior to 2017 documented in ARC 2017. An overview of the groundwater activities undertaken for the audit from 2017 is provided in **Table 17**, below.

**Table 17 Overview of Groundwater Investigation Activities**

| Date | Groundwater Investigation Activity |
|---|---|
| Prior to 2017 | GHD installed groundwater wells MW20 (2006), MW21 (2006), MW27 (2008), MW28 (2008), MW36 (2009) and MW37 (2009). All of these have been included in the monitoring network for the audit. |
| May 2017 | Evolution installed groundwater wells MW52 and MW53 to assess off-site down-gradient CHC impacts. |
| June 2017 | Evolution installed nested groundwater wells MW45A and MW45B to replace MW3 adjacent to the TIT and developed four monitoring wells (MW52, MW53, MW45A and MW45B). |
| August 2017 | ARC Environmental completed a gauging and sampling event (MW20, MW21, MW28, MW37, MW38, MW39, MW45A, MW45B, MW51, MW52, MW53). |
| October 2017 | ARC Environmental completed a gauging and sampling event (MW20, MW21, MW28, MW36, MW37, MW38, MW39, MW45A, MW45B, MW51, MW52, MW53). |
| January 2018 | ARC Environmental completed a gauging and sampling event (MW20, MW21, MW28, MW36, MW37, MW38, MW39, MW45A, MW45B, MW51, MW52, MW53). |
| March 2018 | ARC Environmental installed, gauged and sampled monitoring wells MW54 and MW55 to assess the extent of vinyl chloride contamination from the Site. |
| April 2018 | ARC Environmental completed a gauging and sampling event of MW52, MW53, MW54 and MW55. |
| July 2018 | Gauging round completed for MW20, MW21, MW28, MW36, MW37, MW38, MW39, MW45A, MW51, MW52, MW53, MW54 and MW55 by ARC Environmental.<br>ARC Environmental completed the installation and sampling of three shallow perched groundwater wells (SMW01, SMW02 and SMW03). |
| August 2018 | ARC Environmental completed gauging and sampling of MW20, MW21, MW27, MW28, MW36, MW37, MW38, MW39, MW45A, MW45B, MW51, MW52, MW53, MW54 and MW55. |
| October 2018 | Resolve Environmental completed the drilling and development of MW56, a background bore up-gradient of the Site.<br>ARC Environmental completed gauging of MW21, MW38, MW39, MW51, MW52, MW53, MW54, MW55 and MW56 and sampling of MW52, MW53, MW54, MW55 and MW56. |

Table 17 Overview of Groundwater Investigation Activities

| Date | Groundwater Investigation Activity |
|---|---|
| April 2019 | Resolve completed drilling of MW59 to be nested with MW52 to assess vertical hydraulic gradients and assess off-site impacts of chloroform. |
| May 2019 | Resolve completed gauging and sampling of MW59. |
| June 2019 | Resolve completed gauging and sampling of MW59. |

### 6.3.2 Investigation Results

The findings of the consultant investigations are compiled in Sections 10 and 15 of Resolve 2019 and exceedances of groundwater quality objectives are shown on Figures 11 to 13 of Resolve 2019.

The investigations found that the overall groundwater flow in the watertable aquifer on-Site is interpreted to be towards the south-west. However, the watertable gradient is very flat and therefore highly susceptible to external influences such as leaking services.

The groundwater salinities in the watertable aquifer on and in the immediate vicinity of the Site were reported to range from 87 to 3,262 mg/L, and typically of the order of 500 to 700 mg/L, conservatively classifying local groundwater as Segment A1.

The investigations have typically reported that Site groundwater is contaminated with a range of CHCs including chloroform, trichloroethene, vinyl chloride, cis-1,2-dichlorethene, 1,4-dichlorobenzene, carbon tetrachloride and DCM. These CHCs are considered to derive from on-Site sources, including the former TIT and drum storage area. Non-aqueous phase liquid (NAPL) was not identified to be present during groundwater monitoring, nor were CHC concentrations indicative of the potential presence of NAPL

All concentrations of volatile chemicals were below their adopted vapour intrusion risk-based levels, as derived by Site-specific risk assessment (refer to **Section 5.2.3.12**).

Concentrations of other chemicals measured over the course of the groundwater assessments such as arsenic, copper, cobalt, iron, lead, nickel, zinc, TDS, manganese, sodium, sulfate, chloride, fluoride, ammonia and nitrate, also exceeded adopted groundwater quality objectives. In addition, pH was measured below the acceptable range for the protection of buildings and structures. These were considered to be either indicative of natural background conditions or diffuse regional pollution (this is discussed further in **Section 7.2**).

The extent of the CHC plume has been assessed since 2008 and has been considered laterally delineated since the installation of off-Site down-gradient wells MW52 to MW55 during 2017 (shown on **Figure F4**). The vertical extent of impacts has been assessed through the installation of nested wells MW45A and MW45B adjacent to the former TIT (i.e. a primary contamination source for these chemicals), and in the downgradient direction approximately 15 m from the Site boundary (MW52 and MW59).

Based on the findings of the Site investigations, the Site-sourced CHC contamination plume is considered to be laterally and vertically delineated by the established monitoring well network. The CHC concentrations measured in the groundwater wells during the investigations undertaken at the Site are provided in Section 10.4 of Resolve 2019 and are shown (together with interpreted contamination plume extents) on **Figure F6** and **Figure F7a to F7d**.

A summary of chemical concentrations reported above the relevant groundwater quality objectives during GMEs undertaken from 2017 is provided in **Table 18**.

**Table 18 Contaminants Exceeding Groundwater Quality Objectives**

| Analyte | Concentration Range (mg/L) | Groundwater Quality Objectives Exceeded and Criteria (mg/L) | Applicable Beneficial Use |
|---|---|---|---|
| Chloride (n) | 14 – 919 | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) aesthetic criterion (250) | PW |
| Sodium (n) | 18 – 728 | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) aesthetic criterion (180) | PW |
| Sulfate (n) | 12 - 454 | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) aesthetic criterion (250) | PW |
| TDS (n) | 87 – 2,894 | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) aesthetic criterion (1,200) | PW |
| | | ANZECC (2000) Stock Watering (Poultry – No adverse effects) (2000) | AI (SW) |
| pH (n) | 5.36 – 6.91 | ANZECC (2000) Ecosystems Marine Water (95%) (7.5-8.5) | WDE |
| | | AS2159 (2009) Buildings and Structures, Exposure classification for concrete piles (>5.5) | BS |
| Nitrate as N (b) | 0.01 – 16.4 | NIWA 2014, Nitrate toxicity guidelines for the National Objectives Framework (2.4) | WDE |
| | | NHMRC/NRMMC 2011 - Australian Drinking Water Guidelines (Updated 2018) (11.3) | PW |
| Ammonia as N (b) | <0.01 – 0.59 | NHMRC/NRMMC 2011 - Australian Drinking Water Guidelines (Updated 2018) aesthetic criterion (0.5) | PW |
| Fluoride (b) | <0.01 – 1.6 | NHMRC/NRMMC 2011 - Australian Drinking Water Guidelines (Updated 2018) (1.5) | PW |
| | | ANZECC (2000) Irrigation (LTV) (1) | AI (I) |
| Arsenic (n) | <0.001 – 0.038 | ANZECC (2000) Ecosystems Marine Water (Med-Low Reliability) (0.0023) | WDE |

**Table 18 Contaminants Exceeding Groundwater Quality Objectives**

| Analyte | Concentration Range (mg/L) | Groundwater Quality Objectives Exceeded and Criteria (mg/L) | Applicable Beneficial Use |
|---|---|---|---|
| | | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (0.01) | PW |
| Cobalt (n) | <0.001 – 0.024 | ANZECC (2000) Ecosystems Marine Water (95%) (0.001) | WDE<br>PW |
| Copper (n) | <0.001 – 0.026 | ANZECC (2000) Ecosystems Marine Water (95%) (0.0013) | WDE |
| Iron (b) | <0.05 – 1.64 | ANZECC (2000) Ecosystems Marine Water (Med-Low Reliability) (0.3) | WDE |
| | | ANZECC (2000) Irrigation (LTV) (0.2) | AI (I) |
| | | ANZECC (1992) Industrial Water Quality (0.5) | ICW |
| Lead (b) | <0.001 – 0.028 | ANZECC (2000) Ecosystems Marine Water (95%) (0.0044) | WDE |
| | | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (0.01) | PW |
| Manganese (b) | <0.001 – 0.242 | ANZECC (2000) Ecosystems Marine Water (Med-Low Reliability) (0.08) | WDE |
| | | ANZECC (2000) Irrigation (LTV) (0.2) | AI (I) |
| Nickel (b) | <0.001 – 0.111 | ANZECC (2000) Ecosystems Marine Water (99%) (0.007)[1] | WDE |
| | | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (0.02) | PW |
| | | ANZECC (2000) Recreational water quality (0.1) | WBR |
| Zinc (b) | <0.005 – 0.23 | ANZECC (2000) Ecosystems Marine Water (95%) (0.015) | WDE |
| 1,4-dichlorobenzene | <0.1 – 0.6 (µg/L) | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (0.3 µg/L) | PW<br>AI (SW)<br>WBR |

**Table 18 Contaminants Exceeding Groundwater Quality Objectives**

| Analyte | Concentration Range (mg/L) | Groundwater Quality Objectives Exceeded and Criteria (mg/L) | Applicable Beneficial Use |
|---|---|---|---|
| cis-1,2-dichloroethene | <1 – 84 (µg/L) | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (60 µg/L) | PW<br>AI (SW)<br>WBR |
| Chloroform | <1 –653 (µg/L) | ANZECC (2000) Ecosystems Marine Water (Low Reliability) (370 µg/L) | WDE |
| | | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (250 µg/L) | PW<br>AI (SW)<br>WBR |
| Dichloromethane | <1 – 10 (µg/L) | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (4 µg/L) | PW<br>AI (SW)<br>WBR |
| Trichloroethene | <1 – 101 (µg/L) | WHO (2011) Guidelines for Drinking-Water Quality, fourth edition (20 µg/L) | PW<br>AI (SW)<br>WBR |
| Vinyl Chloride | <0.2 – 12.6 | NHMRC/NRMMC (2011) Australian Drinking Water Guidelines (Updated 2018) (0.3 µg/L) | PW<br>AI (SW)<br>WBR |

*Notes: WDE = Water Dependant Ecosystems; BS = Buildings and Structures; ICW = Industrial and Commercial Water; AI = Agriculture and Irrigation (I = Irrigation; SW = Stock Watering); PW = Potable Water (Desirable); WBR = Water Based Recreation*

*1. Bioaccumulating chemical (99% species protection adopted)*

*(n) – Considered to be indicative of natural background conditions and hence not pollution*

*(b) – Considered to be indicative of diffuse regional pollution*

A comparison of groundwater concentrations measured on-Site with those measured up- and down-gradient, and at other nearby properties formerly subject to audit is presented in Table 10-4 of Resolve 2019.

A summary of precluded beneficial uses as measured during all groundwater monitoring rounds, including analytes whose concentrations exceed adopted groundwater quality objectives but are considered to be naturally occurring (as per Attachment C of EPA Technical Publication 840.2), is provided in **Table 19**.

**Table 19 Precluded Beneficial Use Summary**

| Precluded Beneficial Use | Contaminant(s) |
|---|---|
| Water Dependant Ecosystems | NA (see discussion in **Table 22**) |
| Potable Water (Desirable) | CF, DCE, DCM, TCE, VC, dichlorobenzene, arsenic (n), cobalt (n), lead (n), nickel (b), nitrate (b), TDS (n), chloride (n), sodium (n), sulfate (n), fluoride (b), ammonia (b) |

**Table 19 Precluded Beneficial Use Summary**

| Precluded Beneficial Use | Contaminant(s) |
|---|---|
| Potable Mineral Water Supply | NA |
| Agriculture and Irrigation (Irrigation) | Iron (b), Manganese (b), Fluoride (b) |
| Agriculture and Irrigation (Stock watering) | CF, DCE, DCM, TCE, VC, dichlorobenzene, TDS (n) |
| Industrial and Commercial | Iron (b) |
| Water Based Recreation (Primary Contact Recreation) | CF, DCE, DCM, TCE, VC, dichlorobenzene, nickel (b) |
| Traditional Owner cultural values | NA (applies at point of discharge) |
| Cultural and spiritual values | CF, DCE, DCM, TCE, VC, dichlorobenzene, nickel (b) |
| Buildings and Structures | pH (n) |
| Geothermal properties | NA |

*Notes: (n) – Considered to be indicative of natural background conditions and hence not pollution*
*(b) – Considered to be indicative of diffuse regional pollution but may also be derived from the Site*
*N/A – Beneficial use not applicable*
*NE – No exceedance*

Further discussion regarding the applicability of these beneficial uses is provided in **Section 7.2**.

### 6.3.3 Perched Groundwater Investigation

Due to the known presence of perched aquifers in the Cheltenham area, and observations of shallow wet soils at the Site, ARC Environmental installed three shallow groundwater wells to assess for the presence of a perched aquifer. The locations of these wells are shown on Figure 16 of Resolve 2019 with the findings discussed in Section 11 and presented in Table 10 of Resolve 2019.

The wells were installed to depths of 0.75 m to 0.8 m BGL with well screens extending from approximately 0.3 m. Two of the three wells were dry. In the remaining well (SMW02) which was located in the eastern portion of the drum store, approximately 17 cm of perched water was gauged. No odours or sheens were noted during sampling of the shallow well.

BTEXN and chloroform concentrations in the perched water sample were reported above the laboratory detection limits but were below the adopted criteria. All other VOCs were reported below the laboratory LOR. The measured TDS (1,010 mg/L) and major cations and anion concentrations indicated that the water was not representative of rainwater. The results of the perched aquifer sampling are provided in Table 10 of Resolve 2019. The NATA certified laboratory reports and chain of custody (CoC) documentation are included in Appendix P and the gauging and sampling field sheets are included within Appendix N. The perched aquifer was considered to be ephemeral and recharged via local rainfall events.

### 6.3.4 Auditor Verification Sampling

Verification sampling was completed by the auditor's representative on 10 July 2018 and 17 June 2019. The verification sampling undertaken on 10 July 2018 was to confirm the results of previous rounds of groundwater monitoring undertaken prior to the auditor's engagement. The sampling

undertaken on 17 June 2019 coincided with the second round of sampling of MW59. The primary samples in 2018 were collected by ARC Environmental and in 2019 were collected by Resolve. **Table 20** below provides a comparison between the assessor and auditor verification results. Refer to **Appendix G** for laboratory certificates and associated documentation for auditor verification samples.

## Table 20 Comparison of Auditor Verification and Assessor Samples - Groundwater

| Analyte | Auditor Verification Sample (µg/L) | Assessor Primary Sample | Auditor Verification Sample (µg/L) | Assessor Primary Sample | Auditor Verification Sample (µg/L) | Assessor Primary Sample | Auditor Verification Sample (µg/L) | Assessor Primary Sample |
|---|---|---|---|---|---|---|---|---|
| | MW21/1 (10/07/2018) | MW21 (16/01/2018) | MW36/1 (10/07/2018) | MW36/1 (15/01/2018) | MW45A/1 (10/07/2018) | MW45A (17/01/2018) | MW59/1 (17/06/2019) | MW59 (17/06/2019) |
| Ammonia as N (mg/L) | <0.01 | 0.02 | 0.04 | 0.03 | 0.02 | 0.04 | - | - |
| Nitrate as N (mg/L) | 2.23 | 2.39 | 5.64 | 1.62 | 3.07 | 1.85 | - | - |
| Nitrite as N (mg/L) | <0.01 | <0.01 | 0.01 | <0.01 | 0.02 | 0.04 | - | - |
| TDS (mg/L) | 1,180 | 1,025 | 1340 | 512 | 702 | 790 | - | - |
| Benzene | <0.05 | <1 | 0.19 | <1 | 0.07 | <1 | <0.05 | - |
| Ethylbenzene | <0.05 | <1 | <0.05 | <1 | <0.05 | <1 | <0.05 | - |
| Toluene | <0.5 | <1 | <0.5 | <1 | <0.5 | <1 | <0.5 | - |
| Total Xylenes | <0.05 | <1 | <0.05 | <1 | <0.05 | <1 | <0.05 | - |
| 1,2 Dichloroethene | 52.5 | 84 | <0.1 | <1 | 222 | 208 | <0.1 | <0.1 |
| 1,4 Dichlorobenzene | <0.1 | 0.2 | 0.16 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 |
| Carbon Tetrachloride | 3.07 | 3 | <0.05 | <1 | <0.05 | <1 | <0.05 | <0.05 |
| Chloroform | 8.71 | 13 | 0.3 | <1 | 10.3 | 34 | 0.68 | 0.65 |
| Tetrachloroethene | 7.8 | 13 | <0.05 | <1 | 0.6 | <1 | <0.05 | <0.05 |
| Trichloroethene | 85.5 | 101 | 0.11 | <1 | 299 | 264 | <0.05 | <0.05 |
| Vinyl Chloride | <0.3 | <0.2 | <0.3 | <0.2 | 0.5 | 0.5 | <0.3 | <0.3 |
| TRH ($C_6$-$C_{10}$) | 140 | 150 | <20 | <20 | 380 | 420 | - | - |
| TRH ($C_{10}$-$C_{16}$) | <100 | <100 | <100 | <100 | <100 | <100 | - | - |
| TRH ($C_{16}$-$C_{34}$) | <100 | <100 | 210 | <100 | <100 | <100 | - | - |
| TRH ($C_{34}$-$C_{40}$) | <100 | <100 | <100 | <100 | <100 | <100 | - | - |
| TRH ($C_{10}$-$C_{40}$)(Sum) | <100 | <100 | 210 | <100 | <100 | <100 | - | - |

The auditor verification samples generally correlated well with the assessor's sample results. The samples retrieved from MW59 on the same day showed close correlation, while those retrieved from the other wells, which were to confirm the previously measured results, did have some minor discrepancies. The discrepancies are likely to be due to variation of groundwater quality over time. The auditor verification samples demonstrate that the results of groundwater samples retrieved prior to the engagement of the auditor are appropriate to use for interpretative purposes.

Overall, the auditor considers that the auditor verification sample process supports a suitable level of data quality and representativeness was achieved by the assessment process completed.

## 6.4 Surface Water

On 5 July 2018, ARC Environmental collected a surface water sample from pooled water in the drum storage area excavation to assess whether the source of the water was rainfall run-off or perched groundwater. Details of the surface water investigation completed by ARC Environmental are provided in Section 8.2.2 and 12 of Resolve 2019, and a summary of these works are provided herein.

Surface water parameters were recorded, including temperature, dissolved oxygen (DO), electrical conductivity (EC), oxidation/reduction potential (ORP) and pH during sample collection. Field sheets are provided in Appendix N of Resolve 2019. The surface water sample was analysed for TDS, major ions and VOCs.

The results of the investigation are presented in Table 9 of Resolve 2019 and the primary findings can be summarised as follows:

- Surface water was observed to be slightly turbid with no odour or sheen.
- Concentrations of major ions and TDS indicate that the source of the water is rainfall run-off rather than perched groundwater. VOC concentrations were all below laboratory detection limits.

Based on the results of the surface water sampling, the auditor is satisfied that the pooled water in the drum storage area excavation was rainfall run-off rather than from a perched aquifer.

## 6.5 Soil Vapour

### 6.5.1 Soil Vapour Investigation

Three sub-slab vapour probes (VP01 to VP03) were installed by ARC Environmental on 10 July 2018. The vapour probes were installed within the proposed footprint of the Dan Murphy's store. The locations of the soil vapour probes are shown on Figure 17 and 18 of Resolve 2019 and the details of the investigation are provided in Section 13.

Field measurements, including oxygen, methane, carbon dioxide and photoionisation detector (PID) readings, were taken prior to and directly following sampling. Field sheets and sampling results are provided in Appendix O and Table 11 of Resolve 2019.

### 6.5.2 Investigation Results

The analytical results for the soil vapour samples retrieved from the Site are provided in Table 11 of Resolve 2019. The following analytes were reported above the laboratory limits of detection:

- cis-1,2-dichloroethene (up to 148 µg/m$^3$);
- Trichloroethene (up to 22 µg/m$^3$);
- Tetrachloroethene (up to 484 µg/m$^3$);
- Acetone (up to 2,220 µg/m$^3$); and
- Ethanol (up to 2,990 µg/m$^3$).

All analyte concentrations were below the adopted Tier 1 vapour intrusion screening criteria for a commercial land use. Cis-1,2-dichloroethene and trichloroethene both exceed the screening criteria

for a residential land use as defined by NEPM 2013 Table 1A (2) Res B - Soil Vapour Volatile Organic Chlorinated Compounds HILs.

The identification of CHCs in the vapour phase is consistent with the results of the groundwater monitoring. The two assessment criteria exceedances were both recorded in VP01 which was in close proximity to MW21 where the highest concentrations of CHCs have been detected in groundwater.

The results of the soil vapour investigation reported detectable concentrations of petroleum and CHCs above the laboratory limits of detection, but below the screening criteria for a commercial/industrial land use. In view of this, there is not considered to be any unacceptable vapour risk for ongoing commercial land use.

# 7 Impacts of Site Contamination on Protected Beneficial Uses

## 7.1 Land

An assessment of the impact of Site Contamination on the protected beneficial uses of land is provided in **Table 21** below.

**Table 21 Impacts to Beneficial Uses of Land**

| Protected Beneficial Use | Beneficial Use Precluded? | | Comment |
|---|---|---|---|
| | Before Clean Up | After Clean Up | |
| Maintenance of Ecosystems | Yes | Yes | Soil investigations at the Site found fill to contain copper, zinc and TRH ($C_{16}$ – $C_{34}$) at concentrations above the site-specific EILs (as derived in **Section 5.1.4.1)** and NEPM ESLs for a residential land use. Copper and zinc were also above the criteria for a commercial/industrial land use.<br><br>However, the Site has been redeveloped for a commercial land use that is almost entirely sealed and there are only minor ornamental garden beds with a minimum of 0.5 m of clean fill, this beneficial use would not be precluded for the proposed commercial/industrial development. |
| Human Health | Yes | Yes | Soil investigations at the Site found fill to contain B(a)P TEQ at concentrations above the NEPM HILs for a residential land use. The fill material is also known to contain bonded ACM.<br><br>In addition, formaldehyde was measured in one fill sample and three natural soil samples above the adopted USEPA RSL for residential soil. However, the concentrations were below the criterion for industrial soil.<br><br>The associated human health risks due to the presence of asbestos must be addressed by the implementation of an EMP. The EMP prepared for the Site is further discussed in **Section 8.1**.<br><br>RBLs determined by EnRisks (**Section 5.1.4**) for the vapour intrusion pathway from soil and the vapour intrusion guidelines in the ASC NEPM for a commercial/industrial use were not exceeded, however, there was exceedances of the residential criteria for cis-1,2-dichloroethene and trichloroethene at one location. |
| Buildings and Structures | No | No | Although the pH measured in the natural soil at the suspected location of the former lead acid battery pit would preclude the beneficial use of buildings and structures, the remaining pH measurements and sulfate |

Table 21 Impacts to Beneficial Uses of Land

| Protected Beneficial Use | Beneficial Use Precluded? | | Comment |
|---|---|---|---|
| | Before Clean Up | After Clean Up | |
| | | | concentrations in the soil would not impact on this beneficial use. Therefore, the soil conditions overall are considered likely to be non-aggressive to concrete in accordance with AS2159-2009. |
| Production of Food, Flora and Fibre | Yes | Yes | Soil investigations at the Site found fill to contain copper, zinc and TRH ($C_{16}$ – $C_{34}$) at concentrations above the site-specific EILs (as derived in **Section 5.1.4.1)** and NEPM ESLs.<br>However, the Site has been redeveloped for a commercial land use that is almost entirely sealed and there are only minor ornamental garden beds with a minimum of 0.5 m of clean fill, this beneficial use would not be precluded for the proposed commercial/industrial development. . |
| Aesthetics | Yes (visual assessment by the auditor) | No (visual assessment by the auditor) | The fill material was found to contain minor amounts of inert industrial waste including bricks, ceramic and metal fragments and black ash/charcoal/slag which were not considered to be offensive to the senses. Visible ACM was removed from the surface of the Site and is, therefore, no longer considered to present an aesthetic issue. Furthermore, the Site has been redeveloped with unsealed areas covered with 0.5 m clean fill material. |

## 7.2 Groundwater

An assessment of the impact on the protected beneficial uses of groundwater is provided in **Table 22** below. This includes an assessment of the relevance of each protected beneficial use, in accordance with **Section 5.2.4**.

Table 22 Impacts to Beneficial Uses of Groundwater

| Protected Beneficial Use | Is Groundwater Polluted? | Contaminant/s | Relevance of Beneficial Use [(a)] | Comment / Rationale |
|---|---|---|---|---|
| Water Dependant Ecosystems | No | NA | - | There is no groundwater receiving system (such as a stream or creek) present on the Site. Groundwater from the Site is ultimately expected to discharge to Port Phillip Bay, located approximately 2.7 km to the south-west of the Site. |

**Table 22 Impacts to Beneficial Uses of Groundwater**

| Protected Beneficial Use | Is Groundwater Polluted? | Contaminant/s | Relevance of Beneficial Use [(a)] | Comment / Rationale |
|---|---|---|---|---|
| | | | | Given the distance to the nearest receiving water, the auditor considers that any groundwater pollution originating from the Site that is migrating towards Port Phillip Bay will be dispersed and attenuated. On this basis, this protected beneficial use is not considered to be precluded or relevant at the Site. |
| Potable Water (Desirable) | Yes | CF , DCE, DCM, TCE, VC, dichlorobenzene, arsenic, cobalt, lead, nickel, nitrate, TDS, chloride, sodium, sulfate, fluoride, ammonia | Relevant | Given the presence of a reticulated water supply in the region, it is considered unlikely that the potable water beneficial use will be realised; however, given the identification of numerous bores registered for stock and domestic purposes within a 2 km radius of the Site, this beneficial use is considered relevant. |
| Agriculture and Irrigation (Irrigation) | Yes | Iron, Manganese, Fluoride | Relevant | There are several reserves, a golf course and a cemetery in the vicinity of the Site, and the bore search undertaken identified numerous bores registered for irrigation purposes within a 2 km radius of the Site. As such, this beneficial use is considered relevant. |
| Agriculture and Irrigation (Stock Watering) | Yes | CF, DCE, DCM, TCE, VC, dichlorobenzene, TDS | Relevant | Given the land use in the region, it is considered highly unlikely that the stock watering beneficial use will be realised; however, given the identification of numerous bores registered for stock and domestic purposes within a 2 km radius of the Site, this beneficial use is considered relevant. |

Table 22 Impacts to Beneficial Uses of Groundwater

| Protected Beneficial Use | Is Groundwater Polluted? | Contaminant/s | Relevance of Beneficial Use [a] | Comment / Rationale |
|---|---|---|---|---|
| Industrial and Commercial | Yes | Iron | Relevant | While the potential industrial and commercial uses and associated quality requirements for groundwater are highly varied, on the basis of the criteria selected and the land use locally, this beneficial use is regarded as relevant. In addition, there are three bores registered for industrial use within 2 km of the Site. |
| Water Based Recreation | Yes | CF, DCE, DCM, TCE, VC, dichlorobenzene, nickel | Relevant | It is considered unlikely that contamination present at the Site would preclude this beneficial use at the nearest surface water body, for the same reasons as those outlined for Water Dependant Ecosystems and Species. However, given the abundance of registered stock and domestic bores within 2 km of the Site, it cannot be ruled out that groundwater could be used for swimming pool makeup water. As such, this beneficial use is considered to be relevant. |
| Traditional Owner Cultural Values | No | NA | - | As the Water Dependant Ecosystems beneficial use is considered representative of traditional owner cultural values, the same rationale as that outlined for water dependant ecosystems (above) is considered to apply. |
| Cultural and Spiritual Values | Yes | CF, DCE, DCM, TCE, VC, dichlorobenzene, nickel | Relevant | As the Water Based Recreation beneficial use is considered representative of cultural and spiritual values, the same rationale as that outlined for water-based |

Table 22 Impacts to Beneficial Uses of Groundwater

| Protected Beneficial Use | Is Groundwater Polluted? | Contaminant/s | Relevance of Beneficial Use [(a)] | Comment / Rationale |
|---|---|---|---|---|
| | | | | recreation (above) is considered to apply. |
| Buildings and Structures | No | pH | - | The depth to groundwater (approximately 6-10 m bgl regionally) suggests that single story basements, deep footings or underground services are unlikely to intersect groundwater. Multi-story basements have the potential to intersect groundwater; however, these have not been identified in the vicinity of the Site. |

*Notes: (a) Relevance of beneficial use only indicated for those beneficial uses potentially precluded by pollution*

In view of the presence CHCs, metals/metalloids and nitrate above either the adopted criteria or natural background conditions, in accordance with the SEPP (Waters), the groundwater is polluted. Where groundwater pollution is identified or assumed, the SEPP (Waters) requires that the pollution be cleaned up to the extent practicable. In accordance with section 13.7 of EPA Publication 759, as the Site is a source of the CHC pollution in the groundwater, a CUTEP submission for the Site was provided to EPA and was approved on 16 March 2020. A summary of the CUTEP submission is presented in **Section 9** and a copy of the report is provided in **Appendix F**.

## 7.3 Beneficial Uses of Surface Water

Although a water sample was retrieved from the pooled water in the drum storage area excavation, as this was not a natural water body the SEPP (Waters) does not apply. Surface water from a natural water body was not sampled during this audit. However, in view of:

- The negligible risk to the beneficial uses of aquatic ecosystems at the point of groundwater discharge; and
- The absence of surface water bodies within the boundary of the Site,

it is considered that the beneficial uses of surface water would not be precluded due to the condition of the Site.

## 7.4 Beneficial Uses of Air

Ambient air was not sampled during this audit, however, a direct soil vapour assessment was undertaken to evaluate the potential for the condition of the groundwater, which contains elevated CHCs, to impact upon the beneficial uses of both land and air. The results of the soil vapour investigation undertaken as part of the environmental audit, as well as soil and groundwater as they relate to potential vapour risks, indicate that the soil vapour concentrations above the portion of the plume with peak volatile concentrations were below those applicable for a commercial land use with no basement (i.e. the proposed/current land use of the Site) based on the Site-specific RBC.

Therefore, on the basis of these findings, it was concluded that there were no unacceptable risks from vapour inhalation to current and future on-Site users based on the current redevelopment with

no basement. Based on CHC concentrations measured in groundwater off-Site, there would also be no unacceptable risk to off-Site commercial/industrial and future potential residential users. This included potential future off-Site residences with three-level basements, which is considered to be conservative.

# 8 Risk Evaluation and Management

## 8.1 Soil

Residual fill material contains contaminant levels above the NEPM HILs and is also likely to contain ACM, with potentially a degraded (friable) ACM component. The potential human health risks associated with this material can be managed by the EMP that will be required to be implemented as a condition of the Statement of Environmental Audit.

It is noted that the Site-specific RBLs derived by EnRisks for the vapour intrusion pathway from soil for CHCs present at the Site were not exceeded during the assessment and validation programs. As such, there is not considered to be an unacceptable vapour intrusion risk from the residual fill material or soil at the Site for a commercial/industrial land use.

On this basis, the auditor considers that the condition of soil remaining at the Site does not pose an unacceptable risk to future users of the Site, including commercial occupants, visitors and maintenance workers, provided that appropriate management measures are adopted.

## 8.2 Groundwater

Groundwater at the Site is classified as Segment A1 in accordance with the SEPP (Waters). Most of the relevant protected beneficial uses of groundwater were found to be precluded due to the presence of one or more pollutants. The beneficial uses considered to be precluded due to pollution at the Site included Potable Water, Agriculture and Irrigation (Irrigation and Stock Watering), Industrial and Commercial, Water Based Recreation and Cultural and Spiritual Values. Pollutants comprise CHCs, metals/metalloids and other inorganics, including nitrate. The CHCs are considered to be sourced from Site, however, the remaining species are considered to be representative of diffuse regional pollution in the Cheltenham region.

The concentrations of CHCs in groundwater are present at concentrations below the Site-specific RBLs derived by EnRisks (2018) for vapour intrusion. As such the auditor is satisfied that no unacceptable vapour intrusion risk from groundwater currently exists at the Site for an ongoing commercial land use excluding basements.

Extensive use of groundwater for domestic use (including irrigation) is considered unlikely given the urban industrial setting and the availability of a reticulated water supply within the Site vicinity, however, there are a large number of bores within a 2 km radius of the Site registered for stock and domestic use, and irrigation use, such that beneficial uses including Agriculture and Irrigation (Irrigation and Stock Watering), Water Based Recreation and Cultural and Spiritual Values are considered to be relevant. Site groundwater is considered unsuitable for these purposes without further treatment, however, the Site has been redeveloped as a Dan Murphy's store which includes a building and a sealed car park covering nearly the entire Site area, hence there will be minimal ability or need to access underlying groundwater for these purposes.

As the Site was the source of the CHC pollution in the groundwater, the auditor provided a CUTEP submission to EPA. EPA approved the CUTEP on 16 March 2020 and declared to Site to be within a GQRUZ. A summary of the CUTEP Submission is provided in **Section 9** and the extent of the GQRUZ is shown in **Figure F8**.

## 8.3 Surface Water

There is considered to be no risk to the beneficial uses of surface water due to the condition of the Site at and in the vicinity of the Site. Therefore, no management measures are necessary.

## 8.4 Vapour

There is considered to be no risk from vapour at the Site for the ongoing commercial land use excluding basements. Therefore, no management measures are necessary.

# 9 Groundwater Clean Up to the Extent Practicable Assessment

In accordance with Section 13.6 of EPA Publication 759.3:

- Where polluted groundwater is established at a site, and it is not practicable to clean up groundwater to protect the beneficial uses, clean up must be undertaken to the extent practicable in accordance with the SEPP (Groundwaters of Victoria), and a CUTEP determination must be made. It is noted that SEPP (Waters) was declared in October 2018, replacing SEPP (Groundwaters of Victoria), and states that clean up of pollution must be undertaken so far as reasonably practicable, which for the purposes of this audit is taken to have the same meaning as CUTEP.
- CUTEP has been determined by EPA for this Site (the basis for which is described in **Section 9.1**). A CUTEP Submission was provided to EPA on 12 November 2019 and a copy is provided in **Appendix F**. EPA determined that CUTEP had occurred at the Site on 16 March 2020 and declared the Site to be within a GQRUZ. A copy of EPA's acceptance letter and GQRUZ map is provided in **Appendix H**.

A summary of the auditor's CUTEP submission is provided in the following sections. The auditor has referred to Appendix 2 (CUTEP Information Guide) of EPA Publication 840.2 for guidance in providing this determination. A completed CUTEP checklist, in accordance with Attachment A of EPA Publication 840.2, is provided with the CUTEP submission, together with the groundwater summary tables **Table F1** to **F4** of **Appendix F**.

## 9.1 Basis for CUTEP Submission to EPA

Groundwater at the Site was found to be polluted by chemicals that derived from on-Site sources and this pollution was found to extend off-Site. For this reason, in accordance with EPA Publication 759.3, the auditor sought confirmation from the EPA that clean-up of groundwater had been achieved so for as reasonably practicable.

## 9.2 Summary of Auditor's CUTEP Submission

Groundwater pollution (in the form of CHCs) relating to the Site's former use for chemical storage and distribution, was identified at and extending beyond the boundary of the Site, as discussed in **Section 6.3.2.**

Clean up works undertaken at the Site comprised source/potential source removal, including the removal of the TIT and surrounding soil; excavation and removal of the TIT pipework and surrounding backfill sands; and excavation of soil beneath the former drum store. The validation samples retrieved following the remedial works showed concentrations of CHCs were all below laboratory detection limits, with the exception of chloroform within one sample collected from one of the walls of the TIT excavation, which was below the Site-specific risk-based criteria.

The extent of the groundwater plume has been assessed since 2008 and has been considered laterally delineated since the installation of off-Site down-gradient wells during 2017 and 2018. The vertical extent of impacts has been assessed through the installation of nested wells in the source area and in the downgradient direction approximately 15 m from the Site boundary. Based on the findings of the Site investigations, the Site-sourced contamination plume is considered to be laterally and vertically delineated. The groundwater monitoring undertaken since 2008 indicates the contaminant plume is either stable or decreasing with the exception of VC which has shown a slight increase due to reductive chlorination within the CHC plume.

The concentration of VC and other Site-related CHCs have been predicted via groundwater modelling (undertaken by the auditor and presented as Appendix F of the auditor's CUTEP submission) to ultimately reduce in concentration to acceptable levels. Based on reasonably conservative modelling assumptions, the VC concentrations that exceed the drinking water

guidelines (i.e. the plume extent) should not extend beyond 76 m from MW21 (located in the south-western portion of the Site) in a south-westerly direction. While the overall flow direction is predicted to be to the south-west, the relatively flat watertable may have periodic deviation of direction from west to south.

The remediation options assessment undertaken by the assessment consultant determined that direct remediation of the groundwater was not justified based on the high costs associated with the available remedial options and that current and future risks to on and off-Site receptors were considered to be acceptably low. The Auditor's review of the relevant information confirmed this view. The specific reasons for forming this opinion are as follows:

- Primary and secondary sources of pollution (CHCs) have largely been removed;
- GW pollution (CHCs) has been delineated. The plume extent has been shown to be stable or shrinking, with the exception of VC (increasing) due to the occurrence of biodegradation;
- GW modelling has conservatively predicted that groundwater plume will reach its furthest extent of 76 m in approximately 41 years;
- The closest known groundwater extraction bore is located approximately 213 m south of the Site, well beyond the likely extent of the plume;
- The plume is highly unlikely to discharge to the nearest surface waterbody (Port Phillip Bay), located 2.7 km to the south-west; and
- Risks posed to on and off-Site receptors by CHC vapours deriving from polluted groundwater, including potential future basements, have been found to be acceptably low.

Ongoing groundwater monitoring is required in accordance with the Groundwater Quality Management Plan (GQMP) prepared by the assessment consultant and attached to the Statement of Environmental Audit (**Appendix A**).

As relevant beneficial uses of groundwater are precluded, a GQRUZ was recommended to inform future potential groundwater users of the groundwater pollution. The details of the GQRUZ are defined in **Section 9.3**.

## 9.3 Groundwater Quality Restricted Use Zone

As discussed in **Section 9.2**, the EPA determined that a GQRUZ is warranted to acknowledge the clean-up activities and the presence of groundwater contamination that precludes a number of protected beneficial uses at and down-gradient of the Site.

The extent of the GQRUZ (as shown in **Figure F8)** has been based on comparison of the most recent CHC concentrations in groundwater with the criteria for the beneficial use of potable water, groundwater modelling undertaken by the Auditor as well as an appropriate buffer to account for any future variation in groundwater flow direction.

The GQRUZ restricts local groundwater use from the following beneficial uses:

- Potable Water (Desirable);
- Agriculture and Irrigation (Irrigation);
- Agriculture and Irrigation (Stock watering);
- Industrial and Commercial;
- Water Based Recreation; and
- Cultural and Spiritual Values.

Groundwater quality is not considered suitable for these uses without prior treatment.

It should be noted that natural groundwater conditions may further limit the beneficial uses of groundwater and that appropriate further testing is recommended prior to the utilisation of local groundwater for any purpose.

## 9.4 Community Consultation

A stakeholder engagement plan prepared in accordance with EPA Publication 840.2 was reviewed for implementation of the GQRUZ and is provided in Appendix V of Resolve 2019. The Stage 1 communication letters were sent to the relevant stakeholders on 7 February 2020 and the Stage 2 communication letters were sent on 18 March 2020.

Copies of the GQRUZ communication plan and Stage 1 and 2 communication letters is provided in **Appendix I**. The auditor reviewed the information that has been provided to the stakeholders during both stages of communication and considers that the level of communication is satisfactory for the purposes of notifying land holders and occupiers within the GQRUZ.

# 10 Quality of Information

This section presents an overview of the quality of the information used by the auditor to form his opinions on the contamination status of the Site and its suitability for its intended use.

As discussed in **Section 3.1**, primary reliance was given to investigation summary documents generated by ARC Environmental and Resolve.

## 10.1 Historical Information

A historical review of the Site and surrounding area was completed by both ARC Environmental and Resolve. The information is compiled in the following documents:

- ARC Environmental (2017), Preliminary Site Investigation, 322 – 328 Bay Road, Cheltenham, Victoria, dated 1 May 2017;
- Resolve (2019), Detailed Site Investigation, Remediation & Validation Report, Lot 1, Chandos Bay, 328 Bay Road, Cheltenham, dated 12 September 2019.

The reviews were conducted in general accordance with guidance provided in the following documents:

- Australia Standard (AS 4482.1) Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005); and
- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288. In particular, Schedule B2: Guideline on Site Characterisation.

The combined sources of historical information included the following:

- Current and historical land title information;
- Published geology and hydrogeology for the Site;
- Review of existing hydrogeological databases;
- Review of the EPA Victoria Priority Sites Register;
- Review of the Sands and McDougall directory;
- Review of Melbourne Metropolitan Board of Works records;
- Review of publicly available completed Environmental Audit Reports;
- Review of EPA Victoria Groundwater Quality Restricted Use Zones;
- Review of historic and current Trade Waste Agreements;
- Review of Energy Safe Victoria Cathodic Protection Systems register;
- Inspection of the Site and surrounding areas; and
- Review of Historical aerial photographs from 1945 to 2015.

The auditor considers the combined historical review undertaken by ARC and Resolve, in conjunction with the auditor's own research, is sufficient to provide an adequate understanding of the history of the Site and potentially contaminating historical activities.

## 10.2 Soil Investigation Methodology

Guidance on undertaking soil investigations for the purposes of completing an environmental site assessment is provided in the following documents:

- Australia Standard (AS 4482.1) Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005);
- Australia Standard (AS4482.2) Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile substances (Standards Australia, 1999);
- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288;
- Environment Protection Authority, Publication IWRG621, Soil Hazard Categorisation and Management, 2009;
- Environment Protection Authority, Publication IWRG701, Sampling and Analysis of Waters, Wastewaters, Oils and Wastes, 2009; and
- State Environment Protection Policy (Prevention and Management of Contamination of Land) No.S95, EPA Victoria, June 2002.

Soil investigations completed at the Site are documented within Resolve 2019, the soil assessment locations are presented in **Figure F5** and the results included in Table 1 of Resolve 2019.

Primary components of a soil investigation relevant to this audit, together with the auditor's observations and comments in relation to the works conducted by Resolve, are summarised in the following table:

**Table 23 Soil Investigation Summary**

| Objective | Auditors Observations and Comments |
|---|---|
| Soil Sampling Coverage | As discussed in **Section 6.2.2,** fill material was ubiquitous at the Site and extended to depths of between 0.15 and 0.6 m below the original Site surface, where it overlaid natural sandy clay.<br><br>The contamination status of residual soil (i.e. that remaining at the Site) has been characterised by Resolve via sampling. A total of 15 targeted and gridded soil location assessment investigations have been completed across the site post May 2017. The locations complemented 23 soil bores completed prior to May 2017 to meet spacing requirements outlined in the DSI objectives.<br><br>Targeted soil investigation locations were positioned to investigate potential on-site sources arising from historical Site activities in areas including the TIT, suspected lead acid battery disposal pit, former AGSTs located both within and west of the indoor acid store, former drum storage area and former yacht wash down area. The location of the soil assessments areas is presented in **Figure F5.**<br><br>The auditor considers a comparison of sampling density with that recommended in AS4482.1 is appropriate for this Site with the addition of the targeted sampling locations. Based on first-hand observations from numerous Site inspections, where the quality and nature of fill was regularly observed, the auditor is satisfied that the sampling density is adequate to characterise the soil at the Site. |
| Triple Interceptor Trap Removal and Validation | As discussed in **Section 6.2.3**, targeted validation sampling was undertaken with respect to the removal of the TIT infrastructure that was present along the southern boundary of the Site. Validation sampling was undertaken on the walls and base of the excavation by Evolution Environmental. Following removal of the TIT infrastructure the pit was backfilled with soils from the |

**Table 23 Soil Investigation Summary**

| Objective | Auditors Observations and Comments |
|---|---|
| | stockpiled material located within Lot 1. One (1) targeted soil bore was advanced via hand auger to 1.5 mBGL within the backfilled material.<br><br>The removal of pipework and surrounding packing sands from the TIT to the sewer connection in the south-west corner of the Site to a depth of 2.3 to 2.5 mBGL was also undertaken as part of the interceptor trap removal works. The trench was backfilled with the excavated sandy clay. Following backfill, soil samples were collected from five (5) validation soil bores, advanced along the trench via push tube to a depth of 3 mBGL.<br><br>The location of the trench validation soil bores undertaken following the excavation works are shown on Figure 3 of the ARC environmental DSI. The remediation and validation of the TIT infrastructure and associated pipework was considered to be satisfactory and the available evidence suggests that no significant residual contaminated soil remains in the vicinity of this facility. |
| Drum Store Excavation and Validation | During the soil assessment works in February 2018, four (4) soil bores were advanced by ARC Environmental to laterally and vertically delineate the CHC concentrations identified within the soils within the centre of the former drum store. The soil bores were advanced by hand auger to a maximum depth of 2 mBGL at a distance of approximately 2 m to the north, south, east and west of a historical soil bore (shown on Figure 2 of the ARC DSI report).<br><br>Following the delineation soil assessment works, the drainage pits and infrastructure and, soils were excavated and removed, with validation sampling undertaken on the walls and base of the excavation by EEC and ARC. The excavated soils were stockpiled onsite, with the excavation backfilled following demolition works (see Section **6.2.6**).<br><br>The remediation and validation works undertaken in the drum storage area were considered to be satisfactory and the available evidence suggests that no significant residual contaminated soil remains in this area. |
| Soil Sample Collection Methods | All soil bores were advanced via a combination of hand auger and push tube (GeoProbe) drilling to a maximum depth of 2.5 mBGL (where possible) in an attempt to characterise the imported fill and natural soils beneath the Site.<br><br>During the soil sampling works, soil samples were generally retrieved from near surface (0.05 m BGL), 0.5 mBGL and 1.0 mBGL depth and every metre thereafter, or where visual impact or change in lithology was noted. Where test pitting was utilised sampling occurred directly from the excavation bucket using dedicated disposable nitrile gloves.<br><br>The samples were collected into laboratory supplied glass jars with zero headspace (as close as practicable).<br><br>The sampling techniques adopted by the assessor are considered satisfactory by the auditor. |
| Decontamination | The potential for cross-contamination was minimised by collecting samples directly from excavation surfaces (i.e. grab samples) and hand auger in most cases. Dedicated disposable gloves were used and replaced between each sample collected.<br><br>The hand auger was decontaminated between each sample location using a suitable detergent (decon 90), followed by a potable water rinse and a |

**Table 23 Soil Investigation Summary**

| Objective | Auditors Observations and Comments |
|---|---|
| | laboratory supplied de-ionised water rinse (as documented in Section 8.1.1 of Resolve 2019.<br><br>The decontamination procedures adopted by the assessor are considered satisfactory by the auditor. |
| Field Measurements | Field screening for VOCs was undertaken using a portable PID with a correction factor applied for CHCs; however, records were not consistently kept. The PID calibration certificates are provided in Appendix K of Resolve 2019.<br><br>Instrument calibration was also inadequate with no evidence of a fresh air check completed at the commencement of the daily activities or a span calibration using a known reference standard.<br><br>As the field measurements recorded by the assessor are corroborated by the laboratory data, previous field screening data collected by Resolve/ARC and the auditors own observations such that the assessment overall is considered to have been adequate to assess the potential for volatile contamination at the Site. |
| Field Documentation | All observations and readings, including visual and olfactory observations and PID readings, including the visual observation of suspect ACM were recorded in the field in line with USCS (Unified Soil Classification System).<br><br>Field documentation of the trench soil validation program including bore logs and PID concentrations are presented in Appendix C of Resolve 2019, with observations recorded during the excavations works presented in Appendix K. The sample identification number and depth of soil sample were recorded on CoC documentation.<br><br>A comprehensive record of field instrument calibration records has not been provided.<br><br>When the assessment program as a whole is considered, including corroborating lines of evidence from laboratory analysis and the auditor's own observations, the auditor is satisfied that the assessment program has yielded sufficient reliable data from which to form an opinion regarding the condition of the Site. |
| Sample Handling | Soil samples were collected into laboratory supplied glass jars and transported on ice until received by the laboratory.<br><br>Overall, the sample handling procedures adopted by the assessor are considered satisfactory by the auditor. |
| Number and Type of Quality Control Samples | Quality control samples were collected during the soil validation program at the following frequency:<br>• Eight (8) intra-laboratory samples were collected and analysed for a total of 98 primary samples analysed corresponding to a rate of 12%, which meets the minimum recommended frequency of 5% (1 in 20 primary samples).<br>• Seven (7) inter-laboratory samples were collected and analysed for a total of 151 primary samples, analysed corresponding to a rate of 14%, |

Table 23 Soil Investigation Summary

| Objective | Auditors Observations and Comments |
|---|---|
| | which meets the minimum recommended frequency of 5% (1 in 20 primary samples).<br>• Six (6) (equipment) rinsate samples were collected and analysed.<br>• Seven (7) trip blanks were collected and analysed.<br>Overall the auditor considers the number of quality control samples collected sufficient to validate the resultant dataset for interpretative use. |
| Selection of Chemical Analytes | The auditor is satisfied that the laboratory analytical suite was appropriate based on the historical potential for contamination sources identified. In addition, a broad suite of analytes was investigated at selected locations. |

## 10.3 Groundwater Investigation Methodology

Guidance on undertaking groundwater investigations for the purposes of completing an environmental site assessment is provided in the following documents:

- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288;
- SEPP (Waters);
- EPA Victoria Industrial Waste Resource Guideline (IWRG) Publication 701 – Sampling and Analysis of Waters, Wastewaters, Soils and Wastes, 2009;
- EPA Victoria Publication 669 – Groundwater Sampling Guidelines, 2000; and
- EPA Victoria Publication 668 – Hydrogeological Assessment (Groundwater Quality) Guidelines 2006.

Groundwater investigations completed at the Site are documented within Resolve 2019, which includes coverage of groundwater assessment works completed by Resolve and ARC Environmental.

Primary components of the groundwater investigation relevant to this audit, together with the auditor's observations and comments in relation to the works conducted by Resolve and ARC Environmental, are summarised in **Table 24**.

Table 24 Groundwater Investigation Summary

| Objective | Auditors Comments and Observations |
|---|---|
| Groundwater monitoring well network | As discussed in **Section 6.3**, the groundwater monitoring network comprised 14 on- and off-Site groundwater monitoring wells installed periodically over the course of various assessment programs. Due to the redevelopment of the Site, all on-Site wells have been decommissioned.<br>The following wells were added to the monitoring network from 2017 to target the following sources:<br>• Two on-site groundwater wells (MW45A and MW45B) were installed by Evolve Environmental in June 2017 to target the former triple interceptor and replace MW3. |

**Table 24 Groundwater Investigation Summary**

| Objective | Auditors Comments and Observations |
|---|---|
| | • Two off-site groundwater wells (MW52 and MW53) were installed by Evolve Environmental in May 2017 along Hamlet Street to the south-west in an attempt to delineate CHC groundwater impacts identified in the south-west corner of the Site,<br>• Two off-site groundwater wells (MW54 and MW55) were installed by ARC Environmental in March 2018 to the south-west along Wanrua Street to delineate vinyl chloride groundwater impacts identified in the off-site monitoring wells to the south-west (MW52 and MW53).<br>• Off-site up-gradient well MW56 was installed by Resolve to the east of the Site to assess off-Site groundwater conditions.<br>• Off-site well MW59 was installed by Resolve as a nested well to MW52 to assess the hydraulic gradient and for the presence of dense CHCs.<br>The groundwater monitoring well network has provided coverage of the Site, including the former TIT, drum storage delineation, and also up-, cross- and down-gradient of the Site to provide characterisation of groundwater flow and quality down flow path.<br>The auditor considers the groundwater monitoring network and the monitoring undertaken to be adequate for the purposes of this audit. |
| Groundwater monitoring well construction | Two on-Site groundwater wells and six off-Site groundwater wells were advanced via mechanical drilling to a maximum depth of 20.0 mBGL. The groundwater wells were installed by licensed drillers (Horizon Drilling and Drillworx) with 50 mm, flush jointed, class 18 uPVC, threaded screen and casing. Sand filter packs were installed to 0.5 m above the top of the screened interval and a bentonite seal installed to 0.5 m above the top of the sand pack. The wells were grout sealed from the bentonite seal to the surface and were finished with a flush mounted gatics and fitted with lockable well caps.<br>Based on the borelogs provided in Appendix F of Resolve 2019, the groundwater monitoring wells were constructed in general accordance with 'Minimum Construction Requirements for Water Bores in Australia' – Land and Water Biodiversity Committee, 2012). Copies of the Victorian Water Register License to Conduct Works (WLE068372, WLE071336 and WLE074359) obtained from Southern Rural Water are also included in Appendix I of Resolve 2019 with groundwater monitoring well locations shown on **Figure F3**.<br>Groundwater monitoring wells were generally installed to a depth of between 17 and 20 m BGL and were typically screened within the Red Bluff Sands of the SSA. All new groundwater wells were developed using a stainless-steel bailer or submersible pump to purge the well dry three (3) times.<br>Equilibrated water levels are generally above the screened interval under ambient conditions, such that the wells are generally not appropriately constructed to detect LNAPL, if it was to be present. The auditor considers that the groundwater monitoring well construction is appropriate for the purposes of the audit as CHCs are the contaminants of concern. |
| Shallow Monitoring Well installation | In July 2018, three (3) shallow monitoring wells (SMW01 through SMW03) where installed by ARC Environmental via hand auguring methodology to assess the potential presence of a perched aquifer beneath the site. |

**Table 24 Groundwater Investigation Summary**

| Objective | Auditors Comments and Observations |
|---|---|
| | Two (2) monitoring wells were positioned within the former drum store (south west and east) and one (1) monitoring well positioned in the eastern portion of the former non-toxic store.<br><br>The shallow monitoring wells were installed by Drillworx with 50 mm, flush jointed, class 18 uPVC, threaded screen and casing to depths between 0.75 mBGL and 0.8 mBGL. Shallow monitoring well locations are shown on Figure 16 of Resolve 2019. |
| Well Decommissioning | Seven (7) on-site monitoring wells and the three (3) shallow monitoring wells were decommissioned by licensed drillers (Horizon Drilling and Matrix Drilling) in accordance with the Minimum Construction Requirements for Water Bores In Australia, Edition 3 as required by the Southern Rural Water bore decommissioning licenses (WLE071392 and WLE072096) which are provided in Appendix I of Resolve 2019. |
| Groundwater Sample collection techniques | Resolve and ARC utilised submersible bladder pumps as described in Section 8.2.2 of Resolve 2019, which is considered to be an appropriate low flow methodology in accordance with EPA Victoria publication 669.<br><br>Field parameters including electrical conductivity, pH, temperature, dissolved oxygen and oxidation/reduction potential were measured during purging using a water quality meter, with drawdown kept to a minimum. Purging continued until these parameters stabilised in accordance with EPA publication 669 (EPA, 2000).<br><br>Samples analysed for metals were filtered in the field using a 0.45 micron filter, prior to transport to the laboratory.<br><br>Overall, the auditor is satisfied that the groundwater sampling techniques employed by ARC and Resolve were appropriate to facilitate collection of a representative groundwater sample. Groundwater sampling by the consultants was observed by the audit team on several occasions, including the collection of two verification samples (data for which is presented in **Section 6.3.4)**. |
| Surface Water and shallow monitoring well sample collection techniques | Water observed within the open drum store excavation was sampled via dedicated bailer following the measurement of field parameters (electrical conductivity, pH, temperature, dissolved oxygen and oxidation/reduction potential). The location of the surface water sample collected from the former drum store is shown on Figure 16 of Resolve 2019.<br><br>All three (3) shallow monitoring wells were gauged after a minimum of 24 hours post shallow bore installation. Two (2) of the shallow monitoring wells were dry. The water present within the one (1) shallow monitoring well with water present was sampled via dedicated bailer. Field parameters were not completed due to the limited volume of water present.<br><br>The water samples were directly obtained into laboratory provided sampling containers (pre-preserved where appropriate) without headspace. All samples were labelled and then placed into a cooled, insulated and sealed container for transport to the laboratory under CoC procedures.<br><br>Overall, the auditor is satisfied that the surface water/shallow well sampling techniques employed by the assessors were appropriate. |
| Decontamination | Equipment decontamination procedures in the field were observed to comprise washing non-dedicated/non-disposable sampling equipment with a low phosphate detergent solution (Decon 90) followed by a Decon 90 and de-ionised water rinse |

**Table 24 Groundwater Investigation Summary**

| Objective | Auditors Comments and Observations |
|---|---|
| | and de-ionised water rinse. New nitrile gloves, tubing and bladders were dedicated to each sample location.<br><br>Of the 22 rinsate samples analysed, four reported analytes equal to or above detection limits (chloroform, DCM, TCE, trihalomethanes and inorganics including ammonia, chloride, and metals). The remaining 18 rinsate samples reported all analytes <LOR.<br><br>The auditor is satisfied that, overall, the decontamination techniques were consistent with reference guidelines and were adequate for the purposes of this environmental audit. |
| Field measurements | A calibrated water quality meter was documented to have been used to measure field parameters by ARC, as described in Section 8.2.2 of Resolve 2019.<br><br>A calibrated oil/water interface meter was used to measure standing water levels and to detect the presence or absence of LNAPL by ARC based on a calibration certificate provided in Appendix K of Resolve 2019. |
| Field documentation | Groundwater gauging and sampling sheets are provided in Appendix N of the Resolve DSI report with CoC records provided in Appendix P, Field documentation was appropriately completed for the groundwater sampling program undertaken by ARC and Resolve. |
| Sample handling, preservation and storage | As documented in Section 8.2.2 of the Resolve 2019 report all groundwater samples were collected into laboratory supplied, appropriately preserved sample bottles and transported to the laboratory on ice in an insulated container. Sample receipt notifications (SRNs) were provided in Appendix P of Resolve 2019. The sampling, handling and preservation protocols are determined to be appropriate for interpretive purposes. |
| Number and Type of Quality Control Samples | As described in Section 8.2.2 of Resolve 2019 report quality control samples were collected and analysed at the following rates:<br>• Duplicates and triplicates - 1 in 20 primary samples;<br>• Trip blanks at a rate of 1 per sample batch; and<br>• Rinsate samples at one per piece of non-dedicated field equipment per day.<br><br>The auditor verification process indicated that following:<br>• A total of 11 duplicate and 10 triplicate samples from 68 primary samples were collected and analysed, which meets the minimum recommended frequency of 5% (1 in 20 primary samples).<br>• A total of 23 rinsate blanks were submitted for analysis.<br>• Fourteen trip blank samples were collected and analysed. The concentrations of all analytes were below laboratory LOR.<br><br>Overall, the auditor considers the number of quality control samples collected sufficient to validate the datasets for interpretative use. |
| Selection of Chemical Analytes | The auditor is satisfied that the laboratory analytical suite was appropriate based on the historical potential for contamination sources identified. In addition, a broad suite of analytes was investigated at selected locations. |

## 10.4 Soil Vapour Investigation Methodology

Guidance on undertaking soil vapour investigations for the purposes of completing an environmental site assessment is provided in the following documents:

- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288;
- SEPP (Air quality management); and
- CRC CARE Technical Report 23: Petroleum hydrocarbon vapour intrusion assessment: Australian guidance.

Soil vapour investigations were completed at the Site by ARC Environmental and are documented in Section 13 of Resolve 2019.

Primary components of the soil vapour investigation relevant to this audit, together with the auditor's observations and comments in relation to the works conducted by Resolve and ARC Environmental, are summarised in **Table 25**.

**Table 25 Soil Vapour Investigation Summary**

| Objective | Auditors Comments and Observations |
|---|---|
| Soil Vapour Probe Installation | Three sub-slab vapour pins (VP01-VP03) were installed within the footprint of the proposed Dan Murphy's building to verify that there was unlikely to be a soil vapour risk from soil and/or groundwater. Pins were installed using a concrete hammer drill to a depth of ~100 mm. The vapour pins were completed with flush stainless-steel vapour pins. |
| Soil Vapour Probes Monitored | VP01 to VP03 were sampled on 10 July 2018. |
| Sampling Methodology | Samples were collected by Resolve Environmental in general accordance with ASC NEPM and the methodologies outlined in CRC Care Technical Report 23 Petroleum hydrocarbon vapour intrusion assessment. Samples were collected using summa canisters which were certified clean by the laboratory and pre-prepared under a vacuum of -30 inches Hg. Post sampling vacuums of -5 inches Hg were recorded on all samples. |
| Equilibration Time After Installation | As the soil vapour sampling was to monitor sub-surface conditions immediately beneath the existing concrete/asphalt footprint, the vapour probes were left for at least 45 minutes prior to sampling, which was considered adequate to collect representative samples of the sub-slab environment. |
| Leak Testing | Leak testing was undertaken at each probe using an helium shroud and helium detector (Gas Check 5000). The results of the leak testing confirmed the probes were appropriately sealed to prevent atmospheric ingress. |
| Low Sorbent Tubing Used | Teflon tubing was used on the sample train which is appropriate for the CoPCs including chlorinated solvents. |
| Sample Volume Minimised | The use of summa canisters together with low flow pumping ensures that the sample volume is minimised. |
| Bore Appropriately Purged | At least 100 mL of air was purged from the tubing prior to sampling. |
| Sample Flow Rate Appropriate for Media | A certified mass flow controller was attached to each canister to maintain appropriate flow rates averaging 60 mL/minute, which is appropriate for low permeability media. |

Table 25 Soil Vapour Investigation Summary

| Objective | Auditors Comments and Observations |
|---|---|
| Sample Locations | The three sub-slab soil vapour pins were installed within the footprint of the proposed Dan Murphy's building. The locations of the sub-slab soil vapour pins are shown on Figure 17 of Resolve 2019. One sub-slab soil vapour pin was located in the north of the proposed footprint while two were located in the southern half of the proposed footprint which is deemed appropriate to assess worst case conditions beneath the proposed building and to evaluate potential spatial variation. |
| Field Records and Field Methods | The field methods and soil vapour sampling sheets appropriately describe and record the steps involved with the leak testing of both the sampling train and the three sub-slab soil vapour pins. The field sheets are provided in Appendix O of Resolve 2019. |
| Analytical Suite | Samples were analysed for ALS USEPA Extended TO15 suite for VOCs in soil vapour and for permanent gases. This suite includes BTEXN, limited MAH analytes, CHCs, solvents and VOC, which is appropriate for the COPCs identified at the Site. |
| NATA Accreditation | ALS is NATA accredited for soil vapour analysis and the laboratory report contains a NATA accreditation stamp with its accreditation number and site number. |
| Decontamination procedures | Dedicated flow controllers and laboratory cleaned and certified equipment were utilised during the investigation. |
| Sample preservation and storage | The sample preservation and storage procedures outlined are considered to be appropriate. All canisters were received with vacuums present, the vacuums upon receipt ranged from 1.54 to 3.48 inches Hg while end of sampling vacuums of 5 inches Hg were recorded. |
| Holding times | Samples were received by the laboratory and analysed within the applicable holding times, as demonstrated by the CoC documentation and laboratory reports. |
| Sample tracking | The CoC documentation is considered to be appropriate for the tracking of the samples between the field and laboratory. CoC documentation is provided in Appendix P of Resolve 2019. |
| Calibration of field instruments | A helium detector (Gas Check 5000) and hand-held multi-gas meter (GFM 430) were used during the leak testing and sampling process. A calibration certificate is provided in Appendix K of Resolve 2019. |
| Quality control (QC) testing – equipment and field blank samples | A blank sample was collected and analysed, with no detects recorded for the analytes analysed. |
| QC testing – field duplicate frequency | One blind replicate sample was collected and analysed during the soil vapour investigation. |
| Laboratory QA/QC procedures | The laboratory QA/QC procedures are considered to be appropriate. No inter-laboratory sample was collected. |
| Laboratory detection limits | The laboratory detection limits were below the guideline values for all of the contaminants. |
| Anomalous results | No anomalous data were noted. Specifically the results of the soil vapour monitoring are consistent with those reported in soil and groundwater. |

## 10.5 Laboratory Analysis and Quality Control

Guidance on undertaking laboratory analysis and interpreting quality control results for the purposes of undertaking an environmental site assessment is provided in the following documents:

- NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288;

- EPA Victoria Industrial Waste Resource Guideline (IWRG) Publication 701 – Sampling and Analysis of Waters, Wastewaters, Soils and Wastes, 2009;
- Australia Standard (AS 4482.1) Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds (Standards Australia, 2005); and
- Australia Standard (AS4482.2) Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile substances (Standards Australia, 1999).

Primary components of a laboratory analysis and quality control program relevant to this audit, together with the auditor's observations and comments in relation to the works conducted by Resolve and ARC Environmental, are summarised in **Table 26**.

**Table 26 Laboratory Analyses and Quality Control Summary**

| Objective | Auditors Observations and Comments |
|---|---|
| National Association of Testing Authority (NATA) Accreditation | ALS Environmental was the nominated primary laboratory, while Eurofins-MGT was the nominated secondary laboratory for soil and groundwater analysis for both Resolve and ARC Environmental. Both ALS Environmental and Eurofins-MGT are NATA accredited for the soil and groundwater analyses undertaken. |
| Sample holding times | Soil and groundwater samples were extracted and analysed within the recommended holding times, with the exception of three (3) soil samples and four (4) groundwater samples. Holding times were generally exceeded by one day. It is noted that 17 Groundwater samples collect in August 2018 were analysed outside of the holding time for formaldehyde.<br><br>The auditor considers the holding time exceedances noted above do not materially affect the data set relied upon by the auditor, given the non-volatile nature of the analytes and the preservation of the samples at the time of the collection. |
| Limits of Reporting | The laboratory limits of reporting (LOR) were acceptable for soil and groundwater, as shown in the analytical data summary tables in Resolve 2019. |
| Intra and Inter laboratory field duplicates/triplicates | A review of the assessor's data validation tables for soil and the relative percentage difference (RPD) tables noted that the intra-laboratory duplicates and inter-laboratory field triplicates reported RPDs were within the acceptable range with the exception of two results outside the acceptable limits. The RPDs outside the acceptable limits were reported for metals and were attributed to the heterogeneous nature of the fill soils analysed.<br><br>These non-compliances are not considered by the auditor to affect the soil data interpretation as the explanation provided by Resolve that they are likely due to the sample heterogeneity. Resolve has stated that the highest results were adopted for interpretative purposes as part of a conservative approach.<br><br>A review of the assessor's data validation tables for groundwater water and the relative percentage difference (RPD) tables noted that the intra-laboratory duplicates and inter-laboratory field triplicates reported RPDs outside of the acceptable range for 16 of the calculated 1,556 RPD results. The RPDs outside the acceptable limits were reported primarily for VOCs and were attributed to the volatile nature of VOCs. These non-compliances are not considered by the auditor to materially affect the groundwater data interpretation. Resolve has stated that the highest results were adopted for interpretative purposes as part of a conservative approach. |

**Table 26 Laboratory Analyses and Quality Control Summary**

| Objective | Auditors Observations and Comments |
|---|---|
| Rinsate blanks | Rinsate samples collected by Resolve during the soil investigations were collected from the hand auger or a hand trowel. All rinsate samples collected reported concentrations of analytes <LOR.<br><br>A total of 23 rinsate blanks were collected and analysed from the submersible pump during the groundwater monitoring events. Chloroform, DCM, TCE, trihalomethanes, acetone, ammonia, alkalinity and manganese were detected at concentrations at, or just above the laboratory LOR in five of the rinsate samples collected. This indicates that decontamination procedures may have been sub-optimal during some monitoring episodes.<br><br>Given the low concentrations of the analytes and general sequence of sampling the monitoring wells, the auditor is satisfied that this has no material impact on data interpretation. |
| Field blanks | Field blanks were not collected during the soil or groundwater programs at the Site. The auditor is satisfied that this has no material impact on the data interpretation. |
| Trip blanks | Analyte concentrations in all soil and water trip blank samples collected were reported below the laboratory LORs. |
| Laboratory generated quality control data | The auditor conducted a review of laboratory generated quality control data inclusive of:<br>• Frequency of quality control testing;<br>• Method blanks;<br>• Internal laboratory duplicates;<br>• Matrix spikes; and<br>• Surrogate spikes.<br><br>The review noted a number of non-compliances however, overall their impact was not considered to be significant and they were not considered to affect data interpretation. |
| Anomalous results | Formaldehyde concentrations reported in groundwater in August 2017 were queried with the laboratory, with ALS indicating that the EP010 inorganic method used on the selected samples is a titrimetric method based on colour change analysed on the UV Viscan and can bias high (i.e. cause false positives). As such, the lab indicated that the August 2017 results were not reliable and hence they were rescinded by the laboratory within their reports (EM1711267, EM1711357, EM1711441 & EM1711516).<br><br>There were no other anomalous results reported during the primary soil and groundwater investigations completed by Resolve and ARC environmental. |
| Auditor Verification Samples | The auditor verification groundwater samples collected from MW21, MW36, MW45A and MW59 reported similar concentrations to those reported in samples collected from these wells by the assessor (refer to **Section 6.3.4**). |

## 10.6 Auditor’s Assessment of Adequacy

In the auditor's opinion, the quality and reliability of information generated from the investigation undertaken overall (taking into account all limitations as identified in previous sections) were sufficient for the purposes of this environmental audit.

# 11 Ongoing Management Measures

## 11.1 Environmental Management Plan

In view of the asbestos impacted soil identified at the site during the assessments undertaken for the Environmental Audit, site management measures were developed to ensure that unacceptable human health impacts do not occur post development.

Following completion of the assessment at the Site, Resolve prepared an Environmental Management Plan (EMP) for the management of the asbestos contamination at the Site. The EMP describes the management measures required for the effective and safe management of any ACM which may be encountered during sub-surface excavation works.

The EMP includes a description of the Site (and former land uses), an outline of the environmental investigations undertaken during the assessments for the audit, a summary of the residual contamination remaining in the soil, a description of the management measures to be implemented at the Site, and the roles and responsibilities of stakeholders.

The EMP describes the management strategies necessary at the site in relation to the following:

- Excavation and stockpiling of soil;
- Use of heavy equipment;
- Off-Site disposal of soil;
- Importation of clean fill material; and
- Maintaining the clean fill capping layer of a minimum 500 mm thickness.

The auditor considers the EMP to be practicable, verifiable and enforceable, and provides an appropriate basis upon which the risks associated with the residual soil contamination can be mitigated. In addition, the EMP is able to be effectively implemented and maintained under the ongoing commercial land use.

The EMP will be implemented as a condition of the Statement of Environmental Audit issued for the site. A copy of the EMP is provided in **Appendix A** of this audit report.

A copy of the EMP must be provided to the occupier and managers of the site. Any party undertaking maintenance, repairs or construction at the Site would need to undertake the work according to their own safe work practice procedures and legislative requirements as well as adhere to the EMP.

## 11.2 Groundwater Quality Management Plan

A GQMP has been developed by Resolve for ongoing monitoring and management of the polluted groundwater identified at the Site. A copy of the GQMP is provided in **Appendix A** of this audit report.

The GQMP includes the following:

- Background information relating to Site history and contamination;
- A proposed monitoring schedule including:
  - The selected groundwater monitoring wells to be included in the GQMP;
  - The frequency of monitoring of the selected wells;
  - The timeframe for monitoring; and
  - The analytical program to be implemented.:
- Triggers for further action;

- Reporting requirements and responsibilities; and
- Mechanism for cessation via Auditor verification from EPA.

The Auditor has reviewed the GQMP with regard to the guidance provided in EPA Publication 840.2 and considers that it is appropriate to monitor Site groundwater impacts and manage any potential unexpected risks identified by the monitoring. The GQMP states that overall responsibility for implementation of the GQMP rests with the Site owner.

# 12 Auditor's Conclusions

The Site subject to this environmental audit is located at 328 Bay Road, Cheltenham. The Site was formerly used for commercial and industrial purposes and has been redeveloped for ongoing commercial use (a Dan Murphy's store).

The conclusions of this environmental audit can be summarised as follows:

- The Site was historically used for chemical storage, handling and manufacture.
- The primary sources of contamination identified on-Site comprised a former TIT located near the south-central boundary of the Site which was found to have leaked historically; and a former drum storage area which occupied the majority of the south-western and south-central portions of the Site where cracked and leaking drums containing CHCs were reportedly stored on a gravel surface prior to 1978. In addition, there was a chloroform flocculation area, two AGSTs, and a suspected battery acid pit in the south-central portion of the Site.
- Clean up works undertaken at the Site comprised source/potential source removal, including the removal of the TIT and surrounding soil; excavation and removal of the TIT pipework and surrounding backfill sands; and excavation of soil beneath the former drum store. The validation samples retrieved following the remedial works showed concentrations of CHCs were all below laboratory detection limits, with the exception of chloroform within one sample collected from one of the walls of the TIT excavation, which was below the Site-specific risk-based criteria.
- The soil investigation did not identify any contaminant concentrations that would preclude the use of the site for an ongoing commercial land use. However, the asbestos identified in the form of ACM requires ongoing management.
- Residual asbestos contamination remaining on the Site is contained beneath clean fill material no less than 500 mm in thickness or hardstand material. The auditor considers that the Site is suitable for its intended use provided that these barriers are maintained in accordance with the EMP, which is a condition of the Statement of Environmental Audit (**Appendix A**).
- The groundwater investigations undertaken from wells installed in the vicinity of the potential sources of contamination indicated that groundwater is polluted due to the presence of CHCs (CF, DCE, DCM, TCE, VC in the vicinity of the former TIT (and associated pipework). The polluted groundwater extends off-Site. Non-aqueous phase liquid (NAPL) was not identified to be present during groundwater monitoring, nor were CHC concentrations indicative of the potential presence of NAPL.
- The groundwater is also polluted by metals/metalloids, ammonia, fluoride and nitrate concentrations precluding the criteria for the protected beneficial uses of groundwater, however these analytes are considered to be regionally elevated, with no on-Site source or obvious off-Site source. Groundwater at the Site contains naturally elevated concentrations of arsenic, copper, cobalt, chloride, sodium, sulfate and total dissolved solids and an acidic pH.
- All extractive beneficial uses of the Segment A1 groundwater are considered to be precluded on-Site and at least 15 m from the Site boundary, however, they are not existing uses of the groundwater within the vicinity of the Site.
- The auditor's CUTEP submission to EPA was approved and a GQRUZ, which includes the Site, has been declared by EPA. A requirement of the CUTEP is ongoing groundwater monitoring in accordance with the GQMP for the Site which is a condition of the Statement of Environmental Audit (**Appendix A**).
- Health risk assessments and direct soil vapour sampling undertaken determined that the CHC concentrations in the soil and groundwater do not pose a vapour risk to current or future users of the Site, nor to off-Site receptors including a theoretical three level basement.

- In the auditor's opinion, the quality and reliability of the information obtained from the investigations undertaken at the Site are suitable for the purposes of this environmental audit.

Based on the presence of residual asbestos contamination (that requires ongoing management) and polluted groundwater, a Certificate of Environmental Audit cannot be issued for the Site. Therefore, the auditor has issued a Statement of Environmental Audit which states that the Site is suitable for the beneficial uses associated with commercial and industrial land uses, subject to the following conditions:

1. Ongoing from the date of the Statement, the Site must be covered with physical barriers. This will comprise either concrete or asphalt in areas occupied by buildings, carparks and driveways. Any landscaped area or garden bed must be constructed and maintained with at least 0.5 m thickness of clean fill below the finished surface, which is demonstrated to be suitable for the site and consistent with EPA Publication IWRG 621 Soil Hazard Categorisation and Management as 'fill material'.
2. All physical barriers (as prescribed in condition 1 above) must be maintained on the Site and if subsequently damaged or removed during development or occupation of the Site, must be reinstated as soon as possible and to the same condition or better as it was prior to any disturbance.
3. If removal of the physical barriers (as prescribed in condition 1 above) is proposed, an environmental auditor appointed under Part IXD of the *Environment Protection Action 1970* ("the Act") must be engaged to conduct an environmental audit of the site under Section 53X of the Act, to consider if the barrier is no longer required.
4. Ongoing from the date of the Statement, the owner/occupier/owners corporation of the Site must implement and maintain the Environmental Management Plan attached to this environmental audit report.
5. Groundwater at the Site is polluted and is not suitable for the beneficial use of potable water supply, agriculture and irrigation (irrigation), agriculture and irrigation (stock watering), industrial and commercial, water-based recreation and cultural and spiritual values. Groundwater must not be used for any precluded beneficial use without prior testing and review of results by a suitably qualified professional to confirm its suitability for the proposed use. It may be extracted for the purpose of environmental monitoring or remediation.
6. Ongoing from the date of the Statement, the GQMP formulated for the Site and verified by the environmental auditor must be implemented and maintained by the owner/occupier/owners corporation of the Site.
7. The GQMP must remain in force until such time as an environmental auditor appointed under Part IXD of the *Environment Protection Act 1970* verifies in writing that the monitoring and management requirements of the GQMP are no longer required, and this verification is accepted by EPA and advised in writing to the planning authority.
8. If a basement is incorporated in any proposed future development of the Site, further assessment and the potential design and installation of mitigation measures to manage vapour risks is required. An environmental auditor appointed under Part IXD of the Act must be engaged to conduct an environmental audit of the Site under Section 53X of the Act, to consider this use.

The Statement of Environmental Audit is provided in **Appendix A**.

# 13 Limitations

This audit report was prepared for Chandos Bay Pty Ltd, EPA Victoria and the relevant planning authorities in accordance with section 53X of the *Environment Protection Act 1970*. Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current to the date of this document. Any other party should satisfy themselves that the scope of work conducted and reported herein meets their specific needs. Any other person's use of, or reliance on, the opinions, findings, conclusions, recommendations or any other material presented within this document, is at that person's sole risk.

The professional opinions expressed in this environmental audit report are based upon professional judgment, experience, and training. The environmental auditor believes that his opinions are reasonably supported by the information provided in this report and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time. That standard of care may change and new methods and practices of exploration, testing, analysis and remediation may develop in the future, which might produce different results.

The findings provided in this audit report are based on available information and it is possible that different findings could be made should new information become available, or with changing Site conditions over time. These findings are subject to uncertainty given the potentially complex nature of any subsurface environment. Variation in soil and groundwater conditions may vary significantly between the specific sampling and testing locations and other locations at the Site.

# 14 References


ARC Environmental Pty Ltd, 1 May 2017, Preliminary Site Investigation, 322-328 Bay Road, Cheltenham, Victoria, Revision 1.0, prepared for Chandos Bay Pty Ltd.

Australian and New Zealand Environment and Conservation Council & the Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) 2000, Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality.

Australian and New Zealand Environment and Conservation Council (ANZECC) & the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 1992, *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, January 1992.

Department of Health (WA), May 2009, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Edwards, J.W., M. Van Alpen and A. Langley, 1994. Identification and assessment of contaminated land – Improving site history appraisal. Contaminated sites monograph series No. 3 1994.

Environmental Earth Sciences VIC, May 2018, Solute Fate & Transport Assessment at 322-328 Bay Road, Cheltenham, Victoria, May 2018, prepared for Chandos Bay P/L, Version 1.

Environment Protection Authority, 2006, Hydrogeological Assessment (Groundwater Quality) Guidelines (EPA Publication 668).

Environment Protection Authority, April 2000, Groundwater Sampling Guidelines (EPA Publication 669).

Environment Protection Authority, June 2009, Sampling and Analysis of Waters, Wastewaters, Soils and Wastes (EPA Publication IWRG701).

Environment Protection Authority, June 2009, Soil Sampling (EPA Publication IWRG702).

Environment Protection Authority, April 2016, The Cleanup and Management of Polluted Groundwater (EPA Publication 840.2).

Environment Protection Authority, December 2016, Environmental Auditor Guidelines for Appointment and Conduct (EPA Publication 865.12).

Environmental Protection Authority, August 2007, Environmental Auditor Guidelines for Conducting Environmental Audits (EPA Publication 953.2).

Environment Protection Authority, December 2015, Environmental Auditor (Contaminated Land) Guidelines for issue of Certificates and Statements of Environmental Audits (EPA Publication 759.3)

Environment Protection Authority, December 2015, Environmental Auditor Guidelines – Provision of Environmental Audit Reports, Certificates and Statements (EPA Publication 1147.2).

Environment Protection Authority, Industrial Waste Resource Guidelines (IWRG) Publication 621, Soil Hazard Categorisation and Management, 2009;

Environment Protection Authority, Industrial Waste Resource Guidelines (IWRG) Publication 701, Sampling and Analysis of Wasters, Wastewaters, Oils and Wastes, 2009;

Environment Protection and Heritage Council (EPHC), 2008. Australian Guidelines for Water Recycling – Phase 2: Augmentation of Drinking Water Supplies

Environmental Risk Sciences Pty Ltd, 8 November 2018, Risk-Based Criteria, Former Nuplex Chemical Storage Facility, Cheltenham, VIC, prepared for ARC Environmental and Evolution Environmental Consulting

Food Standards Australia and New Zealand, 2017. Australia New Zealand Food Standards Code – Standard 2.6.2 – Non-alcoholic beverages and brewed soft drinks.

GHD Pty Ltd, September 2016, Site Investigation Report, 18-22 Hamlet St, Cheltenham, prepared for Nuplex Industries (Aust) Pty Ltd

Geological Survey of Victoria 1981, *Ringwood. geological map*. Department of Mines, Victoria.

Government of Victoria, 2002. State Environment Protection Policy (Prevention and Management of Contamination of Land) No.S95, EPA Victoria, June 2002.

Government of Victoria, 2018. State Environment Protection Policy (Waters), S499 23 October 2018

Government of Victoria, 2009. Environment Protection (Industrial Waste Resource) Regulations 2009

Government of Victoria, 2001. State Environment Protection Policy (Air Quality Management), 21 December 2001

Government of Victoria, 1999. Industrial Waste Management Policy (Waste Acid Sulfate Soils), 18 August 1999

Government of Victoria, 1970 Environment Protection Act 1970;

Health Canada, 2014. Guidelines for Canadian Drinking Water Quality. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario

Land and Water Biodiversity Committee 2012, *Minimum Construction Requirements for Water Wells in Australia*, 3rd edn.

Leonard, JG 2006, Hydrogeology of the Melbourne Area, Australian Geomechanics, vol. 41, no. 3.

National Health and Medical Research Council (NHMRC) and National Resource Management Ministerial Council (NRMMC) 2011, *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy.* National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

National Health and Medical Research Council (NHMRC) 2008, *Guidelines for Managing Risks in Recreational Water*, February 2008.

National Environment Protection Council (NEPC) 1999. *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288.

NEPC 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council as amended 15 May 2013, Comlaw No. F2013C00288.

New Zealand Ministry of Health, 2008. Drinking Water Standards for New Zealand, New Zealand, 2008

NHMRC, NRMMC 2011. Australian Drinking Water Guidelines, version 3.5 updated August 2018;

National Health and Medical Research Council (NHMRC) 2008, *Guidelines for Managing Risks in Recreational Water*, February 2008.

Resolve Environmental Pty Ltd, 17 September 2019, Detailed Site Investigation, Remediation & Validation Report, Lot 1, Chandos Bay, 328 Bay Road, Cheltenham.

Standards Australia AS/NZ 2009, Piling Design and Installation, AS2159, Standards Australia Sydney.

Standards Australia, 2005. Australian Standard AS4482.1-2005: Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 1: Non-volatile and Semi-volatile Compounds.

Standards Australia, 1999. Australian Standard AS 4482.2-1999. Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances.

World Health Organisation (WHO) (2017) Guidelines for Drinking Water Quality Fourth Edition, Addendum 1.

# Figures




PROJECT ID 30658.01
DATE 9/04/2020
CREATED BY WM
UPDATED BY SK

BlueSphere ENVIRONMENTAL

## Legend

- Former Site Boundary
- Site Boundary
- VicMap Parcel Boundary
- Road




N

0 8 16 24 32 40

Metres

1:800 when printed at A3
GDA 1994 MGA Zone 55
Imagery: Nearmap 25/09/2019

## SITE LOCATION PLAN

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F1**

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B

B'

LOT 1 (THE SITE)

OFFSITE

CHANDOS STREET

HAMLET STREET

SIGN

WAREHOUSE BUILDING ON CONCRETE SLAB

COMMERCIAL BUILDINGS

BACKFILLED TRIPLE INTERCEPTOR TRAP PIPEWORK TRENCH

GAS WATER

ELECTRICITY WATER

WATER SEWER

GAS SEWER

ELECTRICITY

MW45A MW45B MW21 VP01 SMW1 MW52 MW59 MW55

ELEVATION mAHD

40 38 36 34 32 30 28 26 24 22 20 18 16 14 12

**VP01**

| DATE | TCA | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| JUL 18 | <270 | <240 | 148 | 22 | 484 | <5.1 |

**MW45A**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 69 | 178 | 273 | <1 | 0.7 |
| OCT 17 | <1 | 56 | 236 | 273 | <1 | 1.1 |
| JAN 18 | <1 | 34 | 208 | 264 | <1 | 0.5 |
| AUG 18 | <1 | 4 | 256 | 254 | <1 | <0.2 |

**MW45B**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 570 | 68 | 65 | <1 | 2.4 |
| OCT 17 | <1 | 653 | 90 | 79 | <1 | 1.7 |
| JAN 18 | <1 | 453 | 69 | 55 | <1 | 1 |
| AUG 18 | <1 | 504 | 75 | 57 | <1 | 1.9 |

**MW21**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | 3 | 8 | 63 | 98 | 7 | <0.2 |
| OCT 17 | 2 | 11 | 64 | 93 | 11 | <0.2 |
| JAN 18 | 3 | 13 | 84 | 101 | 13 | <0.2 |
| AUG 18 | <1 | 2 | 6 | 41 | 2 | <0.2 |

**MW52**

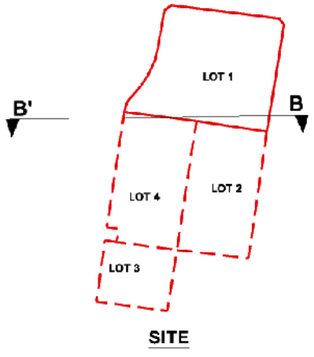
| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 9 | 2 | 7 | 1 | 2.8 |
| OCT 17 | <1 | 7 | 2 | 6 | 1 | 2.5 |
| JAN 18 | <1 | 6 | 2 | 5 | <1 | 3.7 |
| APR 18 | <1 | 6.53 | 1.8 | 8.01 | 0.74 | 8.2 |
| AUG 18 | <1 | 4 | 1 | 7 | <1 | 12.6 |
| OCT 18 | <1 | 3 | 1 | 8 | <1 | 5.7 |

**MW55**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| APR 18 | <0.05 | <0.10 | 3.8 | 18.9 | 14.8 | <0.3 |
| AUG 18 | <1 | <1 | 2 | 10 | 6 | <0.2 |
| OCT 18 | <1 | <1 | 4 | 23 | 19 | <0.2 |

**MW59**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| MAY 19 | <1 | 8 | <1 | <1 | <1 | <0.2 |




**LEGEND**

- FILL
- CLAYEY SAND
- SANDY CLAY
- SAND
- SANDY SILT
- GROUNDWATER LEVEL - APPROX
- SCREEN
- GROUNDWATER FLOW DIRECTION
- *MW35* GROUNDWATER MONITORING WELL
- SMW3 SHALLOW GROUNDWATER MONITORING WELL
- VP02 SOIL VAPOUR PIN
- SITE BOUNDARY

**LEGEND**

- VAPOUR PATHWAY
- INTERPOLATED EXTENT OF CHLOROFORM
- INTERPOLATED EXTENT OF TCE PLUME
- INTERPOLATED EXTENT OF DCE PLUME
- INTERPOLATED EXTENT OF VC PLUME
- INTERPOLATED EXTENT OF TCE PLUME (SECONDARY OFFSITE SOURCE)

**GROUNDWATER AND PERCHED WATER KEY**

- CTC CARBON TETRACHLORIDE (µg/L)
- $CHCl_3$ CHLOROFORM (µg/L)
- DCE cis-1,2-DICHLOROETHENE (µg/L)
- TCE TRICHLOROETHENE (µg/L)
- PCE TETRACHLOROETHENE (µg/L)
- VC VINYL CHLORIDE (µg/L)
- Greater than Adopted Potable Water Supply
- Greater than Adopted Primary Contact Recreation
- Greater than Adopted Stock Watering
- Greater than Adopted Maintenance of Ecosystems
- Greater than Adopted Derived Groundwater Risk Based Contaminant Screening Level - Residential
- Greater than Adopted Derived Groundwater Risk Based Contaminant Screening Level - Commercial / Industrial

**SOIL VAPOUR KEY**

- TCA 1,1,1-TRICHLORETHANE (µg/m³)
- $CHCl_3$ CHLOROFORM (µg/m³)
- DCE cis-1,2-DICHLOROETHENE (µg/m³)
- TCE TRICHLOROETHENE (µg/m³)
- PCE TETRACHLOROETHENE (µg/m³)
- VC VINYL CHLORIDE (µg/m³)
- NEPM 2013 Soil Vapour HILs/HSLs - Residential A/B
- NEPM 2013 Soil Vapour HILs/HSLs - Recreational C
- NEPM 2013 Soil Vapour HILs/HSLs - Commercial/Industrial D

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**Figure Source:**

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328 Bay Road, Cheltenham, Victoria
Figure 019D

# GEOLOGICAL CROSS-SECTION

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328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F2**

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SOURCE: Google Earth, extracted 03/04/2017.

**LEGEND**

- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- FORMER TRIPLE INTERCEPTOR TRAP
- 28.27 GROUNDWATER ELEVATION mAHD
- 28.25 GROUNDWATER CONTOUR mAHD
- GROUNDWATER FLOW DIRECTION

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

**NOTE: GROUNDWATER ELEVATION FOR MW45B WAS EXCLUDED FOR CONTOURING PURPOSES.**

0 12.5 25m
SCALE 1:500

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Figure 010E

## GROUNDWATER ELEVATION CONTOURS

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**Chandos Bay Pty Ltd**

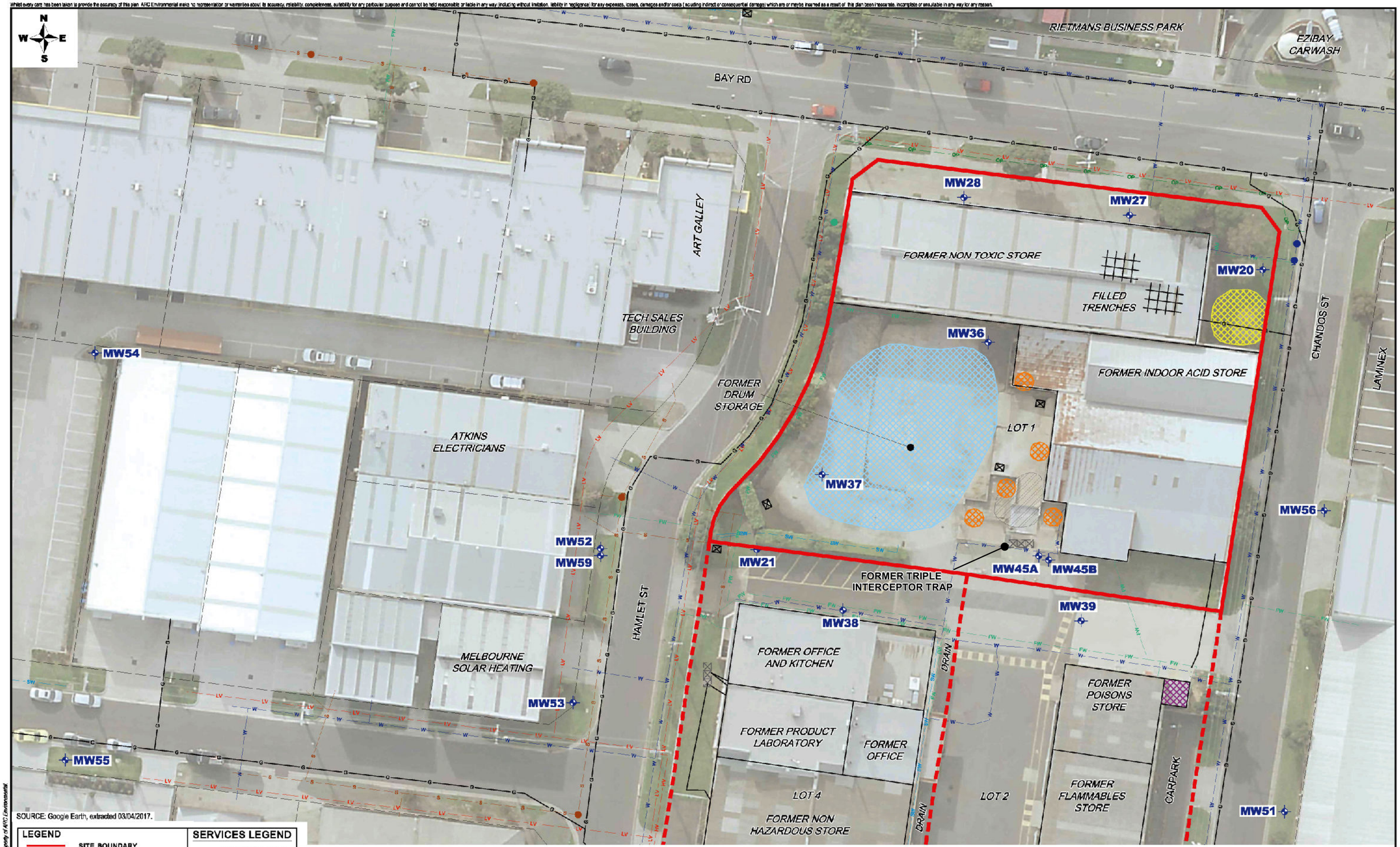
**Figure F3**

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**LEGEND**

- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- POSSIBLE STORAGE AREA FOR LEAKY DRUMS AND BOAT REPAIR
- YACHT WASH DOWN AREA
- FIRE WATER PUMP SHED/ FORMER SUBSTATION
- FORMER AST
- POSSIBLE FORMER LEAD ACID BATTERY DISPOSAL PIT
- FORMER TRIPLE INTERCEPTOR TRAP

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

BlueSphere ENVIRONMENTAL

| | |
|---|---|
| PROJECT ID | 30658.01 |
| DATE | 9/04/2020 |
| CREATED BY | WM |
| UPDATED BY | SK |

**Figure Source:**

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Figure 009

# SITE LAYOUT AND GROUNDWATER WELL LOCATIONS

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328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F4**

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RIETMANS BUSINESS PARK

EZIBAY CARWASH

BAY RD

ART GALLEY

TECH SALES BUILDING

ATKINS ELECTRICIANS

FORMER DRUM STORAGE

HAMLET ST

FORMER OFFICE AND KITCHEN

FORMER PRODUCT LABORATORY

FORMER OFFICE

DRAIN

FORMER NON HAZARDOUS STORE

LOT 1

LOT 2

LOT 4

FORMER INDOOR ACID STORE

FORMER POISONS STORE

FORMER FLAMMABLES STORE

CARPARK

CHANDOS ST

LAMINEX

FILLED TRENCHES

FORMER NON TOXIC STORE

NTS_SB01
NTS_EEC_SB101
NTS_ARC_TP201
NTS_TP01A
NTS_TP01
NTS_ARC_SB104
NTS_ARC_SB105
BH120
BH119
NTS_ARC_SB106
BH2
NTS_SB02
NTS_EEC_SB103A
BH121
BH122
DS_SB01
DS_SB01A
NTS_EEC_SB102
NTS_EEC_SB103
IAS_ARC_SS01
BH123
IAS_EEC_SB102
BH116
DS_SB02
IAS_ARC_SS02
IAS_SB01
DS_ARC_TP01A
DS_SB03A
DS_ARC_TP01B
DS_ARC_TP01D
DS_EEC_DSTP01R
DS_SB03
DS_TP01
DS_EEC_SB101
DS_SB04
DS_ARC_TP01C
BH118
IAS_ARC_SB103
DS_ARC_TP201
LA_ARC_TP01
BH115
BH114
VP113
VP112
IAS_SB02
DS_TP02
DS_SB05
LA_ARC_TP02
VP114
VP115
IAS_EEC_SB101
DS_TP03
DS_TP04
VP117
VP116
BH117
MW52
BH112
VP119
VP118
MW45A
MW45B
BH1
DS_TP05
BH113
DS_TP06

SOURCE: Google Earth, extracted 03/04/2017.

**LEGEND**

- SITE BOUNDARY
- MW-xx — MONITORING WELL - 2017
- DS_SBxx — HISTORIC SOIL BORE - 2015
- VPxxx — HISTORIC SOIL BORE - 2008
- BHxxx — HISTORIC SOIL BORE - 2006
- BHx — HISTORIC SOIL BORE - 2001
- DS_TPxx — HISTORIC TEST PIT - 2015
- DS_ARC_SBxxx — TARGETED SOIL BORE - 2017
- NTS_EEC_SBxxx — GRID BASED SOIL BORE - 2017
- IAS_ARC_SSxx — SURFACE SOIL SAMPLE - 2018
- DS_SBxx — CONFIRMATORY SOIL BORE - 2018
- APPROXIMATE AREA OF SURFACE OF ACM
- xx_ARC_TPxx — TARGETED TEST PIT - 2018
- POSSIBLE STORAGE AREA FOR LEAKY DRUMS AND BOAT REPAIR
- YACHT WASH DOWN AREA
- FIRE WATER PUMP SHED/ FORMER SUBSTATION
- FORMER AST
- POSSIBLE FORMER LEAD ACID BATTERY DISPOSAL PIT
- FORMER TRIPLE INTERCEPTOR TRAP

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

0 10 20m

SCALE 1:400

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Figure 003

## SOIL SAMPLING LOCATIONS

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

Figure **F5**

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N W E S

**MW28**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| OCT 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| JAN 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| AUG 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW20**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| OCT 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| JAN 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| AUG 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW27**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW37**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 3 | 15 | 5 | 29 | <0.2 |
| OCT 17 | <1 | 2 | 12 | 4 | 12 | <0.2 |
| JAN 18 | <1 | <1 | 1 | 1 | 1 | <0.2 |
| AUG 18 | <1 | 2 | 11 | 3 | 15 | <0.2 |

**MW21**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | 3 | 8 | 83 | 98 | 7 | <0.2 |
| OCT 17 | 2 | 11 | 84 | 93 | 11 | <0.2 |
| JAN 18 | 3 | 13 | 84 | 101 | 13 | <0.2 |
| AUG 18 | <1 | 2 | 6 | 41 | 2 | <0.2 |

**MW36**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| OCT 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| JAN 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| AUG 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW54**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| APR 18 | <0.05 | <0.10 | 1 | 2.34 | 0.12 | <0.3 |
| AUG 18 | <1 | <1 | <1 | 5 | <1 | <0.2 |
| OCT 18 | <1 | <1 | <1 | 2 | <1 | <0.2 |

**MW52**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 9 | 2 | 7 | 1 | 2.8 |
| OCT 17 | <1 | 7 | 2 | 6 | 1 | 2.5 |
| JAN 18 | <1 | 6 | 2 | 5 | <1 | 3.7 |
| APR 18 | <1 | 6.63 | 1.8 | 8.01 | 0.74 | 8.2 |
| AUG 18 | <1 | 4 | 1 | 7 | <1 | 12.6 |
| OCT 18 | <1 | 3 | 1 | 8 | <1 | 5.7 |

**MW45A**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 69 | 178 | 273 | <1 | 0.7 |
| OCT 17 | <1 | 56 | 236 | 273 | <1 | 1.1 |
| JAN 18 | <1 | 34 | 208 | 264 | <1 | 0.5 |
| AUG 18 | <1 | 4 | 256 | 254 | <1 | <0.2 |

**MW45B**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 570 | 68 | 65 | <1 | 2.4 |
| OCT 17 | <1 | 653 | 90 | 79 | <1 | 1.7 |
| JAN 18 | <1 | 453 | 69 | 55 | <1 | 1 |
| AUG 18 | <1 | 504 | 75 | 57 | <1 | 1.9 |

**MW59**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| MAY 19 | <1 | 8 | <1 | <1 | <1 | <0.2 |
| JUN 19 | <0.05 | 0.65 | <0.1 | <0.05 | <0.05 | <0.3 |

**MW56**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| OCT 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW38**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| OCT 17 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| JAN 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |
| AUG 18 | <1 | <1 | <1 | <1 | <1 | <0.2 |

**MW39**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | 5 | 13 | 10 | <1 | <0.2 |
| OCT 17 | <1 | 5 | 12 | 10 | <1 | <0.2 |
| JAN 18 | <1 | 8 | 11 | 11 | <1 | <0.2 |
| AUG 18 | <1 | 5 | 8 | 8 | <1 | <0.2 |

**MW55**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| APR 18 | <0.05 | <0.10 | 3.8 | 18.9 | 14.8 | <0.3 |
| AUG 18 | <1 | <1 | 2 | 10 | 6 | <0.2 |
| OCT 18 | <1 | <1 | 4 | 23 | 18 | <0.2 |

**MW53**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | <1 | 12 | 7 | <1 | 1.2 |
| OCT 17 | <1 | <1 | 5 | 2 | <1 | 0.8 |
| JAN 18 | <1 | <1 | 6 | 3 | <1 | 3.9 |
| APR 18 | <0.05 | <0.10 | 7.5 | 3.42 | <0.05 | 0.4 |
| AUG 18 | <1 | <1 | 8 | 3 | <1 | 2.3 |
| OCT 18 | <1 | <1 | 6 | 3 | <1 | 0.6 |

**MW51**

| DATE | CTC | $CHCl_3$ | DCE | TCE | PCE | VC |
|---|---|---|---|---|---|---|
| AUG 17 | <1 | <1 | 12 | 10 | 4 | 9.2 |
| OCT 17 | <1 | <1 | 12 | 10 | 7 | 2 |
| JAN 18 | <1 | <1 | 11 | 23 | <1 | 6.9 |
| AUG 18 | 2 | <1 | 14 | 180 | <1 | 3.6 |

BAY RD
CHANDOS ST
LAMINEX
HAMLET ST
FORMER DRUM STORAGE
LOT 1
LOT 2
LOT 4
MW20
MW21
MW27
MW28
MW36
MW37
MW38
MW39
MW45A
MW45B
MW51
MW52
MW53
MW54
MW55
MW56
MW59

SOURCE: Google Earth, extracted 03/04/2017.

0 12.5 25m
SCALE 1:500

**LEGEND**

- SITE BOUNDARY
- GROUNDWATER MONITORING WELL
- GROUNDWATER MONITORING WELL- DECOMMISSIONED
- POSSIBLE STORAGE AREA FOR LEAKY DRUMS AND BOAT REPAIR
- YACHT WASH DOWN AREA
- FIRE WATER PUMP SHED/ FORMER SUBSTATION
- FORMER AST
- POSSIBLE FORMER LEAD ACID BATTERY DISPOSAL PIT
- FORMER TRIPLE INTERCEPTOR TRAP

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

| | |
|---|---|
| CTC | CARBON TETRACHLORIDE (µg/L) |
| $CHCl_3$ | CHLOROFORM (µg/L) |
| DCE | cis-1,2-DICHLOROETHENE (µg/L) |
| TCE | TRICHLOROETHENE (µg/L) |
| PCE | TETRACHLOROETHENE (µg/L) |
| VC | VINYL CHLORIDE (µg/L) |

- Greater than Adopted Potable Water Supply
- Greater than Adopted Primary Contact Recreation
- Greater than Adopted Stock Watering
- Greater than Adopted Maintenance of Ecosystems
- Greater than Adopted Derived Groundwater Risk Based Contaminant Screening Level - Residential
- Greater than Adopted Derived Groundwater Risk Based Contaminant Screening Level - Commercial / Industrial

BlueSphere ENVIRONMENTAL

PROJECT ID 30658.01
DATE 30/03/2020
CREATED BY WM

**Figure Source:**

Resolve Environmental
Detailed Site Investigation, Remediation & Validation Report
328 Bay Road, Cheltenham, Victoria
Figure 011

# CHLORINATED HYDROCARBON CONCENTRATIONS IN GROUNDWATER

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F6**

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SOURCE: Google Earth, extracted 03/04/2017.

**LEGEND**

- SITE BOUNDARY
- MWxxx — GROUNDWATER MONITORING WELL
- FORMER TRIPLE INTERCEPTOR TRAP
- 254 — TRICHLOROETHENE CONCENTRATION (µg/L)
- EXCEEDS POTABLE WATER CRITERIA

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

NOTE:

1. THE RESULTS FROM THE SHALLOW WELL WITHIN NESTED WELLS HAS BEEN ADOPTED FOR THE CONCENTRATION CONTOURS AND DEEPER WELL RESULTS HAVE NOT BEEN INCLUDED.

0 12.5 25m
SCALE 1:500

BlueSphere ENVIRONMENTAL

PROJECT ID 30658.01
DATE 30/03/2020
CREATED BY WM

**Figure Source:**

Resolve Environmental
Detailed Site Investigation, Remediation & Validation Report
328 Bay Road, Cheltenham, Victoria
Figure 014B

**TRICHLOROETHENE CONCENTRATION CONTOURS**

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F7a**

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**LEGEND**

- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- FORMER TRIPLE INTERCEPTOR TRAP
- 256 cis 1-2 DICHLORETHENE CONCENTRATION (µg/L)
- EXCEEDS WATER DEPENDENT ECOSYSTEMS CRITERIA
- EXCEEDS POTABLE WATER CRITERIA

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

NOTE:

1. THE RESULTS FROM THE SHALLOW WELL WITHIN NESTED WELLS HAS BEEN ADOPTED FOR THE CONCENTRATION CONTOURS AND DEEPER WELL RESULTS HAVE NOT BEEN INCLUDED.

0 12.5 25m
SCALE 1:500

BlueSphere ENVIRONMENTAL

PROJECT ID 30658.01
DATE 1/04/2020
CREATED BY WM

**Figure Source:**

Resolve Environmental
Detailed Site Investigation, Remediation & Validation Report
328 Bay Road, Cheltenham, Victoria
Figure 014A

**CIS-1,2-DICHLOROETHENE CONCENTRATION CONTOURS**

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F7b**

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N
W E
S

BAY RD

MW28 <0.2
MW27 <0.2
MW20 <0.2
MW36 <0.2
MW37 <0.2
MW54 <0.2
MW52 12.6
MW59
MW21 <0.2
MW45A <0.2
MW45B
MW38 <0.2
MW39 <0.2
MW53 2.3
MW55 <0.2

LOT 1
LOT 4
LOT 2

CHANDOS ST
HAMLET ST

SOURCE: Google Earth, extracted 03/04/2017.

LEGEND
- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- XIXX FORMER TRIPLE INTERCEPTOR TRAP
- 12.6 VINYL CHLORIDE CONCENTRATION (µg/L)
- EXCEEDS POTABLE WATER CRITERIA

SERVICES LEGEND
- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

NOTE:
1. THE RESULTS FROM THE SHALLOW WELL WITHIN NESTED WELLS HAS BEEN ADOPTED FOR THE CONCENTRATION CONTOURS AND DEEPER WELL RESULTS HAVE NOT BEEN INCLUDED.

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0 12.5 25m
SCALE 1:500

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PROJECT ID 30658.01
DATE 1/04/2020
CREATED BY WM

**Figure Source:**
Resolve Environmental
Detailed Site Investigation, Remediation & Validation Report
328 Bay Road, Cheltenham, Victoria
Figure 014C

# VINYL CHLORIDE CONCENTRATION CONTOURS

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F7c**

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N
W E
S

BAY RD

MW28
MW27
MW20
MW36
MW54
LOT 1
MW37
MW52
MW59
8
MW21
MW45A
MW45B
504
MW38
MW39
LOT 4
LOT 2
MW53
MW55
HAMLET ST
CHANDOS ST

SOURCE: Google Earth, extracted 03/04/2017.

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**LEGEND**

- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- FORMER TRIPLE INTERCEPTOR TRAP
- 504 CHLOROFORM CONCENTRATION (µg/L)
- EXCEEDS POTABLE WATER CRITERIA

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

0 12.5 25m
SCALE 1:500

BlueSphere ENVIRONMENTAL

PROJECT ID 30658.01
DATE 30/03/2020
CREATED BY WM

**Figure Source:**
Resolve Environmental
Detailed Site Investigation, Remediation & Validation Report
328 Bay Road, Cheltenham, Victoria
Figure 014D

# CHLOROFORM CONCENTRATION CONTOURS

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure**
**F7d**

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PROJECT ID 30658.01
DATE 1/04/2020
CREATED BY WM

BlueSphere ENVIRONMENTAL

## Legend

- Site Boundary
- VicMap Parcel Boundary
- Road
- Current Chlorinated Hydrocarbon Plume
- Modelled Future Vinyl Chloride Plume Extent, 0.0003 mg/L
- Proposed GQRUZ Extent
- Lot 3 Existing GQRUZ Extent
- Future cis-1,2 DCE Plume Extent, 0.06 mg/L
- Future TCE Plume Extent, 0.02 mg/L
- Groundwater Monitoring Bore (ARC, 2019)

N

0 8 16 24 32 40

Metres

1:800 when printed at A3

GDA 1994 MGA Zone 55

Imagery: Nearmap 25/09/2019

# GQRUZ EXTENT

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F8**

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# Appendices

# Appendix A

# Statement of Environmental Audit

*ENVIRONMENT PROTECTION ACT 1970*

## STATEMENT OF ENVIRONMENTAL AUDIT

I, Mr Michael Seignior of BlueSphere Environmental Pty Ltd, a person appointed by the Environment Protection Authority ('the Authority') under the *Environment Protection Act 1970* ('the Act') as an environmental auditor for the purposes of the Act, having

1. been requested by Mr Andrew Johnston of Chandos Bay Pty Ltd to issue a Certificate of Environmental Audit in relation to the site located at 328 Bay Road, Cheltenham, Victoria, identified as Lot 1 on Plan of Subdivision PS802507 ('the Site') owned by Chandos Bay Pty Ltd. The land subject to this audit is shown in **Attachment 1** of this Statement.

2. had regard to, among other things,

   (i) guidelines issued by the Authority for the purposes of Part IXD of the Act

   (ii) the beneficial uses that may be made of the Site

   (iii) relevant State environment protection policies / Industrial waste management policies (IWMPs), namely:

   - State Environment Protection Policy (Prevention and Management of Contamination of Land);
   - State Environment Protection Policy (Waters);
   - State Environment Protection Policy (Ambient Air Quality);
   - State Environment Protection Policy (Air Quality Management);
   - Environment Protection (Industrial Waste Resource) Regulations 2009;
   - Industrial Waste Management Policy (Waste Acid Sulfate Soils).

   in making a total assessment of the nature and extent of any harm or detriment caused to, or the risk of any possible harm or detriment which may be caused to, any beneficial use made of the Site by any industrial processes or activity, waste or substance (including any chemical substance), and

3. completed an environmental audit report in accordance with section 53X of the Act, a copy of which has been sent to the Authority and the relevant planning and responsible authority.

HEREBY STATE that I am of the opinion that

The Site is suitable for the beneficial uses associated with commercial and industrial land uses, subject to the following conditions attached thereto:

1. Ongoing from the date of this Statement, the Site must be covered with physical barriers. This will comprise either concrete or asphalt in areas occupied by buildings, carparks and driveways. Any landscaped area or garden bed must be constructed and maintained with at least 0.5 m thickness of clean fill below the finished surface, which is demonstrated to be suitable for the site and consistent with EPA Publication IWRG 621 Soil Hazard Categorisation and Management as 'fill material'.

2. All physical barriers (as prescribed in condition 1 above) must be maintained on the Site and if subsequently damaged or removed during development or occupation of the Site, must be reinstated as soon as possible and to the same condition or better as it was prior to any disturbance.

3. If removal of the physical barriers (as prescribed in condition 1 above) is proposed, an environmental auditor appointed under Part IXD of the Act must be engaged to conduct an environmental audit of the Site under Section 53X of the Act, to consider if the barrier is no longer required.

4. Ongoing from the date of this Statement, the owner/occupier/owners corporation of the Site must implement and maintain the Environmental Management Plan provided in **Attachment 2** of this Statement.

5. Groundwater at the Site is polluted and is not suitable for the beneficial uses of potable water supply (acceptable), agriculture and irrigation (irrigation), agriculture and irrigation (stock

watering), industrial and commercial, water-based recreation and cultural and spiritual values. Groundwater must not be used for any precluded beneficial use without prior testing and review of results by a suitably qualified professional to confirm its suitability for the proposed use. It may be extracted for the purpose of environmental monitoring or remediation.

6. Ongoing from the date of this Statement, the groundwater quality management plan (GQMP) formulated for the Site and verified by the environmental auditor must be implemented and maintained by the owner/occupier/owners corporation of the Site. A copy of the GQMP is provided as **Attachment 3** of this Statement.
7. The GQMP must remain in force until such time as an environmental auditor appointed under Part IXD of the Act verifies in writing that the monitoring and management requirements of the GQMP are no longer required, and this verification is accepted by EPA and advised in writing to the planning authority.
8. If a basement is incorporated in any proposed future development of the Site, further assessment and the potential design and installation of mitigation measures to manage vapour risks is required. An environmental auditor appointed under Part IXD of the Act must be engaged to conduct an environmental audit of the Site under Section 53X of the Act, to consider this use.

The condition of the Site is detrimental or potentially detrimental to any (one or more) beneficial uses of the Site. Accordingly, I have not issued a Certificate of Environmental Audit for the Site in its current condition, the reasons for which are presented in the environmental audit report. The terms and conditions that need to be complied with before a Certificate of Environmental Audit may be issued are set out as follows:

(i) Soil and groundwater shall be cleaned up to restore all protected beneficial uses or it is demonstrated through risk assessment that its beneficial uses are no longer precluded.

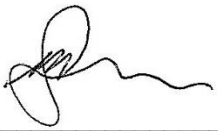
Other related information

1) the Authority has determined that;
   i. groundwater has been cleaned up so far as reasonably practicable, and
   ii. the site is within a Groundwater Quality Restricted Use Zone (GQRUZ).
2) Groundwater is polluted with Site-sourced chlorinated hydrocarbons which extend off-Site. The groundwater is also polluted by metals/metalloids (iron, lead, manganese and nickel), fluoride, ammonia and nitrate, however these analytes are considered to be regionally elevated, with no on-Site source or obvious off-Site source. The polluted groundwater would preclude the beneficial uses of potable water supply (acceptable), agriculture and irrigation (irrigation), agriculture and irrigation (stock watering), industrial and commercial, water-based recreation and cultural and spiritual values. The beneficial uses of water dependent ecosystems and species, traditional owner cultural values and buildings and structures would not be precluded by the pollution.
3) Groundwater at the Site contains naturally elevated concentrations of arsenic, copper, cobalt, chloride, sodium, sulfate and total dissolved solids and an acidic pH. The levels are considered typical of the natural groundwater quality surrounding the site and does not constitute pollution in accordance with clause 17(3) of State Environment Protection Policy (Waters).
4) In accordance with clause 58(4) of State Environment Protection Policy (Waters), the Authority may require periodic reassessment of the practicability of groundwater clean up.
5) In accordance with Section 53ZE of the Act, the owner/occupier of the Site must provide a copy of this Statement to any person who becomes or proposes to become an owner of the Site.
6) Please note that this Statement does not mitigate the ongoing duty of care required under the Act of an owner or occupier to not pollute the environment, either at the Site mentioned herein or elsewhere associated with activities conducted at the Site.
7) Any material excavated from the Site and disposed of off-site or proposed to be brought to the Site, should be appropriately managed in accordance with relevant statutory regulations and EPA guidelines.

This Statement forms part of the environmental audit report (BlueSphere Environmental Pty Ltd, Environmental Audit Report, Transaction Number 8005833, 328 Bay Road, Cheltenham, Victoria, 3192, 9 April 2020).

Further details regarding the condition of the Site may be found in the environmental audit report.

Dated: 9 April 2020

Signed: 

ENVIRONMENTAL AUDITOR

# Attachment 1




PROJECT ID 30658.01
DATE 9/04/2020
CREATED BY WM
UPDATED BY SK

BlueSphere ENVIRONMENTAL

## Legend

- Former Site Boundary
- Site Boundary
- VicMap Parcel Boundary
- Road




N

0 8 16 24 32 40

Metres

1:800 when printed at A3
GDA 1994 MGA Zone 55
Imagery: Nearmap 25/09/2019

## SITE LOCATION PLAN

***Environmental Audit Report***

328 Bay Road, Cheltenham, Victoria
**Chandos Bay Pty Ltd**

**Figure F1**

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# Attachment 2

# Environmental Management Plan

Lot 1, 328 Bay Road Cheltenham



Client: Chandos Bay Pty Ltd

Project Number: P001070-001

# Environmental Management Plan

Lot 1, 328 Bay Road, Cheltenham, VIC

**Prepared for:**
Chandos Bay Pty Ltd
144 Church Street
Brighton, Victoria, 3186

**Prepared by:**
Resolve Environmental Pty Ltd
144 Church Street
Brighton, Victoria, 3186

Ph: 03 9595 3530
ABN: 42 609 904 056

## DOCUMENT CONTROL

**Site Name:** Lot 1, 328 Bay Road Cheltenham

**Site Address:** Lot 1, 328 Bay Road Cheltenham

**Report CEMP Ref:** P001070_ChandosLot1_EMP

**Document Production / Approval Record**

| | Name | Date | Position |
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| Prepared by | Jill Mckendrick | 10 July 2019 | Associate Environmental Scientist |
| Approved by | David Corrigan | 10 July 2019 | Principal Environmental Scientist |

**Document Revision**

| Issue No | Date of Issue | Details of Revision |
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**Document Distribution**

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| 1 | Electronic | Developer/ Owner | Chandos Bay |
| 1 | Electronic | Occupier | Dan Murphy's |
| 1 | Electronic | External Reviewer | Michael Seignior |

## ENVIRONMENTAL PLAN IMPLEMENTATION LOG

| | |
|---|---|
| **Document Details** | Environmental Management Plan (EMP) |
| **Site** | Lot 1, 328 Bay Road Cheltenham |
| **Owner/ Occupier** | Chandos Bay Pty Ltd/ Dan Murphy's |

This implementation log provides a record of the following elements:

- acceptance of the EMP by the Site owner;
- acknowledgement and acceptance of the EMP by responsible parties; and
- recording and revision of amendments to the EMP by responsible parties.

| Action | By Whom | Date | Signed |
|---|---|---|---|
| **Acknowledgement and Acceptance** | | | |
| This EMP has been read and accepted by the following parties: | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
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| | | | |
| **Periodic review of this EMP has been implemented by:** | | | |
| 1. | | | |
| 2 | | | |
| 3. | | | |
| 4. | | | |

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# Appendices

Appendix A – Asbestos Clearance Certificates

Appendix B – Relevant IWRG and WorkSafe Guidance

# ABBREVIATIONS

| | |
|---|---|
| **ACM** | Asbestos Containing Materials |
| **EMP** | Environmental Management Plan |
| **EPA** | Environment Protection Authority |
| **HASP** | Health and Safety Plan |
| **HDPE** | High-Density Polyethylene |
| **NATA** | National Association of Testing Authorities |
| **OH&S** | Occupational Health and Safety |
| **PPE** | Personal Protective Equipment |
| **Resolve** | Resolve Environmental Pty Ltd |
| **SWMS** | Safe Work Method Statement |

# 1. Introduction

This Environmental Management Plan (EMP) has been prepared by Resolve Environmental Pty Ltd (Resolve) for the development of a retail liquor store at Lot 1, 328 Bay Road Cheltenham. The EMP has been prepared following the *"Detailed Site Investigation, Remediation & Validation Report"*, Resolve Environmental, October 2019, and as part of the 53x Environmental Audit undertaken by Mr Michael Seignior of BlueSphere Environmental. This EMP must be implemented and followed for the ongoing commercial use of the site. The site location is shown on **Figure 1.**




**Figure 1: Site Location - 328 Bay Road, Cheltenham**

The site occupies an area of approximately 3,369m$^2$ and is defined as Lot 1 on Plan of Subdivision PS802507T and is zoned as Commercial 2 Zone.

Environmental Site Assessment works conducted for the property identified asbestos containing material (ACM) within soils. This EMP details management measures required for the effective and safe management of any ACM which may be encountered during sub-surface excavation works.

## 1.1. Background

During previous development activities and soil assessment by ARC Environmental at the site, the presence of asbestos containing materials (ACM) as asbestos cement sheet fragments was observed at the site. The ACM contaminated soil was considered to have been imported to site prior to the construction of the former Nuplex facility.

Inspection, assessment and validation of the ACM in soil by an appropriately licenced contractor was completed and deemed as 'non-friable ACM'. This assessment and asbestos clearance certificates have been attached as **Appendix A**. It is considered that further management of the soils will be required to manage the potential risk posed by the soils in an ongoing commercial setting where ACM may be encountered during sub-surface excavation works.

Other contaminants were detected above the adopted ecological criteria for commercial/ industrial sites, including copper, zinc, petroleum hydrocarbons and benzo(a)pyrene. Chlorinated hydrocarbons and formaldehyde were also detected at concentrations below the adopted commercial/ industrial criteria for the site. Due to the placement of at least 0.5m of fill in garden beds and an impermeable barrier (concrete or asphalt at 100mm thick) across the remainder of the site, these contaminants do not pose an ongoing risk to human health or environment and are therefore not implicitly discussed within this EMP.

Clean fill has been placed on the surface of all garden beds across the site to an approximate depth of 0.5m with the exception of two garden beds in the north east and western boundary, where undisturbed natural material is encountered directly below imported topsoil. This clean fill creates a preventative barrier for gardeners undertaking shallow soil works and site visitors who may be exposed to airborne dusts. Therefore the clean fill and impermeable paving across the site provide a sufficient contamination barrier for site visitors and workers completing any shallow soil works in garden beds.

## 1.2. Objective

This EMP has been developed to manage risks from asbestos soils beneath the site during sub-surface excavations (>0.5m in garden beds, or where the impermeable barrier is penetrated). This EMP has also been prepared to minimise the potential for adverse impacts

to the environment, surrounding community and contractors during any sub-surface works undertaken at the site.

Such impacts may potentially include:

- Generation of asbestos fibres from ACM contaminated soil;
- Inadvertent exposure to asbestos contaminated soil by contractors (including gardeners excavating below 0.5m in garden beds), site visitors and the surrounding community i.e. during onsite subsurface excavation works; and
- Transport of contaminated soil offsite during any subsurface excavation works.

## 1.3. Commercial Development

The site has been developed for commercial use as a retail liquor store. Limited garden beds at the site include the placement of imported clean fill at approximately 0.5m thick. The remainder of the site is sealed by an impermeable barrier of either concrete or asphalt (approximately 100mm thick).

## 2. Roles and Responsibilities

Key roles and responsibilities for the development of the site comprise:

- **The site owner/ occupier (Chandos Bay/ Dan Murphy's) is responsible for:** providing this EMP to the any contractors involved in subsurface excavation activities that may expose soils containing ACM; and ensuring controls are put in place to limit/control access to contaminated soils located beneath the site. The site owner is responsible for maintaining the surface cover at the site.
- **The contractor is responsible for:** performing any subsurface excavation/ maintenance works in accordance with the contractual requirements of the owner and with the requirements of this EMP; complying with all applicable legislation and regulations including but not limited to WorkSafe and Environmental Protection Agency (EPA) requirements; and preparing and implementing specific health and safety plans during sub-surface work activities.

### 2.1. Occupational Health and Safety

Workers in Australian workplaces have specific health and safety obligations. While at work, a worker should:

- Take reasonable care for his or her own health and safety;
- Take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons;
- Comply, so far as the worker is reasonably able, with any reasonable instruction that is given by the person conducting a business or undertaking to allow the person to comply with the relevant legislation; and
- Cooperate with any reasonable policy or procedure of the person conducting a business or undertaking relating to health or safety at the workplace that has been notified to workers.

### 2.2. Training

All personnel working on the site during the subsurface excavation activities must receive a site induction to explain the relevant asbestos environmental and safety hazards, asbestos environmental and safety protocols, sensitivities and procedures for the site. The content of the induction must include this document plus procedures developed by the contractor for the completion of the works.

# 3. Potential Risks to Human Health from Known Contamination

A project and contaminant specific Health and Safety Plan (HASP) should be prepared with consideration to the following information and ACM contamination concerns for the site where subsurface excavations are undertaken.

Small fragments of ACM were observed and removed from the site during the development. Asbestos clearance works were undertaken during site excavation and development works in October 2018 and between April and May 2019. These works (including clearance certificates) are included as **Appendix A**. The work area included soils outside the building envelope and asbestos was cleared from all exposed surface soils. The clearance certificates were to facilitate construction works only and were limited to the surface soils, no subsurface or intrusive investigation was undertaken. On this basis, it is possible that ACM is present beneath the soil surface.

This may pose a risk to health during sub-surface excavation works if fibres become airborne. The risk may be increased depending on the type and amount of asbestos material in the soil and if there is a potential for it to become disturbed or airborne.

All workers involved in any subsurface excavation works must be inducted to the site and should be well informed about the likelihood of asbestos contamination present below the soil surface and the required procedures if suspect location is discovered.

## 3.1. Personal Protective Equipment

Based on previous investigations undertaken at the site, potential hazards for site workers associated with the presence of ACM during any future subsurface excavation works include:

- Inhalation of dust.

Exposure control measures that should be implemented to minimise exposure of site construction workers to soil contamination include the following:

- Avoid unnecessary handling of soil;
- Wash hands before eating, drinking or smoking;
- Store and consume food and drink in a designated, dust free, clean area away from the main area of works;
- Use personal protective equipment as required and as outlined in reviewed and approved site specific Safe Work Method Statement (SWMS); and
- Manage works to occur in optimum weather conditions, i.e. excavation works should be avoided on extremely hot or windy days.

Specific personal protective equipment should include, but not necessarily be limited to:

- Impermeable gloves, if handling potentially contaminated soil;
- Long sleeved shirt and long trousers; and
- Dust masks, if dust cannot be controlled.

## 3.2. What to do if Asbestos is Encountered

As the site may contain asbestos below the site surface, the following measures should apply throughout the duration of the construction works. If suspect material is identified, workers must stop work immediately and follow the procedures as per the WorkSafe Guidance Note "Asbestos Contaminated Soil", October 2010, or subsequent revisions thereof, (included in **Appendix B**).

- Prior to any subsurface excavation works, an evaluation of the risk must be undertaken.
- The area needs to be cordoned off and a competent person (trained and qualified as per OH&S Regulations) is required to inspect the soil to determine the likely amount of contamination and later to confirm that all visible asbestos containing material (ACM) has been removed, in accordance with SafeWork guidelines.
- Asbestos removal can only be undertaken on a commercial basis by a licensed asbestos removalist.
- Asbestos contaminated soil that is to be disposed off-site, must be damp before being loaded into transport and all loads are to be covered.
- The competent person is to write a statement about their inspection and outcomes.
- All inspection statement copies are to be retained by the primary contractor.
- All activities required to remove asbestos from the soil must be undertaken by a licensed asbestos removalist. This includes the operators of any machinery and equipment (e.g. excavator) to move contaminated soil to disposal vehicles.

Asbestos Fibre Air monitoring shall be conducted as required by a qualified Occupation Hygienist and results analysed and reported by a NATA certified laboratory.

# 4. Further Management Measures

Further information for the assessment/management of asbestos contamination in soil is provided (but not limited to) the following Sections, and within WorkSafe Guidance Note "Asbestos Contaminated Soil", October 2010 (**Appendix B**).

## 4.1. Isolation and Signage

An effective method for reducing the potential for exposure to ACM by uncontrolled parties (e.g. general public or site personnel not directly involved in the subsurface works) is to isolate the site and thus limit contact with any potential ACM only to persons provided with a specific site induction and inducted under this EMP.

Appropriate signs to warn of a construction zone and of the restricted area are mandatory.

The site supervisor/contractor shall utilise the following controls to ensure the site is isolated and controlled:

- The Site boundary/work zone should be maintained during proposed works at all times. Any contractor working within the work zone should be inducted in accordance with this EMP and undertake the works subject to its requirements;
- Contractors should not enter the designated work zone without the prescribed PPE and the site supervisor should be aware of the number of contractors entering the work zone.

## 4.2. Soil Excavation and Stockpile Management

Where excavation of ACM soils is conducted, and onsite stockpiling of the soils is required to manage the soils, the following soil stockpile controls are to be implemented:

- Stockpiles are to be located away from existing drainage lines and where they can be protected from wind.
- Minimise the amount and duration of soil stockpiled on-site at any one time.
- All stockpiled material is to be placed on a High-Density Polyethylene (HDPE) plastic liner to minimise the potential for leaching to occur. Stockpiled material is to be covered with HDPE plastic to minimise erosion and dust generation. In addition, watering (using manual watering or temporary sprinklers) of the stockpiles and/or surrounding areas may be required.
- Where stockpile watering is performed, any surface water run-off should be minimised and/or appropriately controlled on-site. If necessary, soil stockpiles may need to have a suitable drainage system to collect stockpile surface water run-off to enable appropriate disposal of the (potentially) contaminated water.

- Records shall be completed and kept of movements of stockpiled material at the site during construction works in a clear, concise and readily traceable format.

## 4.3. Dust Control

At any time during construction that soil is exposed to the elements, there is a potential for dust to be generated from site activities. Dust generation should be minimised to the extent possible by ensuring that working surfaces are watered on dry and/or windy days.

## 4.4. Use of Heavy Equipment

The use of heavy equipment such as bobcats and excavators and trucks can increase the potential for cross-contamination to occur.

The contractor shall utilise the following controls:

- Minimise the effect of cross-contamination from tyres/equipment/boots to clean areas of the site and/or off-site;
- Maintain gravel/hard-stand access roads so as to prevent regress of contaminated soils and prevent dust;
- Clean equipment regularly and thoroughly;
- During excavation works, efforts should be made to minimise dust generation by adopting dust suppression methods (i.e. wetting down);
- Excavator operators should keep cabin doors closed and recirculate the internal air;
- Nominate areas of traffic management; and
- At the completion of works and/or prior to plant leaving the designated work zone it should be inspected and deemed free of ACM so far as reasonably practicable.

Transport of ACM contaminated soils off-site should be minimised wherever practicable the contractor may need to consider washing down trucks and/or a street sweeper should soils be observed to be transported off-site attached to vehicles.

## 4.5. Off-Site Disposal of Excavated Soil Containing ACM

Excavation and offsite disposal of contaminated soil will be required to meet the requirements of the management measures outlined. All soils must be classified prior to off-site disposal in accordance with EPA Publication IWRG621 (included in **Appendix B**).

Handling, transport and disposal of contaminated soils is controlled by various regulatory instruments, guidelines and policies including but not limited to the current editions of the following:

- Environment Protection Act 1970.
- Environment Protection (Prescribed Waste) Regulations 1998 & 2007 Amendment.
- Environment Protection (Scheduled Premises and Exemptions) Regulations 2007.
- IWRG702 "*Soil Sampling*", (EPA Victoria, June 2009).
- IWRG621 "*Soil Hazard Categorisation & Management*" (EPA Victoria, June 2009).
- IWRG821.2 "*Waste Transport Certificate*" (EPA Victoria, July 2019).
- IWRG611.2 "*Asbestos Transport and Disposal*" (EPA Victoria, June 2017).

All waste soil generated by site excavation works must be managed in accordance with the requirements of the above publications and/or any future variations to these publications.

## 4.6. Importation of Clean Fill

Any soil imported to the site for backfilling, landscaping or building up site levels must be chemically tested to confirm concentrations of potential contaminants, as listed in EPA Publication IWRG621 (included in **Appendix B**) "*Soil Hazard Categorisation and Management*" are below the maximum threshold values for FILL MATERIAL. The imported clean fill must also be inspected to ensure the material is free of any foreign objects or waste.

## 5. Changed Conditions

If subsurface conditions or contaminant concentrations in fill or natural soil are encountered at the site which differ significantly from those indicated by those referred to in this EMP, an appropriately qualified Environmental Professional will be contacted. The Environmental Professional will be notified of the conditions encountered and provided with an opportunity to assess the differences and provide appropriate advice.

## 6. Periodic Review

This EMP will be subject to a periodic review every 5 years by a suitably qualified environmental professional. The review will be undertaken to ensure its continuing suitability with respect to legal requirements, legislative changes, changes in circumstances, identification of improvements and any changed site conditions.

The review will be captured in the Environmental Plan Implementation Log included as page iii.

# 7. Limitations

Resolve Environmental Pty Ltd (Resolve) has prepared this Environmental Management Plan (plan) in accordance with generally accepted industry practices and standards prevailing at the time this plan was prepared. In preparing this plan, Resolve has applied the level of care and degree of skill ordinarily exercised by reputable members of the Environmental Consulting Profession in the preparation of environmental management plans.

Development of this plan has relied upon data and information available at the time of writing including proposed development plans which may be subject to change that may not be accounted for in this plan.

This plan has been prepared for the exclusive use by Chandos Bay Pty Ltd and BlueSphere Environmental.

The plan is made without any warranty by Resolve either express or implied.

Statements provided in this plan are based on the limited information available at the site at the time of writing.

Resolve confirms that Resolve takes no responsibility or liability for the accuracy or validity of third party information, reports, correspondence and/or data referred to in this plan. This plan does not purport to provide legal advice.

# Appendix A: Asbestos Clearance Certificates

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15th October 2018

C0054:BMM
28823 328 Bay Road Cheltenham Soil CLET

Michael James
Case Meallin
Level 2, 19 Cato Street
Hawthorn East Vic 3123

Dear Michael,

## Asbestos Clearance Certificate - Asbestos Removal Works Conducted at 328 Bay Road, Cheltenham, Victoria

Prensa Pty Ltd (Prensa) was requested by Case Meallin to provide this asbestos clearance certificate in relation to the asbestos removal works completed by Reads Waste (Reads) on the 15th October 2018, in relation to the surface of the soil at 328 Bay Road, Cheltenham, Victoria (the 'Site').

## 1. Objective

The objective of this clearance inspection was to assess whether the works conducted by Reads at the Site were conducted in accordance with the standard described in the Victorian *Occupational Health and Safety Regulations 2017 S.R. No. 22/2017*.

## 2. Scope of Asbestos Removal Works

The Site comprises a vacant block bounded by Hamlet Street, Bay Road, Chandos Street and the temporary site fencing to the south of the Site. It is understood that structures were demolished on Site which may have resulted in asbestos cement sheet debris being identified on the soil surface. As such, the asbestos removal works comprised a walk over of the Site with visible asbestos debris removed from the soil surface. The majority of the asbestos debris was removed from the soil surface adjacent Hamlet Street (approximately <0.5m$^2$ of asbestos debris was removed) (**Photograph 1**).

It is noted that this clearance certificate refers only to area outlined above, which will hereby be referred to as the 'Work Area'.

Further details of the specific location of the Work Area is detailed in the attached Site Plan.

## 3. Prensa Scope of Works

Prensa's visual inspection was conducted to the standard described in Regulation *297 Clearance certificates* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*.

## 4. Clearance Inspection

A Prensa consultant visually inspected the soil surface of the asbestos removal work area on the 15th October 2018, and no visible asbestos debris associated with the above listed removal works was found on the surface of the work area (**Photographs 2-3**). It should be noted that the removal works and Prensa's inspection was limited to the soil surface, and no subsurface or intrusive investigation was completed.

## 5. Findings

Based on the findings of Prensa's clearance inspection, it is Prensa's opinion that the asbestos removal works conducted by Reads at the Site have been completed to a satisfactory standard as per the relevant state regulations outlined in **Section 3**.

In accordance with Regulation *295* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*, Case Meallin should provide the results of this clearance inspection to Reads

## 6. Limitations

Prensa's visual inspection was limited to the surface soils of the asbestos removal work area only, and area immediately surrounding the work area only, and no intrusive inspection was conducted within the subsurface areas. As such, ACM may be unearthed during future works or significant weathering events such as high winds or rainfall. If any assumed ACM is identified during future works, works should cease and a hygienist should be contacted to attend Site and provided recommendations based on the findings of their assessment.

Should you have any questions regarding this clearance certificate, please do not hesitate to contact the Prensa Melbourne office on (03) 9508 0100.

Yours sincerely,



**Brendon Mainey**

**Health Safety and Environment Consultant**

**Prensa Pty Ltd**

**Attachments:** Photographs
Site plans
Statement of Limitations



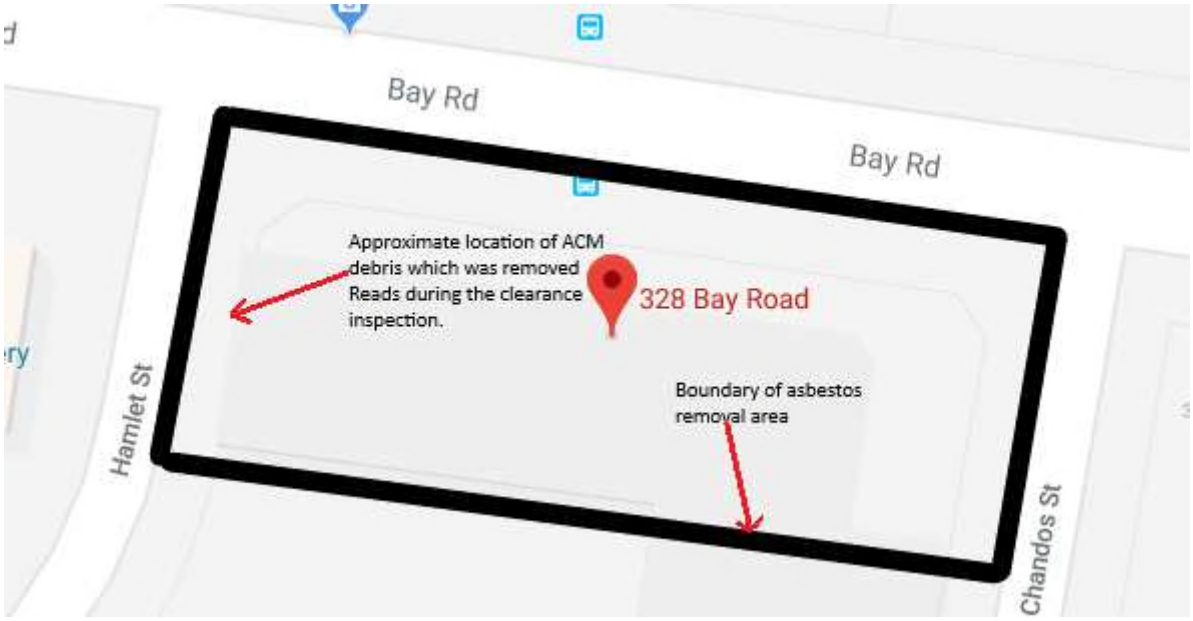
**Photo 1.** Area adjacent Hamlet Street where some ACM fragments were found but subsequently removed.



**Photo 2.** Work area adjacent Hamlet Street post asbestos removal.



**Photo 3.** Work area adjacent Chandos Street post asbestos removal.


Bay Rd
Bay Rd
Approximate location of ACM debris which was removed Reads during the clearance inspection.
328 Bay Road
Boundary of asbestos removal area
Hamlet St
Chandos St

## Statement of Limitations

This document has been prepared in response to specific instructions from the Client to whom the report has been addressed. The work has been undertaken with the usual care and thoroughness of the consulting profession. The work is based on generally accepted standards, practices of the time the work was undertaken. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The report has been prepared for the use by the Client and the use of this report by other parties may lead to misinterpretation of the issues contained in this report. To avoid misuse of this report, Prensa advise that the report should only be relied upon by the Client and those parties expressly referred to in the introduction of the report. The report should not be separated or reproduced in part and Prensa should be retained to assist other professionals who may be affected by the issues addressed in this report to ensure the report is not misused in any way.

Unless otherwise stated in this report, the scope is limited to fixed and installed materials and excludes buried waste materials, contaminated dusts and soils.

Unless expressly stated it is not intended that this report be used for the purposes of tendering works. Where this is the intention of the Client, this intention needs to be communicated with Prensa and included in the scope of the Proposal.

Prensa is not a professional quantity surveyor (QS) organisation. Any areas, volumes, tonnages or any other quantities noted in this report are indicative estimates only. The services of a professional QS organisation should be engaged if quantities are to be relied upon.

**Visual Inspection Limitations**

It is noted that while the visual inspection has attempted to locate any residual asbestos-containing dust or debris materials associated with the scope of removal/remedial works remaining within the work area(s), the inspection was limited to only a visual assessment and limited strategic air monitoring program and/or the review and analysis of previous reports/information made available. Prensa notes that due to the lack of homogeneity of building materials it is possible that the inspection has not detected all asbestos within the nominated locations.

Given that a visual inspection was limited to the removal/remedial scope of works only, not all materials known or assumed or suspected of containing asbestos at the time of the inspection were assessed.

Therefore, it is possible that asbestos materials, which may be concealed within inaccessible areas/voids, may not have been located during the visual inspection. Such areas include, but are not limited to:

- Materials concealed behind structural members and within inaccessible building voids
- Areas inaccessible without the aid of scaffolding or lifting devices
- Areas below ground
- Inaccessible ceiling or wall cavities
- Areas which require substantial demolition to access
- Areas beneath floor covering where asbestos-containing materials were not expected to exist
- Materials contained within plant and not accessible without dismantling the plant
- Areas where access is restricted due to locked doors or safety risks.

**Reliance on Information Provided by Others**

Prensa notes that where information has been provided by other parties in order for the works to be undertaken, Prensa cannot guarantee the accuracy or completeness of this information. The Client therefore waives any claim against the company and agrees to indemnify Prensa for any loss, claim or liability arising from inaccuracies or omissions in information provided to Prensa by third parties. No indications were found during our investigations that information contained in this report, as provided to Prensa, is false.

**Future Works**

During future works at the site, care should be taken when entering or working in any previously inaccessible areas or areas mentioned above and it is imperative that works cease immediately pending further investigation and sampling (if necessary) if any unknown materials are encountered. Therefore, during any refurbishment or demolition works, further investigation, sampling and/or assessment may be required should any suspect or unknown material be observed in previously inaccessible areas or areas not fully inspected, i.e. carpeted floors.

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Michael James
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Level 2, 19 Cato Street
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Dear Michael,

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Prensa Pty Ltd (Prensa) was requested by Case Meallin to provide this asbestos clearance certificate in relation to the asbestos removal works completed by Reads Waste (Reads) on the 15th October 2018, in relation to the surface of the soil at 328 Bay Road, Cheltenham, Victoria (the 'Site').

## 1. Objective

The objective of this clearance inspection was to assess whether the works conducted by Reads at the Site were conducted in accordance with the standard described in the Victorian *Occupational Health and Safety Regulations 2017 S.R. No. 22/2017*.

## 2. Scope of Asbestos Removal Works

The Site comprises a vacant block bounded by Hamlet Street, Bay Road, Chandos Street and the temporary site fencing to the south of the Site. It is understood that structures were demolished on Site which may have resulted in asbestos cement sheet debris being identified on the soil surface. As such, the asbestos removal works comprised a walk over of the Site with visible asbestos debris removed from the soil surface. The majority of the asbestos debris was removed from the soil surface adjacent Hamlet Street (approximately <0.5m$^2$ of asbestos debris was removed) (**Photograph 1**).

It is noted that this clearance certificate refers only to area outlined above, which will hereby be referred to as the 'Work Area'.

Further details of the specific location of the Work Area is detailed in the attached Site Plan.

## 3. Prensa Scope of Works

Prensa's visual inspection was conducted to the standard described in Regulation *297 Clearance certificates* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*.

## 4. Clearance Inspection

A Prensa consultant visually inspected the soil surface of the asbestos removal work area on the 15th October 2018, and no visible asbestos debris associated with the above listed removal works was found on the surface of the work area (**Photographs 2-3**). It should be noted that the removal works and Prensa's inspection was limited to the soil surface, and no subsurface or intrusive investigation was completed.

## 5. Findings

Based on the findings of Prensa's clearance inspection, it is Prensa's opinion that the asbestos removal works conducted by Reads at the Site have been completed to a satisfactory standard as per the relevant state regulations outlined in **Section 3**.

In accordance with Regulation *295* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*, Case Meallin should provide the results of this clearance inspection to Reads

## 6. Limitations

Prensa's visual inspection was limited to the surface soils of the asbestos removal work area only, and area immediately surrounding the work area only, and no intrusive inspection was conducted within the subsurface areas. As such, ACM may be unearthed during future works or significant weathering events such as high winds or rainfall. If any assumed ACM is identified during future works, works should cease and a hygienist should be contacted to attend Site and provided recommendations based on the findings of their assessment.

Should you have any questions regarding this clearance certificate, please do not hesitate to contact the Prensa Melbourne office on (03) 9508 0100.

Yours sincerely,



**Brendon Mainey**

**Health Safety and Environment Consultant**

**Prensa Pty Ltd**

**Attachments:** Photographs
Site plans
Statement of Limitations



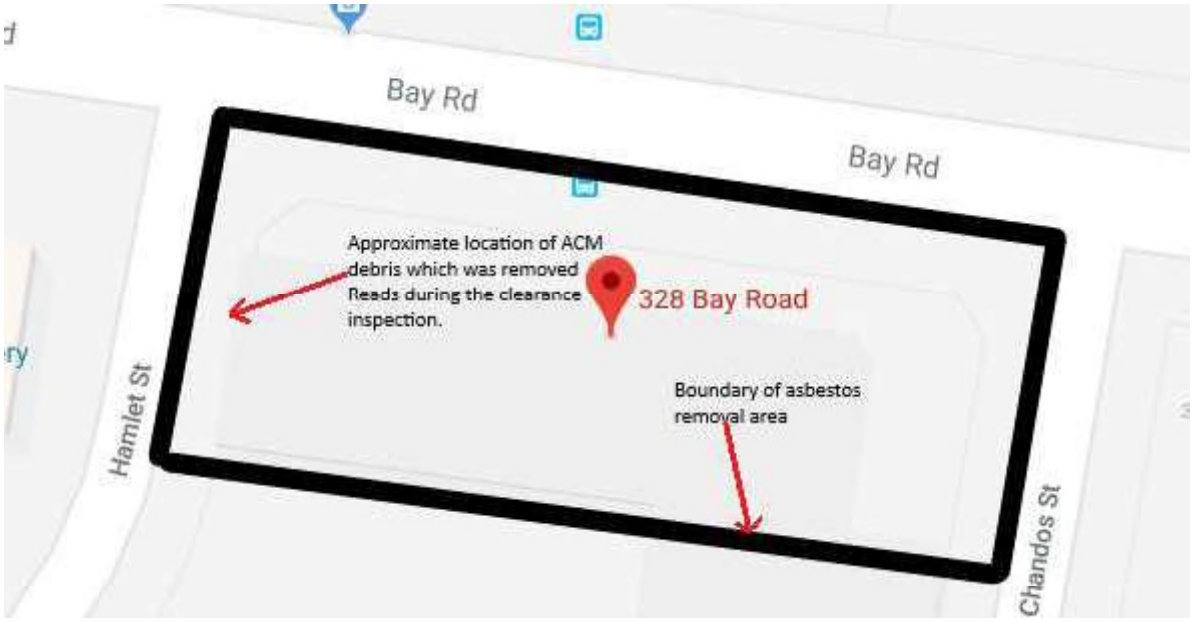
**Photo 1.** Area adjacent Hamlet Street where some ACM fragments were found but subsequently removed.



**Photo 2.** Work area adjacent Hamlet Street post asbestos removal.



**Photo 3.** Work area adjacent Chandos Street post asbestos removal.


Bay Rd
Bay Rd
Approximate location of ACM debris which was removed Reads during the clearance inspection.
328 Bay Road
Boundary of asbestos removal area
Hamlet St
Chandos St

## Statement of Limitations

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The report has been prepared for the use by the Client and the use of this report by other parties may lead to misinterpretation of the issues contained in this report. To avoid misuse of this report, Prensa advise that the report should only be relied upon by the Client and those parties expressly referred to in the introduction of the report. The report should not be separated or reproduced in part and Prensa should be retained to assist other professionals who may be affected by the issues addressed in this report to ensure the report is not misused in any way.

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**Visual Inspection Limitations**

It is noted that while the visual inspection has attempted to locate any residual asbestos-containing dust or debris materials associated with the scope of removal/remedial works remaining within the work area(s), the inspection was limited to only a visual assessment and limited strategic air monitoring program and/or the review and analysis of previous reports/information made available. Prensa notes that due to the lack of homogeneity of building materials it is possible that the inspection has not detected all asbestos within the nominated locations.

Given that a visual inspection was limited to the removal/remedial scope of works only, not all materials known or assumed or suspected of containing asbestos at the time of the inspection were assessed.

Therefore, it is possible that asbestos materials, which may be concealed within inaccessible areas/voids, may not have been located during the visual inspection. Such areas include, but are not limited to:

- Materials concealed behind structural members and within inaccessible building voids
- Areas inaccessible without the aid of scaffolding or lifting devices
- Areas below ground
- Inaccessible ceiling or wall cavities
- Areas which require substantial demolition to access
- Areas beneath floor covering where asbestos-containing materials were not expected to exist
- Materials contained within plant and not accessible without dismantling the plant
- Areas where access is restricted due to locked doors or safety risks.

**Reliance on Information Provided by Others**

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**Future Works**

During future works at the site, care should be taken when entering or working in any previously inaccessible areas or areas mentioned above and it is imperative that works cease immediately pending further investigation and sampling (if necessary) if any unknown materials are encountered. Therefore, during any refurbishment or demolition works, further investigation, sampling and/or assessment may be required should any suspect or unknown material be observed in previously inaccessible areas or areas not fully inspected, i.e. carpeted floors.

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ABN: 12 142 106 581

10 April 2019

B0004:SXM
29423 322 Bay Road Cheltenham Soil CLET 04042019

Brett Taylor
Becon Construction Pty Ltd
68-70 Abbott Rd
Hallam, VIC 3803

Dear Brett,

# Asbestos Clearance Certificate - Asbestos Removal Works Conducted at 322 Bay Road, Cheltenham Victoria

Prensa Pty Ltd (Prensa) was requested by Becon Construction Pty Ltd (Becon) to provide this asbestos clearance certificate in relation to the asbestos removal works completed by Professional Asbestos Removal (PROAS) on the 4th of April 2019, within the north-western portion of 322 Bay Road, Cheltenham, Victoria (the 'Site').

## 1. Objective

The objective of this clearance inspection was to assess whether the works conducted by PROAS at the Site were conducted in accordance with the standard described in the Victorian *Occupational Health and Safety Regulations 2017 S.R. No. 22/2017*.

## 2. Scope of Asbestos Removal Works

The asbestos removal works at the Site comprised the removal of the following from the north-western portion of the Site:

- Excavation of one (1) soil stockpile contaminated with asbestos-containing material (ACM) in the form of fibre cement sheet fragments. This soil was subsequently relocated to the southern portion of the Site to undergo abatement (approximately 10 $m^3$); and
- Removal of asbestos-containing fibre cement sheet debris from the soil surface following the removal of the asbestos-contaminated soil stockpile (**Photograph 1**).

It is noted that this clearance certificate refers only to area outlined above, which comprised an area of approximately 55 $m^2$, which will hereby be referred to as the 'Work Area', see attached **Site Plan** for further details pertaining to the location of the Work Area.

## 3. Prensa Scope of Works

Prensa conducted control airborne asbestos monitoring and a visual clearance inspection following the removal of the asbestos-contaminated soil stockpile.

Airborne asbestos fibre monitoring was conducted in general accordance with:

- Victorian *Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*;
- Membrane Filter Method for Estimating Airborne Asbestos Fibres [NOHSC:3003(2005)]; and
- Prensa Test Method – Asbestos & SMF Fibre Counting Method PRLAB2003.

Prensa's inspection was conducted to the standard described in Regulation *297 Clearance certificates* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*.

## 4. Air Monitoring

Prensa conducted control airborne asbestos fibre monitoring (air monitoring) adjacent to the Work Area during the asbestos removal works.

The results from the air monitoring are described in the previously issued NATA laboratory report **29423.010 AR 04042019**. It is noted that the results of the air monitoring are less than the laboratory detection limit (<0.01 f/ml).

## 5. Clearance Inspection

A Prensa consultant inspected the Work Area on the 4th of April 2019 and observed the asbestos removal works had been satisfactorily completed, and no visible asbestos debris associated with the above listed removal works remained in the Work Area, or in the area immediately surrounding where the asbestos removal work was performed (**Photographs 2 & 3**).

It should be noted that the visual inspection was limited to the surface of the soil within the Work Area where the asbestos contaminated stockpile was previously located. Prensa confirms visible asbestos has been removed from the final surface of the soil within the north-western portion of the Site. No intrusive or sub-surface investigation was undertaken as part of this clearance inspection.

It should be noted that the asbestos-contaminated stockpile was relocated to the southern portion of the Site and will undergo abatement at a later stage. As such, the asbestos barricade tape will remain in the area denoted 'Abatement Work Area' (see attached **Site Plan** for further details).

## 6. Findings

Based on the findings of Prensa's clearance inspection it is Prensa's opinion that the asbestos removal works conducted by PROAS at the Site have been completed to a satisfactory standard as per the relevant state regulations outlined in **Section 3**.

Prensa recommends that this clearance certificate be kept with the Site asbestos register as a record of these asbestos removal works being completed and the remaining asbestos-contaminated soil stockpile in the southern portion of the Site. In accordance with Regulation *295* of the *Victorian Occupational Health and Safety Regulations 2017. S.R. No. 22/2017*, Becon Construction Pty Ltd should provide the results of this clearance inspection to PROAS.

## 7. Limitations

Prensa notes that this clearance inspection relates to the removal of the asbestos-containing materials from the surface of the areas outlined in **Section 2** only, and was true at the time and date of Prensa's inspection.

Prensa's inspection was limited to the final soil surface and no intrusive investigation was undertaken as part of the clearance process. It is further noted that given fill soil still remains at the Site, buried asbestos may become unearthed following disturbance including weather events such as heavy rainfall or winds.

Prensa also recognises that further asbestos-containing materials may be present within the area and if any assumed asbestos-containing materials are found during future works, then a competent hygienist should be contacted to undertake sampling.

Should you have any questions regarding this clearance certificate, please do not hesitate to contact the Prensa Melbourne office on (03) 9508 0100.

Yours sincerely,



**Souzy Melahridis**

**HSE Consultant**

**Prensa Pty Ltd**

**Attachments:** Photographs
Site Plans
Statement of Limitations



**Photo 1.** Asbestos fiber cement sheet debris prior to asbestos removal works.

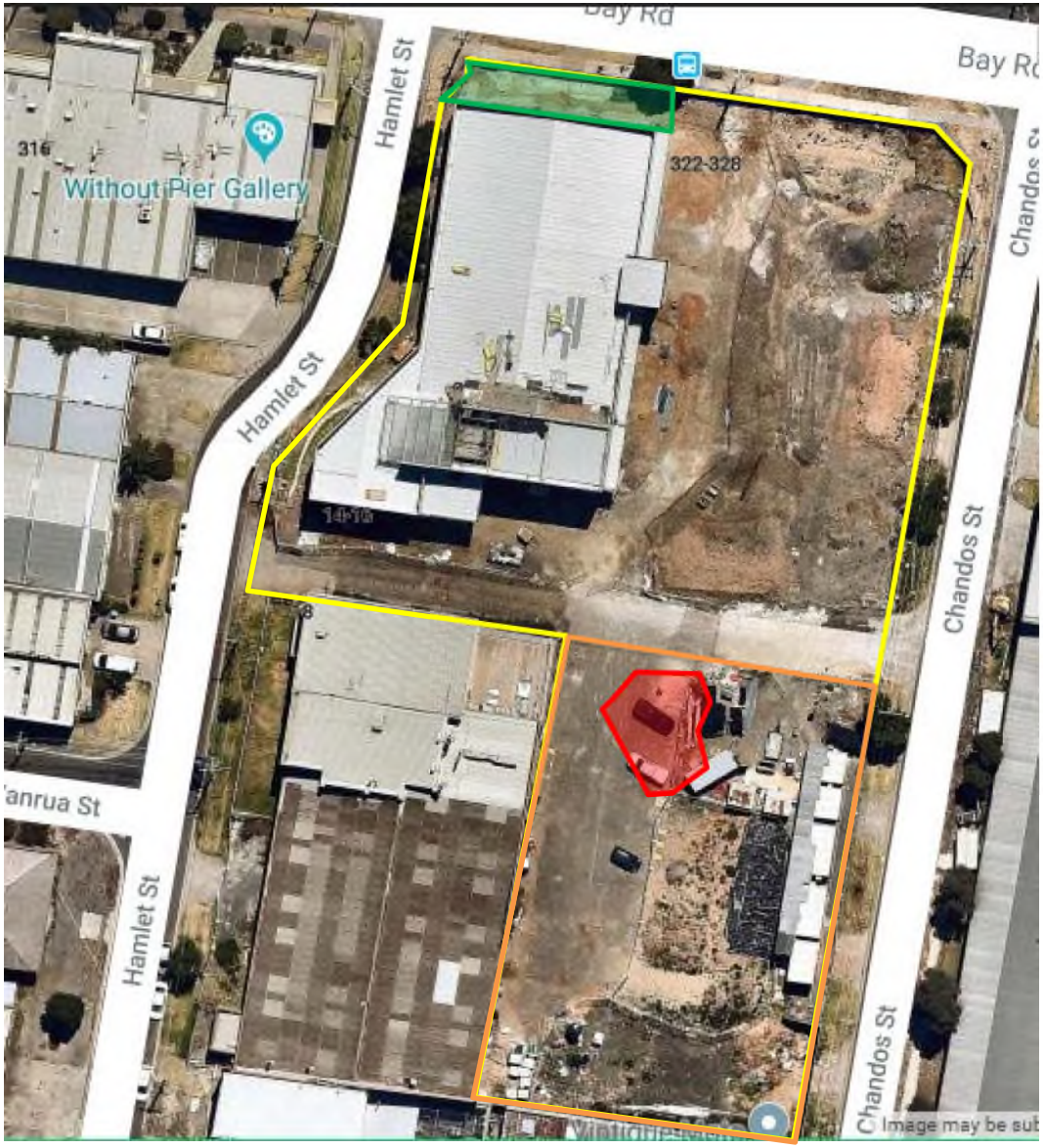


**Photo 2.** The Work Area following the asbestos removal works.



**Photo 3.** The Work Area following the asbestos removal works.

## Site Plans




### Legend

- Site boundary
- Cleared Work Area
- Abatement Work Area
- Soil Stockpile contaminated with ACM.

N

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- Areas which require substantial demolition to access
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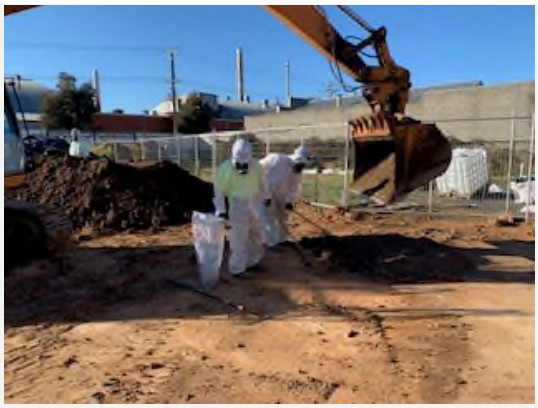
# Daily Site Notes

| | | |
|---|---|---|
| **Client Number:** | B0004 | |
| **Client Name:** | Becon Constructions | |
| **Job Number:** | 29423 | |
| **Project and Project Manager:** | 322 Bay Road, Cheltenham | Dane Fankhauser/Nathan Reynolds |
| **Date and Attending Consultants:** | 12th April 2019 | Souzy Melahridis |
| **Air Monitoring Report:** | 29423.017 AR 12042019 | |
| **Result of Air Monitoring:** | All results are less than 0.01 fibres per millilitre of air, which is the detection level of the analytical method. | |

## GENERAL WORKS

| Time | Activity |
|---|---|
| 07:00 – 08:00 | Prensa attend pre-start toolbox and set up air-monitoring equipment. |
| 08:00 – 11:00 | Abatement works continue, within the Domain D1 stockpile. |
| 11:00 – 12:00 | Lunch Break |
| 12:30 – 14:00 | Abatement works continue, within the recently Domain D1 stockpile.<br>Simultaneously trenching works continued in the DM carpark under Asbestos Work Conditions. |
| 14:30 | Prensa collect pumps prepare air monitoring slides and conduct airborne asbestos fibre count.<br>Following the fibre counting, the air monitoring report and daily site notes are consolidated. |

## WORK AREA

| Time | Activity | Photograph |
|---|---|---|
| Morning – Mid-Morning | Prensa set up air monitoring equipment around the boundary of the Work Area.<br><br>PROAS contractors begin by prepping the zone for the day's works, including consolidating the stockpiles to make as much rom as possible within the 'Abatement Work Area' prior to continuing abatement works.<br>PROAS and Prensa re-commence abatement works within the recently located in-situ D1 stockpile.<br><br>The abatement process involving the sifting of material while PROAS pick ACM from the surface and Prensa conduct a walk over to ensure the soil is visibly clear of ACM before the next bucket is sieved.<br><br>PROAS provide dust suppression during the abatement works.<br><br>Approximately 60 $m^3$ of soil is abated before the lunch break. |  <br>*Abating works commence in the 'Domain D1' stockpile*<br><br>  <br>*ACM handpicked during abatement works* |
| Afternoon | PROAS and Prensa continue abatement works within 'Domain D1' stockpile.<br><br>Simultaneous to the abatement works, Prensa, Becon and PROAS continue trenching in the DM carpark.<br>Works involved trenching down to the geo-fabric layer and then ceasing works while the excavation area is set up as an Asbestos Work Area.<br><br>Once works commenced to trench beyond the geo-fabric the soil was separated into one stockpile according to its associated classification 'in-situ D1'.<br>This material was loaded into a truck and covered with plastic and re-located into within the Abatement Work Area, to be abated at a later stage.<br><br>Approximately 125 $m^3$ of soil was abated by the end of works. |  <br>*Continued abatement works within the Domain D1*<br><br>  <br>*Trenching works in the DM carpark* |




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Client: BECON CONSTRUCTIONS

Project: ASBESTOS REMEDIATION

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Drawing Title: DAILY SITE NOTES: SITE PLAN

| Job No.: | 29423 | Client No.: | B0004 |
|---|---|---|---|
| Drawn by: SXM | Date: 12/04/2019 | Checked by: DXF | Date: 12/04/2019 |
| File name: DAILY SITE NOTES - SITE PLAN | | Figure number: 1 | Revision: A |

Legend:

0 10 20 Metres

N

- Site Boundary
- Asbestos Work Area Boundary
- Cleared Asbestos Work Area
- Stockpile Domain D1 (Fill Material with asbestos)
- Excavation Work Area
- Stockpile (Category C (Contaminated Soil) with asbestos)
- Air Monitoring Sampling Location
- Stockpile (Fill Material with asbestos)
- Abated stockpile (Fill material with asbestos)

Image Source: Near Map
Viewed: 25 January 2019

# Daily Site Notes

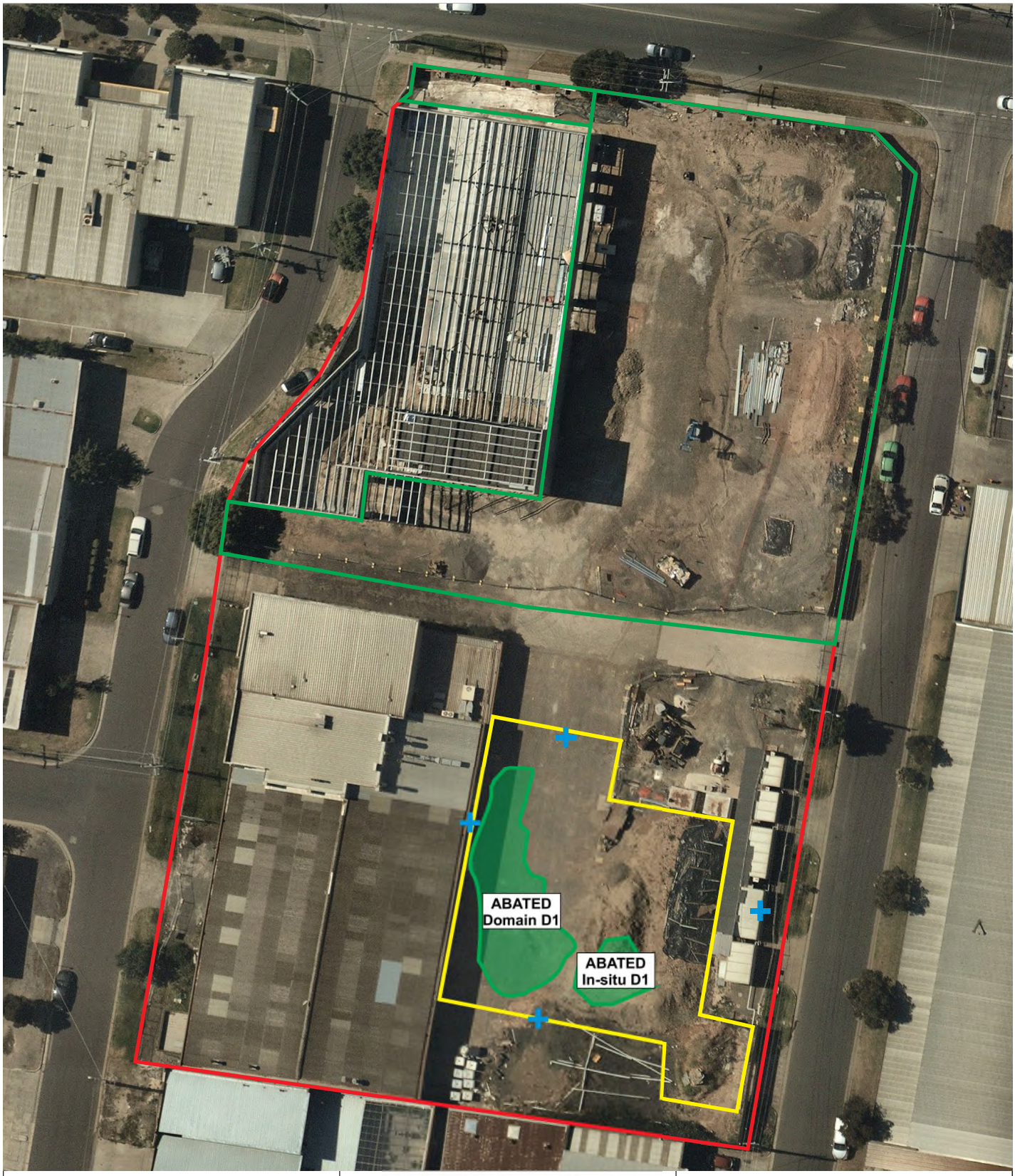
| | | |
|---|---|---|
| **Client Number:** | B0004 | |
| **Client Name:** | Becon Constructions | |
| **Job Number:** | 29423 | |
| **Project and Project Manager:** | 322 Bay Road, Cheltenham | Dane Fankhauser/Nathan Reynolds |
| **Date and Attending Consultants:** | 21st May 2019 | Souzy Melahridis |
| **Air Monitoring Report:** | *Void due to insufficient sample volume | |
| **Result of Air Monitoring:** | All results are less than 0.01 fibres per millilitre of air, which is the detection level of the analytical method. | |

## GENERAL WORKS

| Time | Activity |
|---|---|
| 07:00 – 07:20 | Prensa attend pre-start toolbox and set up air-monitoring equipment. |
| 7:20 – 10:30 | Abatement works finished, within the Domain D1 stockpile, Prensa conducted a visual clearance of the abatement work area and the Case Excavator.<br>PROAS removed the plastic wrapped barricade. |

## WORK AREA

| Time | Activity | Photograph |
|---|---|---|
| Morning – Mid-Morning | Prensa set up air monitoring equipment around the boundary of the Work Area.<br><br>PROAS and Prensa then commence abatement works within the domain D1 stockpile.<br>The abatement process involving the sifting of material while PROAS pick ACM from the surface and Prensa conduct a walk over to ensure the soil is visibly clear of ACM before the next bucket is sieved.<br>PROAS provided dust suppression for the duration of abatement works.<br><br>The processing works are completed within the Domain D1 stockpile.<br><br>Prensa conduct a visual inspection of the Abatement Work Area and the Case Excavator used for the duration of works. |  <br>*Abated D1 stockpile*<br><br>  <br>*Decontamination of the Case Excavator*<br><br>  <br>*Visual inspection of the Abatement Work Area* |




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Drawing Title: DAILY SITE NOTES: SITE PLAN

| Job No.: | 29423 | Client No.: | B0004 |
|---|---|---|---|
| Drawn by: SXM | Date: 29/04/2019 | Checked by: DXF | Date: 29/04/2019 |
| File name: DAILY SITE NOTES - SITE PLAN | | Figure number: 1 | Revision: A |

Legend:

0 10 20 Metres

N

- Site Boundary
- Asbestos Work Area Boundary
- Cleared Asbestos Work Area
- Stockpile Domain D1 (Fill Material with asbestos)
- Excavation Work Area
- Stockpile (Category C (Contaminated Soil) with asbestos)
- Air Monitoring Sampling Location
- Stockpile (Fill Material with asbestos)
- Abated stockpile (Fill material with asbestos)

Image Source: Near Map
Viewed: 25 January 2019

# Daily Site Notes

| | | |
|---|---|---|
| **Client Number:** | B0004 | |
| **Client Name:** | Becon Constructions | |
| **Job Number:** | 29423 | |
| **Project and Project Manager:** | 322 Bay Road, Cheltenham | Dane Fankhauser/Nathan Reynolds |
| **Date and Attending Consultants:** | 23 March 2019 | Dane Fankhauser |
| **Air Monitoring Report:** | 29423.002 AR 23032019 | |
| **Result of Air Monitoring:** | All results are less than 0.01 fibres per millilitre of air, which is the detection level of the analytical method. | |

## GENERAL WORKS

| Time | Activity |
|---|---|
| 07:00 – 08:00 | Prensa attend pre-start toolbox and set up air-monitoring equipment. |
| 08:00 – 10:00 | Prensa and PROAS undertake site preparation works |
| 10:00 – 12:00 | Stockpile relocation works undertaken |
| 12:00 – 13:00 | Lunch break |
| 13:00 – 15:30 | Stockpile relocation works undertaken |
| 15:30 | Prensa collect pumps prepare air monitoring slides and conduct airborne asbestos fibre count.<br>Following the fibre counting, the air monitoring report and daily site notes are consolidated. |

## WORK AREA

| Time | Activity | Photograph |
|---|---|---|
| Morning | Prensa and PROAS undertake site preparation works prior to the planned relocation of stockpiles SP1 – SP4 from the northern portion of the Site to the southern portion of the Site.<br><br>Prensa cordon off two (2) asbestos Work Areas:<br>• Excavation Work Area – (North)<br>• Abatement Work Area – (South)<br>Refer to attached Site Plan for Work Area locations.<br><br>Prensa set up air monitoring equipment around the boundaries of the Work Areas. |  <br>*Excavation Work Area*<br><br>  <br>*Abatement Work Area* |
| Mid-morning - Afternoon | PROAS's subcontracted driver and operator are inducted into the Site and the proposed soil relocation works.<br><br>PROAS remove the tarps from a portion of SP5 to allow for the consolidation of SP1, SP3 and SP5. |  <br>*PROAS remove tarp from SP5 prior to consolidation with SP1 and SP3* |

The excavator loads stockpiles SP1 and SP3 into the truck for relocation into the Abatement Work Area. Prensa advise the operator and driver as to the deposition locations of the stockpiles.

PROAS provide dust suppression during the soil relocation works. An electrical spotter is present during excavation works near overhead power lines.





*PROAS commence relocation of SP3*



*PROAS consolidate SP1 and SP3 with SP5*

Becon undertake hand excavation works on the nature strip of the western boundary of the Site, in order to identify locations of underground high voltage power line. Refer to High Voltage Work Area in Site Plan.

During the excavation, Becon and Prensa identify suspected ACM in the form of fibre-cement sheet debris within the soil.

PROAS perform a chicken-pick of the soil surface at the completion of the excavation, and the soil surface is cleared by Prensa.



*ACM identified in the nature strip soil on the western boundary of the Site.*

PROAS do not relocate stockpiles SP2 and SP4 to the Abatement Area, due to time restraints. Becon propose that the remaining stockpiles are to be relocated on Monday.

In addition, Prensa notes that a small volume of soil classified in report *29423 Bay Road In-situ SCA* as 'In-situ Domain D1' has been excavated and stockpiled adjacent to SP4.

Prensa advise that these three (3) stockpiles are to be kept separated due to their off-site disposal classifications.

Refer to Site Plan for locations of these stockpiles.

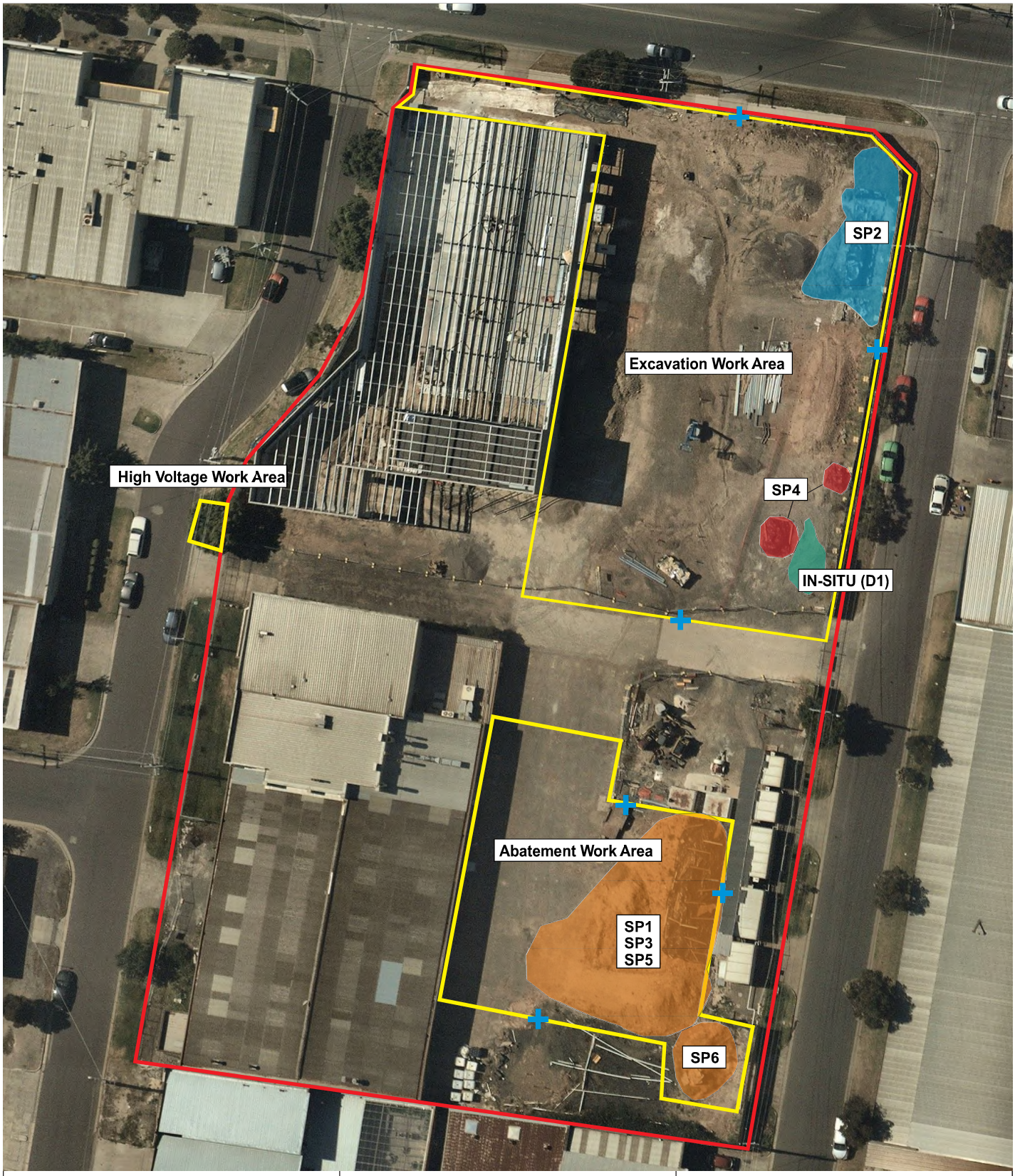


*Stockpiled 'In-situ D1', SP2 and SP4 remain within the Excavation Work Area*

PROAS decontaminate the truck prior to it leaving the Site. Prensa inspect the truck and conduct a visual clearance inspection. The truck is cleared of visible ACM.



*Truck decontaminated prior to leaving site*




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Drawing Title: DAILY SITE NOTES: SITE PLAN

| Job No.: | 29423 | Client No.: | B0004 |
|---|---|---|---|
| Drawn by: DXF | Date: 23/03/2019 | Checked by: DXF | Date: 23/03/2019 |
| File name: DAILY SITE NOTES - SITE PLAN | | Figure number: 1 | Revision: A |

Legend:

0 10 20 Metres

N

- Site Boundary
- Asbestos Work Area Boundary
- Stockpile Domain D1 (Fill Material with asbestos)
- Air Monitoring Sampling Location
- Stockpile (Fill Material with asbestos)
- Stockpile (Category C (Contaminated Soil) with asbestos)
- Stockpiled 'In-Situ D1' (Fill Material with asbestos)

Image Source: Near Map
Viewed: 25 January 2019

# Daily Site Notes

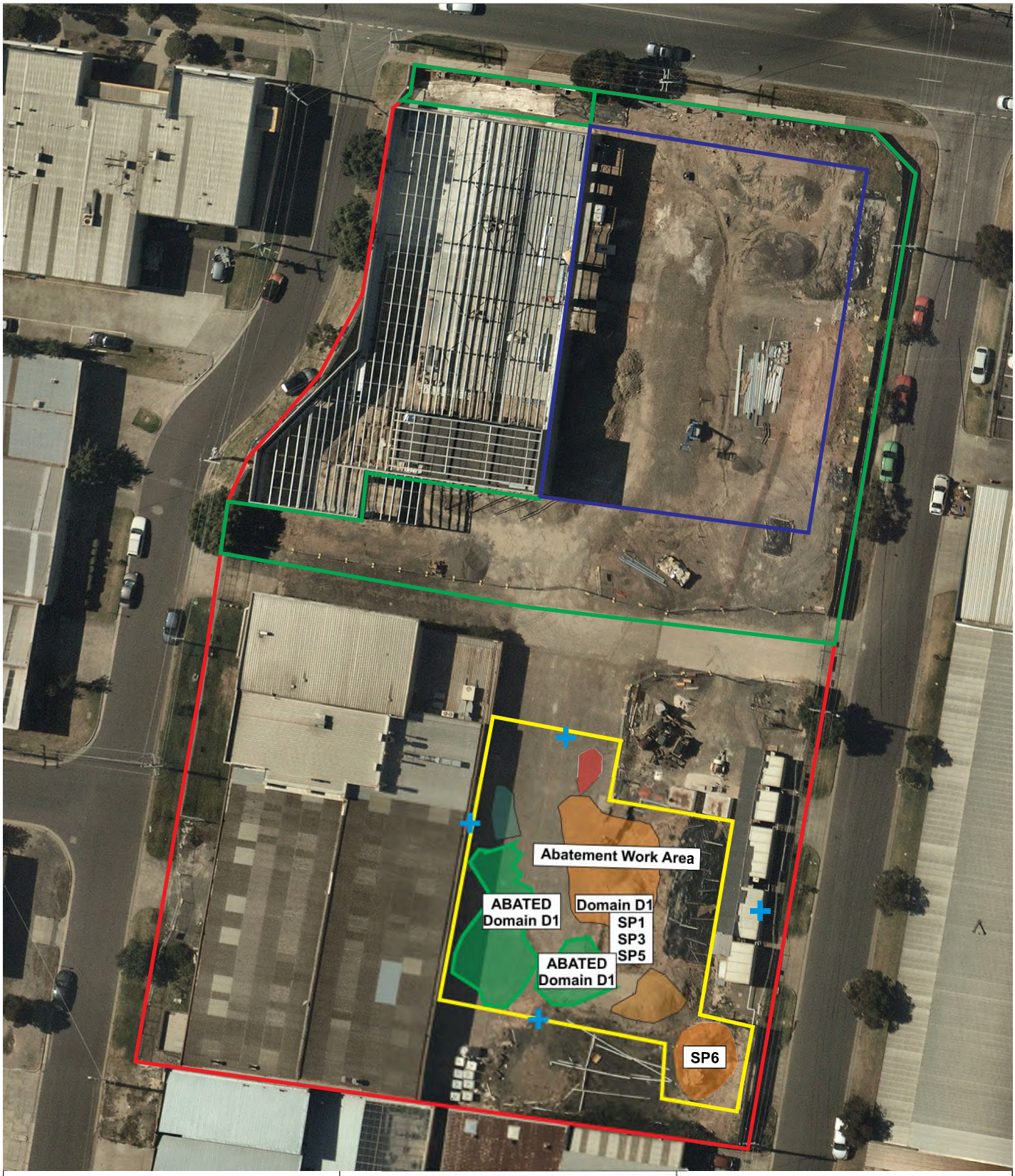
| | | |
|---|---|---|
| **Client Number:** | B0004 | |
| **Client Name:** | Becon Constructions | |
| **Job Number:** | 29423 | |
| **Project and Project Manager:** | 322 Bay Road, Cheltenham | Dane Fankhauser/Nathan Reynolds |
| **Date and Attending Consultants:** | 29th April 2019 | Souzy Melahridis |
| **Air Monitoring Report:** | 29423.024 AR 29042019 | |
| **Result of Air Monitoring:** | All results are less than 0.01 fibres per millilitre of air, which is the detection level of the analytical method. | |

## GENERAL WORKS

| Time | Activity |
|---|---|
| 07:00 – 08:00 | Prensa attend pre-start toolbox and set up air-monitoring equipment. |
| 08:00 – 11:00 | Abatement works re-commence, within the Domain D1 stockpile that was moved forward, away from the site-sheds on the 23rd of April. |
| 11:00 – 12:00 | Lunch Break |
| 12:30 – 14:00 | Abatement works continue, within the recently Domain D1 stockpile.<br>Simultaneously trenching works continued in the DM carpark under Asbestos Work Conditions. |
| 14:30 | Prensa collect pumps prepare air monitoring slides and conduct airborne asbestos fibre count.<br>Following the fibre counting, the air monitoring report and daily site notes are consolidated. |

## WORK AREA

| Time | Activity | Photograph |
|---|---|---|
| Morning – Mid-Morning | Prensa set up air monitoring equipment around the boundary of the Work Area.<br><br>PROAS contractors begin by prepping the zone for the day's works, including consolidating the recently moved stockpiles in preparation for the continued abatement of the D1 domain stockpiles, as well as re-establishing the work zone and ensuring the signage, tape and plastic was in-tact.<br><br>PROAS and Prensa re-commence abatement works within the Domain D1 stockpile.<br><br>The abatement process involving the sifting of material while PROAS pick ACM from the surface and Prensa conduct a walk over to ensure the soil is visibly clear of ACM before the next bucket is sieved.<br><br>Approximately 40 $m^3$ of soil is abated before the lunch break. |  <br>*Abatement Works within the Domain D1 soil*<br><br>  <br>*ACM material hand-picked during abatement works* |
| Afternoon | PROAS and Prensa continue abatement works within 'Domain D1' stockpile.<br><br>Simultaneous to the abatement works, Prensa, Becon and PROAS commence digging boreholes in the DM carpark.<br>Works involved boring down through the geo-fabric layer, with the zone set up as an asbestos work zone, in the event that ACM is identified before re-commencing drilling.<br><br>The soil was separated into two (2) stockpiles according to its associated classification 'in-situ D1' or D2 Domain.<br>This material was loaded into a truck and covered with plastic and re-located into within the Abatement Work Area, to be abated/loaded out at a later stage.<br><br>Approximately 70 $m^3$ of soil was abated by the end of works. |  <br>*Continued abatement works within the Domain D1*<br><br>  <br>*Drilling works within the DM carpark* |




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Drawing Title: DAILY SITE NOTES: SITE PLAN

| Job No.: | 29423 | Client No.: | B0004 |
|---|---|---|---|
| Drawn by: SXM | Date: 29/04/2019 | Checked by: DXF | Date: 29/04/2019 |
| File name: DAILY SITE NOTES - SITE PLAN | | Figure number: 1 | Revision: A |

Legend:

0 10 20 Metres

N

- Site Boundary
- Asbestos Work Area Boundary
- Cleared Asbestos Work Area
- Stockpile Domain D1 (Fill Material with asbestos)
- Excavation Work Area
- Stockpile (Category C (Contaminated Soil) with asbestos)
- Air Monitoring Sampling Location
- Stockpile (Fill Material with asbestos)
- Abated stockpile (Fill material with asbestos)

Image Source: Near Map
Viewed: 25 January 2019

# Appendix B: Relevant IWRG and WorkSafe Guidance





# SOIL HAZARD CATEGORISATION AND MANAGEMENT

## CONTENTS

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## INTRODUCTION

Producers of contaminated soil must categorise their waste into one of four categories, Category A, B, C or clean fill.

This guideline applies only to soils (it is not suitable for rubble, concrete and other inert solid waste materials).

## WHAT THIS MEANS FOR YOU

If you are a producer or treater of contaminated soils, you will be required to categorise the soil into Category A, B, C or clean fill to determine what management options are available for that material.

## WASTE CHARACTERISATION

Waste characterisation involves an assessment of the soil, including site history, to identify which contaminants require analysis to determine the hazard category. The assessment must be for all chemical substances known and reasonably expected to be present in the waste.

If the waste contains a contaminant that is potentially poisonous (acute), toxic (delayed or chronic) and/or ecotoxic and the contaminant is not listed in Table 2, the waste generator must apply to EPA for a determination of hazard category.

Allowable contaminant levels for fill material are also specified in Table 2. EPA does not regulate the use of fill material. However, the Environment Protection Act 1970 places general obligations to prevent adverse impacts on the environment and human health. Where there is potential for adverse impacts from the deposit of fill material, advice should be sought from EPA.

## SAMPLING AND ANALYSIS

Soil sampling should be conducted in accordance with the IWRG *Soil sampling*, whilst soil analysis should be performed in accordance with the IWRG *Sampling and analysis of waters, wastewaters, soils and wastes*.

EPA requires that leachability testing be undertaken in accordance with the Australian Standard Leaching Procedure (ASLP) (Australian Standards AS4439.2 and 44396.3) by a NATA accredited laboratory. For contaminated soil going to disposal or re-use, it is necessary to perform ASLP using the acetate buffer solution (pH of 2.9 or pH 5, dependant on the pre-testing step as outline in the Australian Standard).

There is no need to conduct leachability tests in cases where total concentration data indicates that all total concentration results are less than 20 times the relevant Category C leachable concentration upper limits. This reflects the effect of dilution resulting from the use of the Australian Standard Leaching Procedure.

## RECOMMENDED METHODS

The recommended methods for contaminated soils are provided in the IWRG *Solid industrial waste sampling*. EPA has no plans to mandate methods for 'totals', but the method that is used must be appropriate to determine the 'total concentration' of the contaminants.

Further information on these methods can be found on the USEPA website Test Methods SW-846 www.epa.gov/epaoswer/hazwaste/test/main.htm and from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Guideline on Laboratory Analysis of Potentially Contaminated Soils www.ephc.gov.au/sites/default/files/ASC_NEPMsch__03_Lab_Analysis_199912.pdf

## SPECIFIC CONTAMINANTS

Many laboratories conduct Total Recoverable Hydrocarbon (TRH) analysis and report this for Total Petroleum Hydrocarbon (TPH). A number of people have raised concerns with using TRH result and reporting these as TPH due to the presence of other hydrocarbon substances, not related to petroleum hydrocarbons, that are included in a TRH test. Until

This guidance forms part of the Industrial Waste Resource Guidelines (IWRG), which offer guidance for wastes and resources regulated under the *Environment Protection (Industrial Waste Resource) Regulations 2009* (the Regulations). Publication IWRG621 – June 2009.

there is a routine test developed exclusively for TPH, it may be necessary to discuss with clients what options are available to remove non petroleum based hydrocarbons.

To provide consistency in the approach of summing grouped contaminants and interpreting results that are below the limit of reporting, EPA recommends all positive values for the individual components be summed together.

Soils with a pH value of 4 or less or a pH of 9 or more are considered to be Prescribed Industrial Wastes (PIWs). Table 1 provides further information on pH values that are applicable to Category A.

Results for total concentrations are to be reported on a dry weight basis.

## WASTE CATEGORIES

To determine the hazard category, contaminated soil must first be considered and excluded from Category A, then considered and excluded from Category B, before it can be considered as Category C. Figure 1 shows a decision flowchart for classifying waste soils.

Contaminated soils that display any specific hazard characteristic listed in Table 1 are categorised as Category A PIW.

Table 2 contains the threshold limit values (upper limits) for each of the categories, including clean fill. Contaminated soils must be assessed against the total concentration (TC0, TC1 and TC2) and leachable concentration (ASLP1 and ASLP2) thresholds specified in Table 2

Contaminated soils with any contaminant level above the TC2 or ALSP2 thresholds are categorised as Category A. Contaminated soils with any contaminant level greater than TC1, but below TC2, or greater than ASLP1, but below ASLP2 are categorised as Category B. Soils with any contaminant level greater than TC0, but below the TC1 and ALSP1 thresholds are categorised as Category C. Soils with all contaminant levels below the TC0 threshold are categorised as clean fill.

If doubt exists as to which hazard category applies to a soil, seek advice from EPA.

Landfill operators will require analytical results to demonstrate that the contaminated soil meets the relevant criteria set out in their licence.

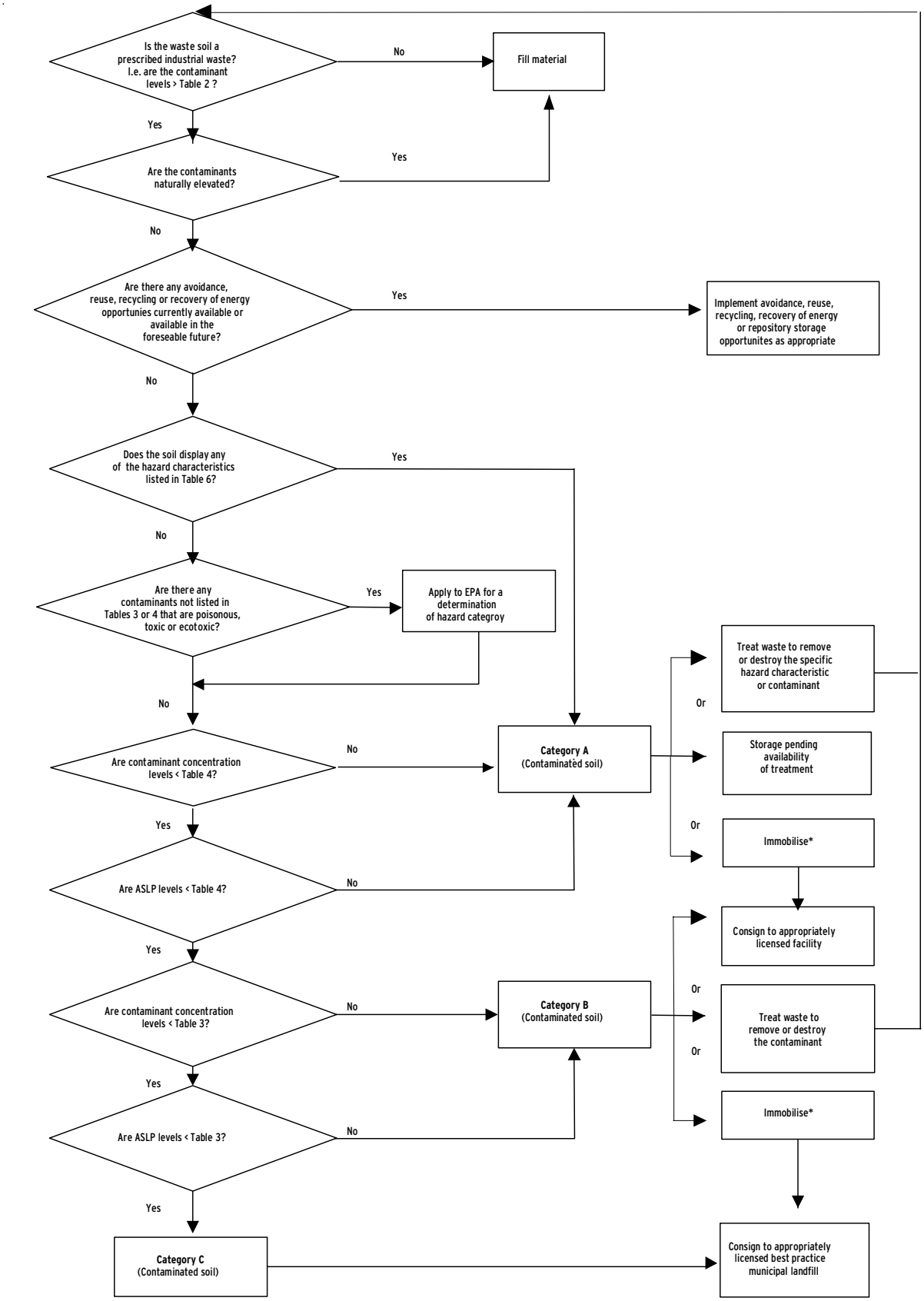



**Figure 1: Decision flow chart for waste soil**

**Table 1: Specific hazard characteristics**

| Hazard characteristic | Definition1 |
|---|---|
| **Explosive wastes** | An explosive waste is a solid waste (or mixture of wastes) which is in itself capable, by chemical reaction, of producing gas at such a temperature, pressure and speed, as to cause damage to the surroundings.<br>Note: These are wastes classified as 'Class 1' under the provisions of the Road Transport (Dangerous Goods) Act 1995 and/or classified as 'Goods too dangerous to be transported' under the Australian Dangerous Goods Code. |
| **Flammable2 solid wastes** | Waste solids, other than those classified as explosives, which, under conditions encountered in transport or containment, are readily combustible, or may cause or contribute to fire through friction.<br>Note: These are wastes classified as 'Class 4.1' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Wastes liable to spontaneous combustion** | Wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up in contact with air, and liable to catch fire.<br>Note: These are wastes classified as 'Class 4.2' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Wastes which, in contact with water, emit flammable gases** | Wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.<br>Note: These are wastes classified as 'Class 4.3' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Oxidising wastes** | Wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other materials.<br>Note: These are wastes classified as 'Class 5.1' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Organic peroxide wastes** | Organic wastes which contain the bivalent-O-O-structure and which are thermally unstable and may undergo exothermic self-accelerating decomposition.<br>Note: These are wastes classified as 'Class 5.2' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Infectious wastes** | Wastes containing viable microorganisms or their toxins which are known or suspected to cause disease in animals or humans.<br>Note: These include clinical and related wastes as prescribed in the Environment Protection (Prescribed Waste) Regulations 1998 and is waste classified as 'Class 6.2' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Corrosive wastes** | Wastes which, by chemical action, will cause severe damage when in contact with living tissue, or in the case of leakage, will materially damage, or even destroy, other goods or the means of transport or containment. They may also cause other hazards.<br>Where corrosivity testing data is not available, pH may be used to determine if the material is Category A.<br>• pH value of 2 or less<br>• pH value of 12.5 or more<br>Note: This includes wastes classified as 'Class 8' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |
| **Wastes that liberate toxic gases in contact with air or water** | Wastes which, by liberation with air or water, are liable to give off toxic gases in dangerous quantities.<br>Note: These are wastes liable to give off toxic gases that are classified as 'Class 2.3' under the provisions of the Road Transport (Dangerous Goods) Act 1995. |

1 Definitions are adopted from the *Industrial Waste Management Policy (Movement of Controlled Wastes between States and Territories) 2001*.

2 In this document the word 'flammable' has the same meaning as 'inflammable'. Flammable liquid wastes are waste liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc.) which give off flammable vapour at temperatures of not more than 60.5 °C (closed-cup test), or not more than 65.6 °C (open-cup test). Note: The definition of flammable liquid wastes are those wastes classified as 'Class 3' under the provisions of the Road Transport (Dangerous Goods) Act 1995.

**Table 2: Soil hazard categorisation thresholds**

| Category | Fill Material upper limits | | Category C upper limits | | Category B upper limits | | |
|---|---|---|---|---|---|---|---|
| Contaminant concentration thresholds (dry weight) | | TC0 | ASLP1[1] | TC1 | ASLP2[1] | TC2 | |
| Units | | (mg/kg) | (mg/L) | (mg/kg) | (mg/L) | (mg/kg) | |
| **Inorganic species** | **Inorganic species** | | **Inorganic species** | | **Inorganic species** | | |
| Arsenic | | 20 | 0.7 | 500 | 2.8 | 2,000 | |
| Cadmium | | 3 | 0.2 | 100 | 0.8 | 400 | |
| Chromium (VI) | | 1 | 5 | 500 | 20 | 2,000 | |
| Copper | | 100 | 200 | 5,000 | 800 | 20,000 | |
| Lead | | 300 | 1 | 1,500 | 4 | 6,000 | |
| Mercury | | 1 | 0.1 | 75 | 0.4 | 300 | |
| Molybdenum | | 40 | 5 | 1,000 | 20 | 4,000 | |
| Nickel | | 60 | 2 | 3,000 | 8 | 12,000 | |
| Tin | | 50 | - | 500 | - | - | |
| Selenium | | 10 | 1 | 50 | 4 | 200 | |
| Silver | | 10 | 10 | 180 | 40 | 720 | |
| Zinc | | 200 | 300 | 35,000 | 1,200 | 140,000 | |
| **Anions** | **Anions** | | **Anions** | | **Anions** | | |
| Cyanide | | 50 | 8 | 2,500 | 32 | 10,000 | |
| Fluoride | | 450 | 150 | 10,000 | 600 | 40,000 | |
| **Organic species** | **Organic species** | | **Organic species** | | **Organic species** | | |
| Phenols (halogenated)[2] | | 1 | 2 | 10 | 8 | 320 | |
| Phenols (non-halogenated)[3] | | 60 | 14 | 560 | 56 | 2,200 | |
| Monocyclic aromatic hydrocarbons[4] | | 7 | - | 70 | - | 240 | |
| Benzene | | 1 | 0.1 | 4 | 0.4 | 16 | |
| Polycyclic aromatic hydrocarbons[5] | | 20 | - | 100 | - | 400 | |
| Benzo(a)pyrene | | 1 | 0.001 | 5 | 0.004 | 20 | |
| C6-C9 petroleum hydrocarbons | | 100 | - | 650 | - | 2,600 | |
| C10-C36 petroleum hydrocarbons | | 1,000 | - | 10,000 | - | 40,000 | |
| Polychlorinated biphenyls[6] | | 2 | see note 6 | | see note 6 | | |
| Chlorinated hydrocarbons[7] | | 1 | | | | | |
| Hexachlorobutadiene | | | 0.07 | 2.8 | 0.28 | 11 | |
| Vinyl chloride | | | 0.03 | 1.2 | 0.12 | 4.8 | |
| Other chlorinated hydrocarbons[8] | | | - | 10 | - | 50 | |
| **Pesticides** | **Pesticides** | | **Pesticides** | | **Pesticides** | | |
| Organochlorine pesticides[9] | | 1 | | | | | |
| Aldrin + dieldrin | | | 0.03 | 1.2 | 0.12 | 4.8 | |
| DDT + DDD + DDE | | | 2 | 50 | - | 50 | |
| Chlordane | | | 0.1 | 4 | 0.4 | 16 | |
| Heptachlor | | | 0.03 | 1.2 | 0.12 | 4.8 | |
| Other organochlorine pesticides[10] | | | - | 10 | - | 50 | |

FILL MATERIAL | CATEGORY C CONTAMINATED SOIL | CATEGORY B CONTAMINATED SOIL | CATEGORY A CONTAMINATED SOIL

### Notes

1. Australian Standard Leaching Procedure (acetate buffer) as specified in Australian Standards 4439.2 and 4439.3.
2. Total sum of 4-chloro-3-methylphenol, 2-chlorophenol, 2,4-dichlorophenol, 2,6-dichlorophenol, pentachlorophenol, 2,3,4,5-tetrachlorophenol, 2,3,4,6-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,4,5-trichlorophenol, and 2,4,6-trichlorophenol.
3. Total sum of phenol, 2-methylphenol (o-cresol), 3-methylphenol (m-cresol), 4-methylphenol (p-cresol), 2,4-dimethylphenol, 2.4-dinitrophenol, 2-methyl-4,6-dinitrophenol, 2-nitrophenol, 4-nitrophenol, 2-cyclohexyl-4,6-dinitrophenol and dinoseb.
4. Total sum of benzene, toluene, ethyl benzene, xylenes (includes ortho, para and meta xylenes) and styrene.
5. Total sum of naphthalene, acenaphthylene, acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluorene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene and pyrene.
6. Soil containing polychlorinated biphenyls (PCBs) must be managed in accordance with the *Notifiable Chemical Order for Polychlorinated Biphenyls*. Industrial Waste Guidelines section *Polychlorinated Biphenyls (PCBs)* provides further information.
7. Total sum of carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, dichloromethane (methylene chloride), 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, tetrachloroethene, vinyl chloride and hexachlorobutadiene.
8. Total sum of carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, dichloromethane (methylene chloride), 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene and tetrachloroethene.
9. Total sum of aldrin, hexachlorobenzene, alpha BHC, beta BHC, gamma BHC (lindane), delta BHC, chlordane, DDT, DDD, DDE, dieldrin, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, methoxychlor and endosulfan (includes endosulfan I, endosulfan II and endosulfan sulphate).
10. Total sum of hexachlorobenzene(HCB), alpha BHC, beta BHC, gamma BHC (lindane), delta BHC, chlordane, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, methoxychlor and endosulfan (includes endosulfan I, endosulfan II and endosulfan sulphate).

## MANAGEMENT OPTIONS

Waste generators must classify contaminated soil by hazard category in order to determine which facility is licensed to accept the soil. If the soil does not meet the acceptance criteria, further treatment or stabilisation will be required.

Category C and Category B Contaminated soil can be accepted at a landfill or facility licensed by EPA to accept such waste.

Category A Contaminated soil will require treatment to reduce or control the hazard before meeting acceptance criteria for disposal at an appropriate EPA-licensed facility.

**Table 3: Contaminated soil management options**

| | | |
|---|---|---|
| **Category A contaminated soil** | • On-site remediation<br>• Off-site remediation<br>• Storage pending availability of treatment | No disposal to landfill.<br>• EPA transport certificates must be used.<br>• Vehicles must hold EPA permit (unless exemption issued). |
| **Category B contaminated soil** | • On-site remediation<br>• Off-site remediation<br>• Licensed facility | Disposal to licensed facility.<br>• EPA Transport certificate system must be used.<br>• Vehicles must hold EPA permit (unless exemption issued). |
| **Category C contaminated soil** | • On-site remediation<br>• Off-site remediation<br>• Licensed landfill | Disposal to licensed landfill.<br>• EPA Transport certificate system must be used.<br>• Vehicles must hold EPA permit (unless exemption issued). |

Generators of contaminated soils may wish to submit a classification application to EPA for approval, where it can be demonstrated that a different category from that outlined above is appropriate for a particular contaminant or group of contaminants in soil. For example, a contaminant that is intrinsically immobilised (without treatment) may display a low hazard because of the very low leachable concentration, despite a relatively high total concentration. Applications will need to provide justification as to why the proposed management will achieve the best environmental outcome. Further analytical testing may also be required. The Industrial Waste Resource Guidelines (IWRG) Classifications - for Disposal provides further information on the requirements for a classification.

## FURTHER INFORMATION

- Australian Standard 4439.2 – 1997, *Wastes, sediments and contaminated soils*. Part 2: Preparation of leachates – Zero headspace procedure
- Australian Standard 4439.3 – 1997, *Wastes, sediments and contaminated soils*. Part 3: Preparation of leachates –Bottle leaching procedure
- Australian Standard 4482.1 – 2005, *Guide to sampling and investigation of potentially contaminated soil*. Part 1: Non-volatile and semi-volatile compounds

## Guidance Note

# Asbestos-contaminated soil

**This information sheet provides advice for any person (including employers, removalists and commercial contractors) inspecting, removing, transporting and disposing of asbestos-contaminated soil.**

**October 2010**

### Background

Asbestos may be found in soil on any property, including businesses and residential sites. For example, it may be present because buildings that contained asbestos were not demolished and disposed of properly or asbestos-contaminated soil was used as a top soil or fill material.

Asbestos in soil is a risk to health if fibres can become airborne so they may be inhaled. The risk may be increased depending on the type and amount of asbestos material in the soil, and if there is potential for it to become disturbed or airborne.

Exposure to asbestos can cause mesothelioma, asbestosis and lung cancer. All people must be protected against the risk of asbestos-related disease resulting from the exposure to airborne fibres.

There are legal requirements that prohibit anyone supplying, storing, transporting, selling, using and re-using asbestos-contaminated soil that contains any visible amount of asbestos.

### Inspecting asbestos-contaminated soil

If asbestos-contaminated soil is intended to be supplied, stored, transported, sold or used it must be inspected by a competent person.

The person who has management or control of the soil must ensure any visible asbestos-containing material (ACM) is removed so far as is reasonably practicable throughout the supply chain.

After a competent person determines the soil contains no visible asbestos it can be used for its intended purpose.

If ACM becomes visible in the soil at a later stage, the soil must be inspected again and all visible asbestos removed. This is the duty of the person with management and control of the soil at that stage.

This duty does not apply to licensed transporters disposing of asbestos-contaminated soil as asbestos waste.

Sometimes it may be more cost-effective to remove and dispose of soil as asbestos-containing waste instead of following the inspection and clearance processes that may otherwise be required.

### Who can inspect asbestos-contaminated soil?

A competent person should inspect the soil to determine the likely amount of contamination and later to confirm all visible ACM has been removed so far as is reasonably practicable.

The extent of the inspection required depends on factors including background knowledge of the soil and site, the likely amount (breadth and depth) of asbestos contamination and the likely source of the contamination.

A competent person should write a statement about the inspection and outcome (see example A). This statement should be given to the person receiving the soil (eg transporter, landfill operator etc).

Note: A competent person must have the ability to identify ACM or potential ACM and have experience in asbestos removal work to undertake visual inspections.

### Who can remove asbestos contamination from soil?

All activities required to remove asbestos from soil must be done by a class A licensed asbestos removalist, unless it takes less than one hour to remove the contaminated soil. This includes the use of any machinery and equipment (eg an excavator) to move contaminated soil to disposal vehicles.

If the asbestos contamination is only minor (eg it takes less than one hour to be removed) it can be removed by a class A or class B removalist, or an appropriately trained person.

### Transporting asbestos-contaminated soil

Asbestos contaminated soil must be damp before being packaged for transport. This prevents the chance of dust and fibres becoming airborne.

Soil should be carefully transferred to a suitable container, then sealed and labelled as asbestos-containing.

Owners and operators of vehicles that transport waste asbestos from an industrial or commercial source must hold an Environment Protection Authority (EPA) waste transport permit.

If a commercial contractor (eg a licensed asbestos removalist) removes asbestos from a domestic source, they must have transport certificates and a permitted vehicle.

Further information on the transport, disposal and packaging of waste asbestos can be found in Industrial Waste Resource Guidelines – *Asbestos transport and disposal* at **epa.vic.gov.au**

To find a list of licensed transporters see EPA's *Prescribed industrial waste database*.

## Disposing of asbestos-contaminated soil

The EPA controls the disposal of waste asbestos from a workplace or household and the transportation of asbestos of industrial origin (including commercial or trade).

Asbestos from industrial and commercial activities, and asbestos from domestic premises that is removed by a contractor, is prescribed industrial waste and must be deposited at a site licensed to accept asbestos using waste code N220.

Soil that contains asbestos and no other contaminants must be disposed of as asbestos-containing material using waste code N220.

Before disposing of waste asbestos, the removalist, appropriately trained person or commercial contractor should contact the disposal site to confirm if and when it can accept this type of waste.

To find sites licensed to accept waste asbestos, go to Asbestos at **epa.vic.gov.au**

If a landfill is licensed to receive asbestos, it can also receive soil with asbestos (no other contaminants). A $30 per tonne asbestos landfill levy would apply.

Soil with contaminants in addition to asbestos must be assessed and labelled as category A, B or C using the Industrial Waste Resource Guidelines – *Soil hazard categorisation and management* at **epa.vic.gov.au**

Soil must then be packaged appropriately for disposal and taken to a facility licensed to accept both asbestos and the category of waste. The waste transport certificate must note the soil category code (contaminated soil A, B, C), listing asbestos as a contaminant.

## Example A

**Sample statement of a soil inspection and outcome by a competent person**

As a competent person in relation to asbestos matters, I inspected the soil at [insert address and specific soil location] for the visible presence of asbestos-containing material (ACM) on [*insert date and time*].

This inspection was undertaken in the presence of a class A licensed asbestos removalist and all removal of ACM was undertaken by a class A licensed asbestos removalist.

The process involved removing any visible ACM from the surface of the soil, then dispersing the soil to a satisfactory depth to be inspected for the presence of asbestos. Any further visible ACM was removed.

I confirm visible asbestos-containing material has been removed so far as is reasonably practicable from the soil at the above-named address and specific soil location. Hence the prohibitions (for supply, storage, transport, sale, use or re-use) relating to asbestos-containing material do not apply to this soil.

If ACM becomes visible at a later stage, any person who has management and control of this soil must also inspect it and remove any visible ACM. If ACM becomes visible and is not removed, the prohibitions relating to asbestos-containing material will again apply to this soil.

Signature:

Name:

Position:

Date:

## Further information

**WorkSafe Advisory Service**
1800 136 089
**worksafe.vic.gov.au/asbestos**

**Environment Protection Authority**
03 9695 2722
**epa.vic.gov.au**

**Related WorkSafe publications**
Compliance Code, *Removing asbestos in workplaces*

**Related websites**
**ephc.gov.au/contam**

On 18 June 2017, the Occupational Health and Safety Regulations 2017 (OHS Regulations 2017) replaced the Occupational Health and Safety Regulations 2007 (OHS Regulations 2007), which expired on this date. **This publication has not yet been updated to reflect the changes introduced by the OHS Regulations 2017 and should not be relied upon as a substitute for legal advice.**

Information on the key changes introduced by the OHS 2017 Regulations can be found in the guidance titled *Occupational Health and Safety Regulations 2017: Summary of changes* - available at https://www.worksafe.vic.gov.au/__data/assets/pdf_file/0011/207659/ISBN-OHS-regulations-summary-of-changes-2017-04.pdf. However, this guidance document contains material of a general nature only and is not to be used as a substitute for obtaining legal advice.

# Attachment 3

# Groundwater Quality Management Plan

328 Bay Road, Cheltenham, Victoria



Client: Chandos Bay Pty Ltd
Project Number: P001070
Date: 12 September 2019

# Groundwater Quality Management Plan

Lot 1, Chandos Bay
328 Bay Road, Cheltenham

**Prepared for:**
Chandos Bay
144 Church Street
Brighton, Victoria 3186

**Prepared by:**
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Figure 1 – Site Location Plan

Figure 2 – Layout of the Former Site

Figure 3 – Existing Well Network

Figure 4 – Proposed GQRUZ

# Abbreviations

| | |
|---|---|
| **BTEXN** | Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene |
| **COC** | Chain of Custody |
| **CoPC** | Contaminant of Potential Concern |
| **DELWP** | Department of Environment Land Water and Planning |
| **DCE** | Dichloroethene |
| **EIL** | Ecological Investigation Levels |
| **EAO** | Environmental Audit Overlay |
| **ESL** | Ecological Screening Level |
| **EPA** | Environment Protection Authority |
| **GME** | Groundwater Monitoring Event |
| **GQRUZ** | Groundwater Quality Restricted Use Zone |
| **HIL** | Health Investigation Levels |
| **HSL** | Health Screening Level |
| **IL** | Investigation Level |
| **LOR** | Limit of Reporting |
| **MAH** | Monocyclic Aromatic Hydrocarbons |
| **mBGL** | Meters Below Ground Level |
| **mBTOC** | Meters Below Top of Casing |
| **mg/kg** | Milligrams Per Kilogram |
| **NATA** | National Association of Testing Authorities |
| **NA** | Not Applicable |
| **ND** | Not Detected |
| **NEPM** | National Environment Protection Measure |
| **PAH** | Polycyclic Aromatic Hydrocarbons |
| **PID** | Photo-Ionisation Detector |
| **PPM** | Parts Per Million |
| **PSI** | Preliminary Site Investigation |
| **QA / QC** | Quality Control / Quality Assurance |
| **RPD** | Relative Percent Difference |
| **SAQP** | Sampling Analysis Quality Plan |
| **SEPP** | State Environment Protection Policy |
| **SWL** | Standing Water Level |
| **TDS** | Total Dissolved Solid |
| **TCE** | Trichloroethene |
| **TPH** | Total Petroleum Hydrocarbons |
| **TRH** | Total Recoverable Hydrocarbons |
| **VC** | Vinyl Chloride |
| **VOC** | Volatile Organic Compounds |
| **µg/L** | Micrograms Per Litre |

# 1. Introduction

Resolve Environmental (Resolve) was engaged by Chandos Bay Pty Ltd (Chandos) to develop a Groundwater Quality Management Plan (GQMP) for Lot 1 of 328 Bay Road, Cheltenham Victoria (the site). The location of the site is presented in **Appendix A, Figure 1**.

The site was subject to a groundwater investigation as part of a 53x Environmental Audit. Due to the site's historical use as a chemical handling, storage and distribution facility, groundwater contamination, chlorinated hydrocarbons) was present. Site sourced contamination extends off-site to the west and because of this, a Groundwater Quality Restricted Use Zone (GQRUZ) has been established which is presented in **Appendix A, Figure 4**.

The site has a prior GQMP that ceased at the completion of the 53X Audit, which was also prepared to satisfy the requirements of the Environment Protection Authority (EPA) Victoria Clean-Up Notice (CUN, 16/05/2019, Notice ID: 90010025).

This revised GQMP is for the ongoing monitoring and management of groundwater.

## 1.1. Purpose

The purpose of this GQMP is to:

- Outline a methodology and procedures for ongoing monitoring and management of groundwater, as required to support the clean up to the extent practicable (CUTEP) submission for the site.
- Specify trigger levels for contaminants of concern, including a contingency plan (where required).
- Establish a process for review and cessation of the GQMP.

## 1.2. Responsibilities

To ensure the GQMP is effectively and successfully implemented, a number of actions and corresponding responsible parties have been allocated and described in **Table 1.1**.

The owner of the site is responsible for the implementation of the GQMP, including monitoring, testing and reporting, at the frequency outlined in this GQMP until the cessation of groundwater monitoring has been approved by the EPA.

**Table 1-1: Summary of Responsibilities**

| Site Details | Description |
|---|---|
| Site Owner | Ensure implementation of the GQMP<br>The site owner may delegate management of the GQMP performance but remains responsible for implementation of the GQMP.<br>Engage an Environmental Consultant to undertake the activities required under the GQMP.<br>Inform any future site owners and/ or occupiers of the site, by provision of the Statement of Environmental Audit and GQMP, that the groundwater is unsuitable for use.<br>Ensure the tenants occupying the site are aware of the GQMP and its implementation.<br>Provide a copy of the Statement of Environmental Audit and GQMP to tenant management to inform them of the condition of the site and restrictions on groundwater use.<br>Ensure that future conditions of sale placed on transfer of site ownership make reference to the GQMP and its requirements (if at that time the GQMP is still requirement to be implemented).<br>Ensure that all monitoring reports and correspondence regarding action taken under this GQMP are kept in one place and are available to site occupants.<br>Arrange for repair and/or replacement of damaged, inaccessible or lost monitoring wells.<br>Engage an Environment Protection Authority (EPA) appointed Environmental Auditor (Contaminated Land) to review the groundwater monitoring results as specified within the GQMP (and as presented in reporting by the Environmental Consultant), and to review the requirement for further monitoring at completion of the specified monitoring program. |
| Environmental Auditor | Review and endorse the GQMP and any updates thereof.<br>Review data provided by the Environmental Consultant to ensure the GQMP is being adhered to.<br>Ensure any EPA issues/ concerns are incorporated into the GQMP.<br>Review any changes to the GQMP. Determine the cessation of groundwater monitoring under the GQMP – being subject to discussion and agreement with EPA. |
| Environmental Consultant | Update GQMP as required<br>Plan, undertake and report on the activities in accordance with the GQMP and applicable guidelines and legislation.<br>Provide recommendation, where required.<br>Notify the Site Owner and Environmental Auditor if trigger levels are exceeded.<br>Initiate contingency measures (in conjunction with the Environmental Auditor), if required. |

# 2. Site Details

## 2.1. Site Location and Setting

The site is located at 328 Bay Road, Cheltenham as shown on **Figure 1**. The site details are summarised in **Table 2-1**.

**Table 2-1: Site Details**

| Site Details | Description |
|---|---|
| Site Address | 328 Bay Road, Cheltenham |
| Certificate of Title | Volume 11973 Folio 116. |
| Lot Details | Lot 1 on Plan of Subdivision PS802507T |
| Registered Proprietor | Chandos Bay Pty Ltd |
| Site Area | 3,469m$^2$ |
| Zoning and Planning Overlays | Commercial 2 Zone (C2Z)<br>Cultural Heritage Sensitivity Overlay<br>Development Contributions Plan Overlay |
| Current Site Use | The site has been developed as a Dan Murphy's liquor store. |
| Proposed Site Use | The Site has been redeveloped for commercial use with a planning permit in place for a Dan Murphy's liquor store. This include a single storey 1,175 m2 liquor warehouse, a 122 m2 office and a loading dock in the western portion and a car park containing 63 spaces in the eastern portion. |

## 2.2. Site History

The summary of historical site infrastructure and activities was compiled from the PSI completed by ARC (ARC, 2017) which reviewed all relevant historical documentation, site inspections and historical environmental reports. The site is Lot 1 of the former Nuplex Facility which was histroicallty used for the handling, storage and distribution of chemicals. The locations of key site features are provided in **Figure 2.**

# 3. Groundwater Assessment

## 3.1. Summary of Previous Investigations

Groundwater investigations as part of the Environmental Audit were undertaken from 2017 to 2019 from on-site and off-site wells to determine the contaminants of concern, characterise the plume, delineate the plume and assess plume stability.

, the measured depth to groundwater at the Site generally ranges from 6 to 10 mbgl, with the water table at most locations encountered around 10 mbgl to 11 mbgl (or approximately 27.2 to 28.2 m AHD), within the Sandringham Sands, which forms the regional aquifer at the Site.

During all groundwater monitoring events undertaken at the site, no evidence of Non-Aqueous Phase Liquid (NAPL), dense or light, has been measured in any of the monitoring wells. Groundwater concentrations are also not indicative of NAPL.

## 3.2. Final Groundwater Results

Groundwater analytical results from the final sampling rounds (August 2018 onsite wells and October 2018 offsite wells, as well as May and June 2019 for MW59) are shown in **Table 3-2**, together with the relevant beneficial uses that are precluded based on the results. The contaminants presented are considered to be site-sourced or co-sourced, based on historical use of the site.

During groundwater investigations at the site, concentrations of arsenic, cobalt, lead, manganese, nickel, zinc, nitrate, sulfate, ammonia and fluoride were found to exceed the adopted criteria; however, these constituents were found to be related to an off-site source, natural background concentrations or regional pollution and as such, are not relevant to the GQMP.

**Table 3-1: Groundwater Analytical Results Summary Table – Final Sampling Round**

| Analyte (ug/L unless specified) | On-Site concentration Range (Aug 2017 – Oct – 2018) | Up-gradient Concentration Range | Down-gradient concentration Range | Analyte (ug/L unless specified) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Potable Water (desirable) | Water Based Recreation (primary contact) | Agriculture & Irrigation (Stock Watering) | Agriculture & Irrigation (irrigation) | Water dependent Ecosystems & Species (Marine 95% protection) | Buildings & Structures | Human Health – Vapour Intrusion | Site Specific RBCs (commercial/ industrial[2]) | Site Specific RBCs (residential) |
| Benzene | <1 - **1** | <1 | <1 | **1** | **1** | **1** | | 700 | - | 900 (HSL A &B)<br>5,000 (HSL D) | - | - |
| Chloroform | <1 -**504** | <1 | <1 - 3 | **250** | **250** | **250** | - | **400** | - | - | 380,000 | 26,000 |
| cis-1,2-dichloroethene (DCE) | <1 - **256** | <1 | <1 - 14 | **60** | **60** | **60** | - | **20** | -- | - | 35,000 | 2,000 |
| Dichloromethane | <2 - **9** | <2 | <2 | **4** | **4** | **4** | - | 1,000 | - | - | - | - |
| Trichloroethene (TCE) | <1 - **254** | <1 | <1 - **23** | **20** | **20** | **20** | - | 330 | - | - | 8,000 | 500 |
| Vinyl chloride | <0.2 – **1.9** | <0.2 | <0.2 – **5.7** | **0.3** | **0.3** | **0.3** | - | 100 | - | - | 4,000 | 200 |
| Trihalomethanes | <1 - **504** | <1 | <1 - 3 | **250** | **250** | **250** | - | - | - | - | - | - |
| Iron (mg/L) | <0.05 – **0.66** | 0.08 - **1.02** | <0.08 – **12.7** | **0.3** | **0.3** | **0.3** | **0.2** | - | - | - | - | - |
| Chloride (mg/L) | 31 - **786** | 33 - **315** | 30-244 | **250** | **250** | **250** | - | - | 6,000 | - | - | - |

| Analyte (ug/L unless specified) | On-Site concentration Range (Aug 2017 – Oct – 2018) | Up-gradient Concentration Range | Down-gradient concentration Range | Analyte (ug/L unless specified) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Potable Water (desirable) | Water Based Recreation (primary contact) | Agriculture & Irrigation (Stock Watering) | Agriculture & Irrigation (irrigation) | Water dependent Ecosystems & Species (Marine 95% protection) | Buildings & Structures | Human Health – Vapour Intrusion | Site Specific RBCs (commercial/ industrial[2]) | Site Specific RBCs (residential) |
| Sodium (mg/L) | 34 - **550** | 117 - **323** | 83 - **260** | **180** | **180** | **180** | - | - | | - | - | - |
| pH (pH units) | **5.62 – 10.65** | **5.36** – 6.76 | **5.56** – 6.71 | **6.5-8.5** | **6.5-8.5** | **6.5-8.5** | **6.0-8.5** | **6.0-8.5** | **>5.5** | | | |
| | | **Notes:**<br>1: On-site wells include MW21, MW36, MW37, MW45A and MW45B<br>2. Upgradient on and off-site wells include MW20, MW27, MW28 and MW56<br>3. Downgradient off-site wells include MW52, MW53, MW54 & MW55<br>4. Fluoride was only analysed in January 2018.<br>**Bold**: Indicates exceedance of the assessment criteria in on-site monitoring wells | | | | | | | | | | |

## 3.3. Contaminants of Concern

Site Sourced:

- Low detection levels Volatile Organic Compounds (VOCs). Although the VOC analytes is greater than those detected above the adopted criteria, it includes all VOCs for which there has previously been low levels of detection in groundwater.
    - 1,1,1-trichloroethane;
    - 1,1-dichloroethane;
    - 1,2-dichloroethane;
    - Carbon tetrachloride;
    - Chloroform;
    - trans-1,2-DCE;
    - Trichloroethene (TCE);
    - Dichloromethane
    - 1,1,2-trichloroethane;
    - 1,1-dichloroethene;
    - Trihalomethanes
    - Chlorobenzene;
    - cis-1,2-dichloroethene (cis-DCE);
    - Tetrachloroethene (PCE);
    - Vinyl chloride;

## 4. Groundwater Quality Restricted Use Zone

A remediation feasibility assessment was conducted by Resolve as part of the Detailed Site Investigation. All primary and secondary sources of contamination were removed from site. It was also noted that groundwater monitoring results were generally stable across the plume. It was found that the parent product of TCE was degrading to daughter products including DCE and VC. Furthermore, a potential secondary source of chlorinated hydrocarbons was detected in monitoring well MW55, located approximately 100m south- west of the site on Wanrua Street adjacent to commercial/ industrial properties.

Based on the outcome of the remediation feasibility assessment, even after active groundwater remediation, all potential candidate remediation technologies would have the high probability of leaving at least some low-level concentrations of chlorinated hydrocarbons, and therefore, it is unlikely that groundwater beneficial uses will be restored in a reduced timeframe with any degree of certainty.

Conducting active remediation works in an attempt to improved groundwater quality, when concentrations of chlorinated hydrocarbons are already below site-based RBCs and there is a low risk to off-site receptors, is not considered technically, logistically or financially practicable for the site. There would be no net-benefit to the site if active groundwater remediation was undertaken at the site.

Based on the outcome of the remediation feasibility assessment, Resolve considered that CUTEP had been achieved at the site and that the residual contamination evident at the site and offsite was not posing a risk to the identified potential sensitive receptors (on- and off-site). A CUTEP submission was prepared by the Environmental Auditor and presented to the EPA and a groundwater quality restricted use zone (GQRUZ) was proposed. The GQRUZ proposed extends across the entirety of the site, and across Hamlet Street to the west, and encompasses a number of commercial buildings to the west of the site.

The proposed GQRUZ extent is presented on **Figure 4**.

## 5. GQMP Monitoring Well Network

All on-site monitoring wells were decommissioned during development of the site The groundwater monitoring network for this GQMP includes:

- 7 off-site monitoring wells targeting the Sandringham Sands (MW23A, MW52 – MW56 & MW59)

The existing monitoring network is shown in **Table 5-1** and the location of existing monitoring wells is shown in **Figure 3**.

The rationale for each bore is as follows:

- MW23A – located south of the site to determine if there is a southerly component to the groundwater flow, to be monitored for water levels only.
- MW52 & MW53 – downgradient of the source area(s) to monitor plume stability within the Sandringham Sands aquifer
- MW54 - downgradient of the site to be monitored for water levels only to determine groundwater elevation contours.
- MW55 – downgradient of the source area(s) to monitor plume stability within the Sandringham Sands aquifer (i.e. vinyl chloride), noting that an additional source of PCE and TCE has been detected in this location from an off-site source.
- MW56 – upgradient of the site to be monitored for water levels only to determine groundwater elevation contours.
- MW59 – downgradient of the source area(s) to monitor plume stability in the deeper portion of the Sandringham Sands aquifer

**Table 5-1: Summary of Lot 1 Groundwater Monitoring Well Network**

| Well ID | Date Installed | Location/ rationale | Status | Total Depth (m) | Screened Interval | GW Level (mBTOC) 2012– 2018 | Geology of Screened Interval | TDS (mg/L) range |
|---|---|---|---|---|---|---|---|---|
| ***Off-Site – Sandringham Sands*** | | | | | | | | |
| MW23A | April 2018 | 14 Hamlet Street – south of the site | Existing | 11.5 | 8.5 - 11.5 | 9.48 – 9.63 | Clayey Sand | 611 - 634 |
| MW52 | May 2017 | 21 Hamlet Street – downgradient off-site | Existing | 17.0 | 14.0 - 17.0 | 10.00 - 10.15 | Clayey/silty sand | 592 - 988 |
| MW53 | May 2017 | 19 Hamlet Street – downgradient off-site | Existing | 17.0 | 14.0 - 17.0 | 9.91 - 10.06 | Clayey/silty sand | 200 - 312 |
| MW54 | March 2018 | 3 Wanrua Street – downgradient off-site | Existing | 17.0 | 14.0 - 17.0 | 9.92 - 10.06 | Sand | 274 - 546 |
| MW55 | March 2018 | 6 Wanrua Street – downgradient off-site | Existing | 17.0 | 14.0 - 17.0 | 9.12 - 9.26 | Sand | 358 - 969 |
| MW56 | October 2018 | Chandos St – East of site – upgradient of site | Existing | 12.66 | 10 - 13 | 11.08 | Clayey Sand | 1,021 |
| MW59 | April 2019 | Hamlet St, nested with MW52. Targeting deeper portion of the Sandringham Sandstone aquifer to delineate chloroform | Existing | 25.0 | 23.5 - 25 | 10.49 – 10.50 | Sandy Silt | 3,340 – 4,452 |

## 5.1. Inspection of Groundwater Well Integrity

An inspection and visual assessment of the integrity of the groundwater monitoring well network shall be conducted during each groundwater-monitoring event, with any repairs undertaken prior to commencement of subsequent events.

## 5.2. Damaged Groundwater Monitoring Wells

Should any of the wells in the current monitoring well network become damaged or unserviceable in any way, an appraisal is to be undertaken to determine the most appropriate action(s) which may include:

- Conduct repairs if damage is superficial;
- Complete appropriate decommissioning by a licensed driller if well is deemed to be no longer required or damaged beyond repair;
- Following decommissioning, remove the well from the monitoring well network if no replacement is considered required;
- Replace well to an equivalent depth, screen interval and construction design; or
- Replace well with one or more wells deemed to better meet assessment objectives.

Any replacement well(s) shall be installed by a licensed driller in accordance with the Water Act (1989) and shall comply with the Agriculture and Resource Management Council of Australia and New Zealand 1997 Minimum Construction Requirements for Water Bores in Australia. The well(s) location and measuring point level should be surveyed by a licensed surveyor, and the GQMP updated. The borehole log for any newly installed well(s) should be completed and form part of the reporting of the subsequent sampling event.

# 6. Assessment Methodology

All investigation works undertaken under this GQMP are to be conducted in general accordance with accepted industry standards and practices as defined in the following documents:

- Environment Protection Act 1970.
- Water Act 1989.
- Occupational Health and Safety Act 2004.
- Planning and Environment Act 1987
- Catchment and Land Protection Act 1994.
- State Environment Protection Policies (SEPPs), including:
    - SEPP (Waters)
    - SEPP (PMCL)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013) (NEPM 2013 Guidelines).
- EPA Victoria (Publication 669), Groundwater Sampling Guidelines, 2000.
- EPA Victoria Industrial Waste Resource Guidelines (IWRG701), Sampling and Analysis of Waters, Wastewaters, Soils and Waste, June 2009.
- EPA Victoria (Publication 840.2), The Clean Up and Management of Polluted Groundwater, 2016.
- EPA Victoria (Publication 759), Environmental auditor (contaminated land): Guidelines for issue of certificates and statements of environmental audit, 2014.

## 6.1. Frequency and Duration of Groundwater Monitoring Program

Groundwater monitoring will be implemented at the site over a three year program – with biannual monitoring. Given that monitoring during the 53X Audit was undertaken until June 2019, then the next biannual events should be in October 2019 and April 2020.

The frequency and duration of monitoring is subject to change/ review based on the trigger levels and contingency actions provided in **Section 9**.

Resolve estimate the cost of monitoring will be $ 18K/year.

## 6.2. Groundwater Sampling Procedure

Groundwater sampling will be completed using the low flow method. However, other sampling methodologies may be trialled with the aim of determining the most appropriate

sampling method for the site. Sampling methodologies to be trialled may include: passive (diffusion) samplers, snap-samplers and/or sleave samplers (such as HydraSleeve®). If a sampling method other than low flow (as described below) is to be adopted, a Standard Operating Procedure and justification for the method (including a comparison of analytical results) would be provided to the Environmental Auditor for review prior to adoption.

### 6.2.1. Low Flow Sampling Procedure

Prior to the commencement of sampling, an interface probe is to be used to gauge and record the water level and test for the presence of Non-Aqueous Phase Liquid (NAPL) (Light NAPL (LNAPL) at the water interface and dense (DNAPL) at the base of the well). The gauging data will be used in conjunction with the Map Grid Australia coordinated and the Australian Height Datum (AHD) survey data to assess the groundwater flow direction.

Groundwater sampling is to be conducted in accordance with EPA Victoria Publication 669 (2000) Groundwater Sampling Guidelines using a low flow sampling technique. Field parameters to be measured and recorded for inclusion in the groundwater monitoring report are:

- Temperature (°C);
- pH (units);
- Electrical conductivity (µS/cm);
- Dissolved oxygen (mg/L);
- Oxidation / reduction potential (mV); and
- Total dissolved solids (mg/L).

Groundwater samples to be obtained following stabilisation of field quality parameters. Once collected, samples shall be immediately placed in laboratory prepared bottles (specific to the analytes) and placed in a sealed cooler chilled with ice for transport to a National Association of Testing Authorities (NATA) accredited laboratory, accompanied by appropriate chain-of-custody documentation.

All waste groundwater generated during the groundwater sampling process is to be disposed from the site in accordance with current EPA Victoria guidelines.

Currently, a 1,000L Intermediate Bulk Container (IBC) is present within Lot 2 of the greater Nuplex Site for the purpose of containing purged groundwater for later disposal.

### 6.2.2. Sample Collection, Preservation and Storage

Groundwater samples will be collected in the bottles supplied by a National Association of Testing Authorities (NATA) accredited laboratory. The bottles will be placed in ice chests before

being transported to the laboratory along with the appropriately completed Chain of Custody (COC) documentation.

### 6.2.3. Groundwater Analytical Schedule

The groundwater samples collected from the monitoring well network during monitoring events will be analysed as follows:

- Low detection levels Volatile Organic Compounds (VOCs). Although the VOC analytes is greater than those detected above the adopted criteria, it includes all VOCs for which there has previously been low levels of detection in groundwater.
    - 1,1,1-trichloroethane;
    - 1,1-dichloroethane;
    - 1,2-dichloroethane;
    - Carbon tetrachloride;
    - Chloroform;
    - trans-1,2-DCE;
    - Trichloroethene (TCE);
    - Dichloromethane
    - 1,1,2-trichloroethane;
    - 1,1-dichloroethene;
    - Trihalomethanes
    - Chlorobenzene;
    - cis-1,2-dichloroethene (cis-DCE);
    - Tetrachloroethene (PCE);
    - Vinyl chloride;

The detection limit for vinyl chloride is 0.2µg/L with the remaining chlorinated hydrocarbons having a detection limit of 1µg/L.

# 7. Assessment Criteria

The framework for relevant beneficial uses and environmental values of groundwater to be protected within Victoria is set out in the State Environment Protection Policy (SEPP) – *Waters* (SEPP Waters, 2018). SEPP Waters identifies the beneficial uses of groundwater to be protected by the inherent capacity (e.g. total dissolved solid (TDS) concentration) of the water to support these specific uses.

These beneficial uses are based on the classification of groundwater into segments with segments being determined by groundwater quality based on measured total dissolved solids (TDS). The segments are defined in **Table 7-1** below.

**Table 7-1: Groundwater Segments of TDS Ranges**

| Segment | A1 | A2 | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| TDS Range (mg/L) | 0-600 | 601-1,200 | 1,201-3,100 | 3,101-5,400 | 5,401 – | 7,100 – 10,000 | >10,000 |

Groundwater monitoring indicates that groundwater TDS from wells screened within the Sandringham Sandstone ranged from 87 to 3,262 mg/L. groundwater beneath the Site has been conservatively classified as Segment A1.

The significance of groundwater contamination in Victoria is assessed in terms of the beneficial uses of the groundwater. The beneficial uses to be protected under legislation for each groundwater segment as defined in the SEPP Waters are shown in **Table 7-2** below.

**Table 7-2: Protected Beneficial Uses of Groundwater Segments**

| Beneficial Uses | Segment (mg/L TDS) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A1 0-600 | A2 601-1,200 | B 1,201-3,100 | C 3,101-5,400 | D 5,400 – 7,100 | E 7,101 – 10,000 | F >10,000 |
| Water Dependent Ecosystems and Species | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Potable Water Supply | | | | | | | |
| Desirable | ✓ | | | | | | |
| Acceptable | | ✓ | | | | | |
| Potable Mineral Water | ✓ | ✓ | ✓ | ✓ | | | |
| Agriculture and irrigation (irrigation) | ✓ | ✓ | ✓ | | | | |
| Agriculture and irrigation (stock watering) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

| Beneficial Uses | Segment (mg/L TDS) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A1 0-600 | A2 601-1,200 | B 1,201-3,100 | C 3,101-5,400 | D 5,400 – 7,100 | E 7,101 – 10,000 | F >10,000 |
| Industrial and Commercial | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Water-based recreation (primary contact recreation) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Traditional Owner cultural values | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cultural and spiritual values | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Buildings and structures | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Geothermal properties | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

✓ Beneficial uses requiring protection for a nominated segment
Orange shading indicates segment relevant to the site based on reported TDS

The following beneficial uses are protected for Segment A1:

- Water dependent ecosystems and species
- Potable water supply (desirable)
- Potable mineral water supply
- Agriculture and irrigation (irrigation)
- Agriculture and irrigation (stock watering)
- Industrial and commercial
- Water-based recreation (primary contact recreation)
- Traditional Owner cultural values
- Cultural and spiritual values
- Buildings and Structures
- Geothermal properties

Groundwater contaminant concentrations were compared against criteria relevant for the beneficial uses protected for Segment A1 classified groundwater. These are:

### Water dependent ecosystems and species

Groundwater associated with the site is likely to discharge to Port Phillip Bay located approximately 2.8 km to the south-west of the Site. The water quality objectives (applied at

the point of discharge of groundwater to surface water) to protect beneficial uses shall be applied in following order of preference where available:

- ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Criteria for slightly to moderately disturbed marine water ecosystems (95% level of protection) were adopted for this assessment, high to low trigger values (in order of preference). Aquatic ecosystem criteria are generally applied at the point of discharge of the groundwater, however, these criteria are initially applied at the point of measurement (i.e. onsite) as a conservative screening method.
- Netherlands (2009) Groundwater Intervention Values
- US EPA (2003) Region 5 Ecological Screening Levels

For nitrogen species nitrate toxicity guidelines for the National Objectives Framework NIWA (2014) and the Canadian Water Quality Guidelines for the Protection of Aquatic Life/Agriculture - Freshwater (CCME 2007) were adopted.

### Potable Water Supply (desirable)

The primary source of criteria for the protection of the beneficial use of 'Potable Water Supply' is the Australian Drinking Water Guidelines (ADWG; NHMRC and NRMMC 2011, updated 2017). Where Australian Drinking Water Guidelines are not available, the hierarchy of documents containing national and international drinking water guideline values outlined within Section 6.5 of the 2017 ADWG were adopted.

### Potable Mineral Water Supply

The site is not located in a mineral spring district therefore the use of groundwater for potable mineral water supply is not relevant for this assessment.

### Agriculture and irrigation (irrigation)

The ANZECC/ARMCANZ) *National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) Irrigation Water Quality Guidelines*, Table 4.2.10: Irrigation Water Long-term Trigger Values for tolerance of up to 100 years irrigation, were used to assess this beneficial use.

### Agriculture and irrigation (stock watering)

The ANZECC/ARMCANZ) *National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) Livestock Water Quality Guidelines (Table 5.10)* were used to assess this beneficial use. Where no criteria are available for organics, the National Health and Medical Research Council and the National Resource

Management Ministerial Council (2011) National Water Quality Management Strategy - Australian Drinking Water Guidelines would be adopted as default.

### Industrial and Commercial

In the absence of industrial guidelines in ANZECC 2000, ARC Environmental adopted the industrial water uses defined in the ANZECC 1992 (Chapter 6 Industrial Water Quality) relevant to groundwater extractive use are generic processes (heating and cooling), textile industry, chemical and allied industry, food and beverage industry, iron and steel industry, tanning and leather industry, pulp and paper industry and the petroleum industry).

- Once through cooling and make-up water systems for fresh water: TDS <1000 and <500, respectively
- Textile industry: <100 mg/L
- Food and beverage industry: <850 mg/L
- Iron and steel industry: <1,000 mg/L
- Pulp and paper industry: <500 mg/L
- Petroleum industry: <750 mg/L

### Water-based recreation (primary contact recreation)

NHMRC (2008) Guidelines for Managing Risks in Recreational Water. Value adopted for health / aesthetics.

NHMRC (2018) National Water Quality Management Strategy – Australian Drinking Water Guidelines (ADWG), version 3.5. Value adopted for health / aesthetics.

### Traditional Owner cultural values

SEPP (Waters) does not provide any specific guidance or criteria for the protection of Traditional owner cultural values; however, the beneficial use for Traditional owner cultural values at the site is considered protected by consideration of other protected beneficial uses.

### Cultural and spiritual values

SEPP (Waters) does not provide any specific guidance or criteria for the protection of Cultural and spiritual values; however, the beneficial use for Cultural and spiritual values occurs at the point of discharge, Port Phillip Bay, located approximately 2.8km south west of the site. Therefore, the beneficial use of Cultural and spiritual values is considered protected by consideration of the protection of the beneficial use, water dependent ecosystems and species.

## Buildings and Structures

The Groundwater SEPP states that "introduced contaminants shall not cause groundwater to become corrosive to structures or building materials". Standards Australia AS2159-2009 *Piling – Design and Installation* (2009), provides exposure classifications for concrete and steel based on sulphate, chloride and pH values of groundwater.

## Geothermal properties

Groundwaters at the site do not exhibit the water quality (i.e. temperature) of geothermal waters, therefore the use of groundwaters for geothermal properties is not relevant for this assessment.

## Human Health

The groundwater concentrations were assessed against NEPM 2013 Health Screening Levels HSL A/B for sensitive uses (high density residential and other) and HSL D for commercial/industrial land use to assess the vapour inhalation exposure risk. The NEPM HSL D for commercial land uses has been adopted in the first instance for the proposed development.

In addition to the screening levels above, site-specific Risk Based Criteria (RBC) for groundwater COPCs were developed for the Site by EnRisks in March 2018. The slab on grade criteria are considered appropriate for the proposed development. A summary of the screening levels adopted is shown in **Table 7-3**.

**Table 7-3: Site-specific Groundwater Risk Based Criteria (mg/L)**

| Contaminant of Concern | Commercial/ Industrial RBC SL | | | | | Open Space RBC | Residential & RBC |
|---|---|---|---|---|---|---|---|
| | Slab on grade: warehouses | Slab on grade: multistorey offices | Commercial with 1 level basement carpark | Commercial with 2 level basement carpark | Commercial with 3 level basement carpark | | |
| Trichloroethene | 18 | 8 | 9 | 8 | 8 | S | 0.5 |
| Tetrachloroethene | 1,500 | 720 | 820 | 760 | 690 | S | 45 |
| Dichloroethene, 1,2-cis- | 110 | 37 | 42 | 39 | 35 | 7,600 | 2 |
| Dichloroethene, 1,2-trans- | 580 | 270 | 310 | 286 | 260 | S | 17 |
| Carbon Tetrachloride | 19 | 10 | 12 | 11 | 10 | S | 0.6 |

| Contaminant of Concern | Commercial/ Industrial RBC SL | | | | | Open Space RBC | Residential & RBC |
|---|---|---|---|---|---|---|---|
| | Slab on grade: warehouses | Slab on grade: multistorey offices | Commercial with 1 level basement carpark | Commercial with 2 level basement carpark | Commercial with 3 level basement carpark | | |
| Chloroform | 1,300 | 420 | 470 | 430 | 380 | S | 26 |
| Chlorobenzene | S | 3,500 | 3,900 | 3,600 | 3,200 | S | 220 |
| Dichloroethane, 1,1 | 2,100 | 830 | 940 | 870 | 790 | S | 53 |
| Dichloroethylene, 1,1 | 750 | 420 | 490 | 460 | 420 | S | 27 |
| Trichloroethane, 1,1,1 | S | S | S | S | S | S | 1,100 |
| Trichloroethane, 1,1,2 | 1,100 | 150 | 160 | 140 | 110 | S | 10 |
| Trichlorofluoromethane | 1,500 | 940 | 1,100 | 1,000 | 940 | S | 59 |
| Vinyl Chloride | 7 | 4 | 4 | 4 | 4 | 790 | 0.2 |
| Dichloroethane, 1,2 | 160 | 30 | 32 | 28 | 24 | 6,000 | 2 |
| S = derived RBC significantly exceeds the solubility of the VOC<br>Shading denotes adopted criteria | | | | | | | |

Within nested groundwater monitoring wells vapour intrusion screening levels are only applicable to the groundwater concentrations reported within the shallowest wells. Only the top of the water table is relevant for vapour intrusion as the vapours have to partition to air which occurs at the water and air (soil pore) interface.

# 8. Quality Assurance / Quality Control Procedure

A Quality Assurance / Quality Control (QA / QC) program in accordance with the above noted guidance documents and industry standards is to be adopted throughout the implementation of this GQMP. The quality control sampling program forms an essential part of determining the Data Quality Indicators (DQI's) of: acceptability; precision; representativeness; and comparability of data collected during the sampling program(s).

The following sections detail how the DQI requirements for the assessment are to be met:

## 8.1. Comparability

- All monitoring and sampling events are to be conducted by a suitably qualified and experienced person in accordance with Resolve's procedures and investigation methodology(s).
- Both primary and secondary analytical laboratories are to be NATA accredited for the testing employed and operate under documented procedures.
- All field data collection equipment (water quality meter, interface probe) are to be suitably calibrated, with in-date calibration certificates to be presented in reporting.

## 8.2. Precision

- Both primary and secondary analytical laboratories are to undertake internal QA / QC programs including internal laboratory duplicate testing, control spike recovery, matrix spike recovery and matrix spike duplicates to assess data precision.
- Laboratory analysis is to be completed to a precision such that all limits of reporting are below applicable assessment criteria.

## 8.3. Accuracy

- All field equipment is to be calibrated according to manufacture specification prior to use and checked periodically throughout operation for accuracy against calibration standards. Calibration certificates are to be provided in reports.
- Both primary and secondary analytical laboratories are to be NATA accredited for the testing employed and operate under documented procedures.
- Duplicate and triplicate sampling is to be conducted to allow comparison of variation in analytical results due to sampling methodology (duplicates) and laboratory methods (triplicate)

## 8.4. Representativeness

- All samples are to be placed into NATA-accredited laboratory supplied sample containers and stored on ice in a sealed cooler and transported to the laboratory within specified analyte holding times.
- All re-useable sampling equipment (e.g. interface probe, water quality meter and low flow pump) are to be decontaminated prior to and following use by washing items in a bucket of potable water containing Decon-90 solution, then an initial rinse in clean potable water and a final rinse in laboratory supplied de-ionised water.
- A rinsate sample is to be collected for each day of sampling (during which a piece of re-useable sampling equipment is used) to assess the effectiveness of the decontamination process.
- A Trip blank is to be collected and analysed during sampling to assess for potential cross contamination of primary samples during transport.

The frequency and analytes for QA / QC samples are provided in **Table 8-1** below.

**Table 8-1: Sampling and Analysis Quality Plan**

| Quality Control Sampling Program | | | | |
|---|---|---|---|---|
| **Sampling** | Duplicate | Triplicate | Rinsate | Trip Blank |
| **Sample Analysis** | As Per Primary Samples | | | TRH $C_6$-$C_{10}$ / BTEXN / VOCs |
| **Frequency Required** | 1:20 | 1:20 | 1 (Per Day of fieldwork) | 1 (Per Batch) |

# 9. Triggers/ Contingencies

Trigger levels have been defined as part of this GQMP to provide contingency actions where groundwater monitoring indicates the potential for an increase in risk to potential receptors. The trigger levels and relevant actions are summarised in **Table 9-1**.

The trigger levels that should be adopted for the GQMP are outlined in the following table and specify a concentration of contaminants that would be unacceptable at a critical location. Should the trigger conditions be exceeded, the site owner and Environmental Auditor are to be notified and, following approval from the Environmental Auditor, a contingency plan comprising the following will be initiated.

**Table 9-1: Trigger Levels and Actions**

| Location | Trigger | Assessing Trends | Action |
|---|---|---|---|
| All monitoring wells | -Increasing concentrations of chlorinated hydrocarbons (except VC) in wells MW52, MW53 and MW59)<br>-Increasing trends of VC in MW55<br>Increasing concentrations of VC in MW53 along with an observed southerly groundwater flow direction<br>-Concentrations exceed vapour risk criteria (TBC)<br>-NAPL detected | Historical monitoring data to be compiled and provided.<br>Production of trend graphs.<br>The use of Mann-Kendall analysis to be used once sufficient data is obtained (i.e. greater than or equal to 6 monitoring events).<br>The presence of a measurable thickness in DNAPL in any of the monitoring wells, or where groundwater concentrations are indicative of DNAPL. | Notify the Auditor<br>Assess significance of upward trend (rate and risk). If not significant, no further action required with the exception of ongoing monitoring.<br>Notify the site owner and affected stakeholders<br>Re-assess the risks to groundwater beneficial uses and sensitive receptors<br>Re-assess the suitability of the monitoring and management plan for the site<br>Consider the possibility of new sources<br>Consider undertaking further investigative works to refine the conceptual model and quantify the risks to receptors.<br>Consider further dissolved phase plume delineation.<br>Consider the implications of the increasing trend on the conceptual understanding of the plume.<br>Perform a subsequent monitoring event within 3 months.<br>Continue monitoring |

# 10. Reporting

## 10.1. Monitoring Round Reporting

A brief summary letter is to be provided by the Environmental Consultant to the site owner at the completion of each round of groundwater monitoring. The letter report should include the following information:

- Scope of work conducted.
- The sampling and analytical methods adopted.
- Tabulated summaries of gauging data and field parameter measurements.
- Tabulated analytical results, including quality control results.
- Comparison of results to trigger levels.
- An assessment of data quality including an evaluation of quality assurance and quality control elements against compliance criteria, indication of potential quality issues and details of corrective action taken.
- An assessment of trend in groundwater concentrations for the contaminants of concern using Mann-Kendall statistical analysis.
- Groundwater contour plan indicating the inferred groundwater flow direction of the well network.
- Purging and sampling field logs.
- Equipment calibration documentation.
- Laboratory certificates of analysis, including confirmation of NATA accreditation of the analytical methods used.
- Chain of custody documentation.
- Recommendations or further action in accordance with the GQMP.

## 10.2. Detailed Review of the Monitoring Program

Upon completion of the three year monitoring program, a detailed groundwater monitoring report will be prepared by the Environmental Consultant, including interpretation of the data collected, to assess whether termination of the monitoring program is feasible. This report should consist of information obtained throughout the duration of the monitoring program and should include:

- Introduction and background.
- Objective.

- Scope of works and methodology.
- Tabulated analytical results and field parameters.
- Tabulated gauging data for each monitoring round.
- Assessment of analytical results against trigger levels.
- Discussion of quality assurance program.
- Concluding statement and recommendations.

Additional information should be appended to the report, including:

- Groundwater contour plans for each monitoring round.
- Purging and sampling field logs.
- Equipment calibration documentation.
- NATA certified analytical results.
- Chain of custody documentation.

An electronic database of analytical results in a reproducible format will be retained by the Environmental Consultant and provided to the Environmental Auditor to assist with data management and interpretation.

## 10.3. Environmental Auditor Review

An Environmental Auditor is required to review results following each year of monitoring via an annual summary report from the Environmental Auditor to the client.

A more detailed review by an Environmental Auditor and discussions with the EPA will be held following Year 3 to determine the necessity of continuing the GQMP at the site (provide that no significant increases in contaminant concentrations or breaches of trigger levels have been reported during the three-year monitoring schedule).

Discussions should be held periodically with the Environmental Auditor and the EOA regarding the results of the groundwater monitoring program.

## 11. Review and Cessation of the Plan

To evaluate the progress of the GQMP, the following will be considered as part of the review:

- If any trigger levels are exceeded, the data should be submitted to the appointed Environmental Auditor to assess whether changes to the GQMP are required, and if changes are required, the GQMP will be revised and submitted for approval to the Environmental Auditor.
- After completion of the monitoring program specified in this GQMP, the Environmental Auditor will review the data to assess if further monitoring and/or management is required or if the GQMP can cease. In accordance with current EPA advice, the mechanisms for cessation of groundwater monitoring and management shall be via verification from an Environmental Auditor that the residual risks to beneficial uses of groundwater no longer warrant monitoring and management.
- Following cessation of the GQMP activities, all wells shall be decommissioned in accordance with the *Water Act 1989*.

Furthermore, EPA Victoria may review the practicability of the CUTEP. EPA will review the Environmental Auditor's recommendation and provide feedback regarding the cessation of monitoring.

# 12. Limitations

Resolve Environmental Pty Ltd (Resolve) has prepared this GQMP in accordance with generally accepted industry practices and standards prevailing at the time this Report was prepared. In preparing this Report, Resolve has applied the level of care and degree of skill ordinarily exercised by reputable members of the Environmental Consulting Profession in the preparation of environmental assessment reports.

This Report has been prepared for the exclusive use by Chandos Group Pty Ltd and Mr Michael Seignior (EPA-Appointed Auditor) of BlueSphere. The Report is made without any warranty by Resolve either express or implied.

Any reliance on this Report either in whole or in part by any third party shall be at such third party's risk unless use is authorised in writing by Resolve. This Report shall only be represented in full and may not be used to support any objective other than the objectives stated in this Report.

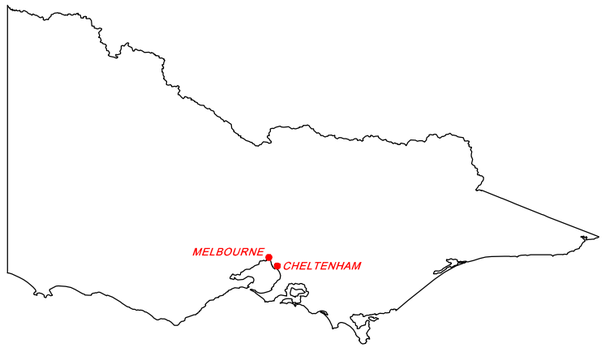
Findings, conclusions and recommendations contained in this Report are based on the assessment of geological, groundwater and chemical conditions encountered at the site at the time of investigation. Subsurface conditions including contaminant concentrations can vary significantly across a site and as such results and estimations expressed in this Report may not represent the extremes of conditions at the site.

Site conditions (including subsurface) may change over time and the conclusions in this Report, while accurate at the time of writing, may or may not be affected by such changes. Resolve confirms that Resolve takes no responsibility or liability for the accuracy or validity of third party information, reports, correspondence and/or data referred to in this Report.

This Report does not purport to provide legal advice.

# Appendix A - Figures

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NOT TO SCALE




SCALE 1:5000

0 125 250m

SCALE 1:5000

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Client: CHANDOS BAY PTY LTD

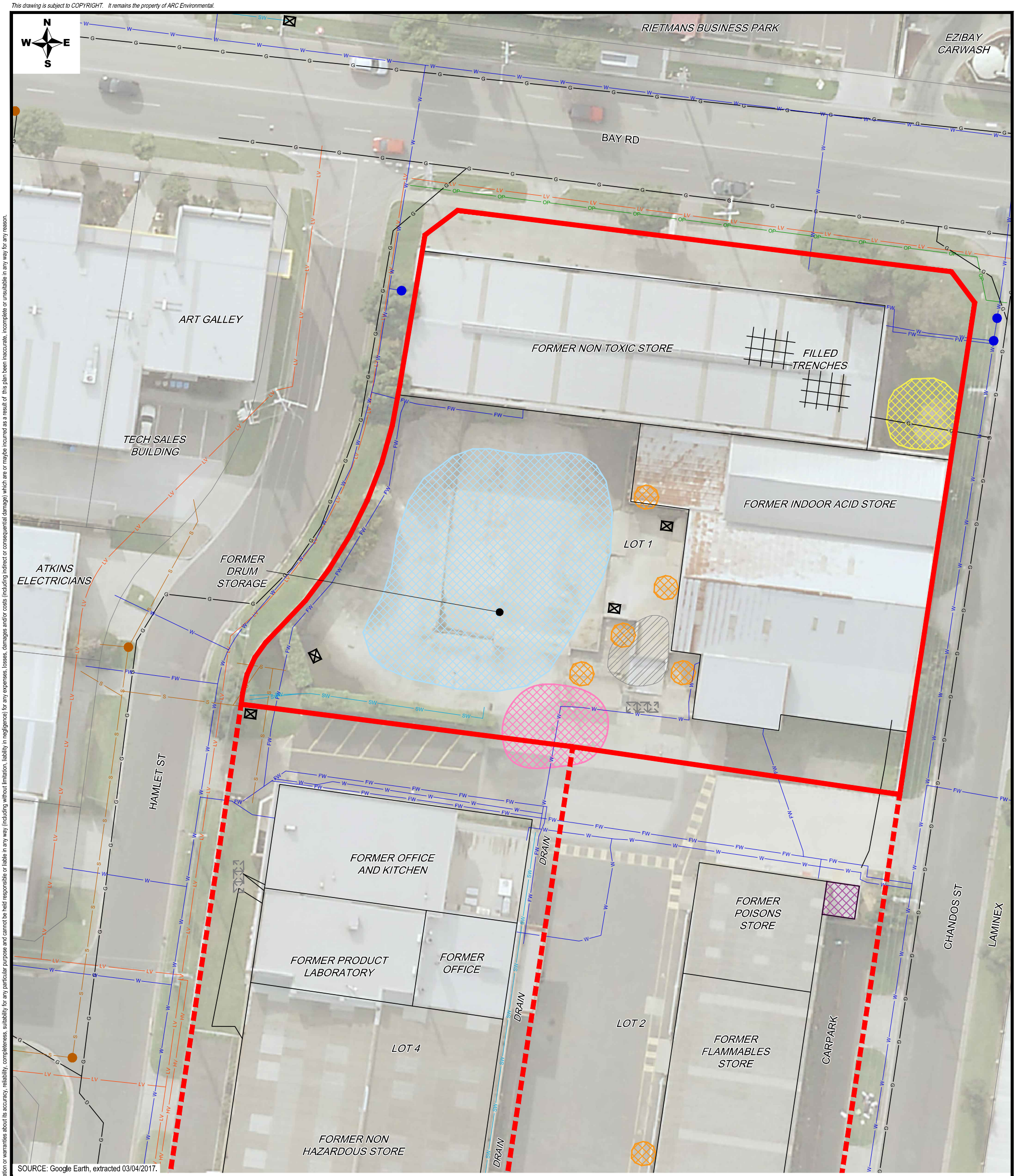
Project: GROUNDWATER QUALITY MANAGEMENT PLAN, LOT 1, 328 BAY ROAD, CHELTENHAM, VICTORIA

Title: SITE LOCATION PLAN

Drawn: BBL | Designed: SP | Date: 28/02/2019 | File No.: 1707054-Lot 1-GQMP-Figure 001 | Job No.: 1707054 | Figure: 001 | Rev. A

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SOURCE: Google Earth, extracted 03/04/2017.

**LEGEND**

- SITE BOUNDARY
- POSSIBLE STORAGE AREA FOR LEAKY DRUMS AND BOAT REPAIR
- POSSIBLE CHLOROFORM FLOCCULATION AREA
- YACHT WASH DOWN AREA
- FIRE WATER PUMP SHED/ FORMER SUBSTATION
- FORMER AST
- POSSIBLE FORMER LEAD ACID BATTERY DISPOSAL PIT
- FORMER TRIPLE INTERCEPTOR TRAP

**SERVICES LEGEND**

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

0 10 20m

SCALE 1:400

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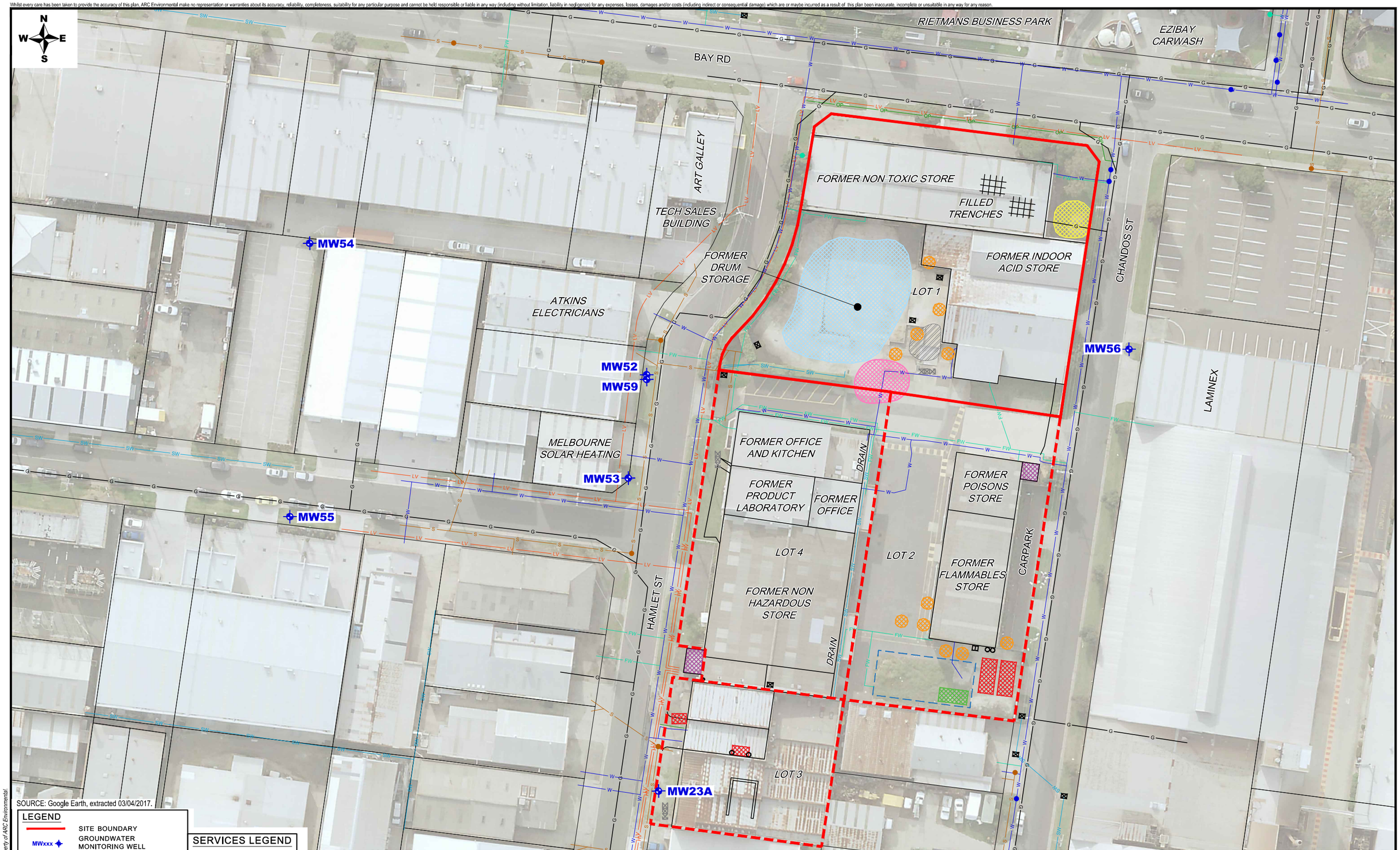
Client: CHANDOS BAY PTY LTD

Project: GROUNDWATER QUALITY MANAGEMENT PLAN, LOT 1, 328 BAY ROAD, CHELTENHAM, VICTORIA

Title: LAYOUT OF FORMER SITE

Drawn: BBL | Designed: SP | Date: 11/07/2019 | File No.: 1707054-Lot 1-GQMP-Figure 002 | Job No.: 1707054 | Figure: 002 | Rev. A

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SOURCE: Google Earth, extracted 03/04/2017.

LEGEND

- SITE BOUNDARY
- MWxxx GROUNDWATER MONITORING WELL
- POSSIBLE STORAGE AREA FOR LEAKY DRUMS AND BOAT REPAIR
- POSSIBLE CHLOROFORM FLOCCULATION AREA
- YACHT WASH DOWN AREA
- FIRE WATER PUMP SHED/ FORMER SUBSTATION
- FORMER AST
- POSSIBLE FORMER LEAD ACID BATTERY DISPOSAL PIT
- FORMER TRIPLE INTERCEPTOR TRAP

SERVICES LEGEND

- ELECTRIC LOW VOLTAGE
- ELECTRIC HIGH VOLTAGE
- OPTIC FIBRE
- FIRE WATER
- GAS
- SEWER
- STORMWATER
- DRAIN
- WATER
- UNKNOWN

0 18.75 37.5m

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Project: GROUNDWATER QUALITY MANAGEMENT PLAN, LOT 1, 328 BAY ROAD, CHELTENHAM, VICTORIA

Title: EXISTING WELL NETWORK

| Drawn: BBL | Designed: SP | Date: 17/10/2019 | File No.: 1707054-Lot 1-GQMP-Figure 003 | Job No.: 1707054 | Figure: 003 | Rev. A |
|---|---|---|---|---|---|---|




## Legend

- Site Boundary
- VicMap Parcel Boundary
- Road
- Current Chlorinated Hydrocarbon Plume
- Proposed GQRUZ Extent

**SOURCE:** BLUESPHERE PROPOSED GQRUZ EXTENT 2019

0 8 16 24 32 40

N

IMAGE © NEARMAP
IMAGERY DATE 25/09/2019

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| A | FOR REPORT | CG | JM | JM | 15/10/19 |

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PROPOSED GQRUZ EXTENTS

GROUNDWATER QUALITY MANAGEMENT PLAN

LOT 1, 328 BAY ROAD, CHELTENHAM, VIC

PROJECT
P001070-001

FIGURE
4