
Construction Environmental Management Plan (CEMP)

Lot 20 Adelaide Street, Hazelmere WA

May 2026

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Report

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File:	PES25019
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Synopsis:	This Construction Environmental Management Plan (CEMP) has been developed for implementation during development activities at Lot 20 Adelaide Street, Hazelmere. This CEMP addressed potential risks which may arise during earthworks at a former landfill including potential latent discoveries of potential asbestos containing material (PACM). This document has been developed taking due cognisance of the Department of Health (DoH) 2021 <i>Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia</i> , the Department of Environment Regulation (DER) <i>Assessment and Management of Contaminated Sites</i> (2015), the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (the ASC NEPM 1999) regulatory framework and pertinent Australian New Zealand standards.

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1. Introduction

This Construction Environmental Management Plan (CEMP) has been developed for implementation during development works at Lot 20 Adelaide Street, Hazelmere (the Site). An overview of site works is provided in section 2.1 below.

This CEMP applies to all Head Civil Works Contractor personnel, subcontractors, consultants and visitors undertaking activities within the Stage 1 project footprint and must be implemented in conjunction all other applicable project procedures.

This document provides management procedures and controls which are to be implemented during all aspects of work related to the civil works associated with the development the Site. This document shall be administered to all personnel/teams involved in site works.

1.1 Objectives

The primary purpose of the CEMP is to demonstrate compliance with the RAP and specifically how contamination risks associated with the proposed earthworks activities will be effectively managed, monitored and reported on, with a focus on protecting the health and safety of workers, visitors and residents as well as the environment during site remediation activities.

1.2 Scope

The scope of works includes:

- Identifying and allocating roles and responsibilities to personnel involved in development works at the Site.
- Developing a method for the distribution, communication and review of this document.
- Providing a framework to ensure compliance with all statutory and regulatory requirements.
- Providing a handling procedure for potential latent discoveries.
- Providing a method for complaint and incident reporting and handling.

1.3 Document Control Procedure

This document is subject to a strict document control procedure to ensure that all holders have up to date versions. This version is designated Issue one (1) and future revisions, supplements and/or replacements shall be dated and numbered sequentially. Revised pages shall be removed but kept on file. Distribution and amendments shall be recorded in the tabulations provided on page three of this document.

The currency of this document remains valid until a practical completion certificate has been issued and until all obligations in terms of maintenance and/or other requirements have been fulfilled.

1.4 Implementation and Use

All Contractors (including sub-contractors) undertaking works at the site, will implement this CEMP. This document may be refined to include site-specific, activity-specific or task-specific information, but the overall concept cannot be changed. Where contractors and/or sub-contractors use their own documents, such documents will comply with this CEMP, address the environmental issues raised in this document as a minimum and be approved by the Site Manager prior to commencement of activities at the site.

1.5 Limitations and Justification

In accordance with Section 1.3 of the Department of Health (DoH) 2021 Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, the following provides a summary of the asbestos related experience of key project personnel.

Ryan Lawrence will be responsible for assisting with field work and reporting for all project elements, a CV is provided in Appendix A. Ryan has over eighteen years' experience in contaminated land assessment, management and remediation. Ryan is also a certified contaminated land specialist by the EIANZ and holds master's degrees in both Business Administration and Environmental Management.

2. Site Identification and General Information

The Site is located at Lot 20 Adelaide St, Hazelmere, Western Australia (Figure 1):

Lot on Plan: D076128 20.

Land ID Number: 1288710.

Area: 17.6814ha

The coordinates of the site boundaries appear in Table 1.

Table 1: Site Coordinates.

Site Corners	Easting (Latitude)	Northing (Longitude)
North	116°011938	31°926156
East	116°016659	31°927637
South	116°016348	31°930780
West	116°010629	31°928635

The environmental parameters in Table 2 were ascertained from earlier investigations.

Table 2: Site Details.

Aspect	Details
Topography	According to the DRAFT Thuroona RAP: "The topography of the site ranged between approximately 27 m and 37 m Australian Height Datum (mAHD) (NationalMap.gov.au). The western edges of site start at 27 mAHD, sloping gently upwards to 36 mAHD from the south-west to the south-east, and peaking around 36-37 mAHD in the northeastern sector. The topography sharply grades down from 36 to 30 mAHD from approximately the middle of the northern boundary towards the north-west."
Geology/Geotechnical	The dominant natural geological component of the Site is Bassendean Sand. Based on the Geological Survey of Western Australia (1986) <i>Perth, part sheets 2034 I and 2034 II, 1:50,000 Environmental Geology Series</i> map, surface geology of the site comprises of Quaternary aged Bassendean Sand, interfingering with the Guildford Clay. Drill logs from boreholes drilled as part of an <i>Initial Contamination Assessment of Inert Landfill</i> by Dames and Moore in 1992 confirmed that: - Sand occurs within 1.2 m or less of the surface towards the western and northern ends of the site and extends to depths of up to 12m in these areas; - Near the surface soils towards the southeastern end of the site are generally sandy clays and clayey sands underlain by sand.
Groundwater	Groundwater at the Site has been encountered between approximately 5 and 15 mBGL, although this is a consequence of the undulating Site surface and does not suggest a steep groundwater gradient. Shallow groundwater at the Site has been identified as the Superficial Swan and Leederville aquifers.
Acid Sulfate Soils (ASS)	The Acid Sulfate Soils (ASS) Risk Map (accessed 20 th September 2025) indicates that the site contains a low to moderate risk of containing acid sulfate soils.
Wetlands	The closest surface waterbody appears to be Helena River, almost 4 km to the east. However, groundwater flow has been measured to be to the north-northwest (Abacus Environmental 2025).
Based on the data obtained from earlier site investigations (Abacus Environmental 2025, Parsons Brinckerhoff (2006) and Thuroona Services c (2024).	

2.1 Overview of Stage 1 Works

Stage 1 works covered by this CEMP comprise the physical rehabilitation of the Site to deliver a level, trafficable platform suitable for future development and to establish the basis of the engineered separation between buried waste and future receptors full details of site works are available in the RAP (Abacus Environmental 2025) with site actions shown in Figure 1.

Stage 1 works include:

- Site establishment, including fencing upgrades, signage, security, laydown and amenities.
- Removal of all structures on site and clearance of green waste across the residential strip to allow soils to be assessed visually.
- Construction of a temporary sand bund and/or swale along Adelaide Street using validated clean sand to provide noise, dust and visual screening for nearby residents.
- Excavation and re-use of natural sand from designated areas of the Site to support bund construction, capping and formation of the future residential strip.
- Cut-and-fill regrading of the former landfill surface to achieve design levels, while minimising unnecessary disturbance of waste materials.
- Placement of a cobble and gravel layer above residual waste, followed by installation of a geofabric or similar marker layer and subsequent placement of a verified clean cap across the commercial/industrial footprint.
- Bulk earthworks to establish the Adelaide Street residential strip and interim drainage/swale works at the interface between the residential and commercial areas.
- Temporary stockpiling, sorting and handling of materials, and off-site disposal of unsuitable or contaminated materials to appropriately licensed facilities.

The detailed methodology and staging for these activities are set out in the RAP (Remediation Action Plan) (Abacus Environmental 2025). This CEMP focuses on the environmental controls, monitoring, supervision and reporting required to complete the Stage 1 works safely and in accordance with regulatory and auditor requirements.

2.2 Overview of Stage 2 Works

Stage 2 works which are outside the scope of this CEMP and to be completed post completion of Stage 1 works and the associated MAR. The Stage 2 works include the additional testing (soil, groundwater and landfill gas) will be required to specifically demonstrate site suitability for development (proposed reclassifications) which will be detailed in another MAR submitted to the auditor for review and endorsement by the regulators.

2.3 Compliance and Auditability

This CEMP is structured to provide clear, auditable evidence that Stage 1 earthworks are being conducted in accordance with the RAP (Abacus Environmental 2025), IMAR (Interim Mandatory Auditor's Report) (Australian Environmental Auditors 2025), relevant legislation and approval conditions. Environmental controls, monitoring programs, inspection frequencies and reporting arrangements are

designed to:

- Demonstrate that contamination and exposure related risks are being effectively managed during Stage 1 works.
- Provide sufficient data and documentation for the auditor to verify compliance and support preparation of the final MAR (Mandatory Auditors Report).
- Facilitate transparent communication with DWER, DoH, local government and the community on the environmental performance of the project.

3. Roles Responsibilities and Communication

The Stage 1 works at Lot 20 Adelaide Street will be delivered by an integrated project team comprising the Head Civil Works Contractor (principal contractor), Environmental Contractor, the contaminated sites auditor, the client/landowner, specialist Community Engagement Consultant and other technical consultants as required.

The Head Civil Works Contractor has overall responsibility for planning and executing the physical works in accordance with this CEMP, the RAP and all relevant approvals overseen by the project director. The Environmental Contractor is responsible for independent environmental supervision, monitoring and reporting, and for providing technical advice to the Head Civil Works Contractor and the auditor on environmental performance and compliance.

The following key roles have been identified for the implementation of this CEMP, the Site Manager (Head Civil Works Contractor), Project Manager, Environmental Consultant, Site Auditor, Community Engagement Consultant and Site Workers.

Prior to the commencement of all stages of development works, a start-up meeting should be coordinated by the project director and this documents distributed to all site personnel. Site personnel are to review the below information and ensure they have a clear understanding of their role and associated responsibilities.

All personnel (including Contractors and Sub-Contractors) shall endeavour to minimise disruption to the existing surrounding environment and local neighbouring residences. Site management shall through the community engagement consultant liaise with Regulators, the Environmental Consultant and residents of surrounding residential properties frequently, pertaining to any requirements they may have for the duration of works and shall take the necessary steps to ensure that neighbouring operations/activities continue uninhibitedly.

A full communications chart, a table of responsibilities and an inspection regime is provided in Appendix B.

On becoming aware of an environmental incident, the site manager is to notify the environmental consultant who will then brief the project director. Following consultation initial actions will be enacted to limit the extent of the incident. If required, the environmental auditor will be notified immediately who will liaise with the relevant regulators, otherwise the incident will be detailed within the monthly report.

3.1 Project Director (Robert Moltoni – Moltoni Group)

The project manager will be responsible for:

- Ensuring all licences and regulatory approval are received and complied with.
- Review of the implementation of the CEMP and RAP.
- Ensuring that the management procedures identified in the CEMP/RAP are carried out and complied with.
- Conducting periodic inspections.

- Ensuring communication pathways are utilised and are appropriate.
- Liaising with the environmental auditor.
- Reviewing weekly, monthly and quarterly reports provided by the environmental consultant along with final reporting.

3.2 Site Manager (Head Civil Works Contractor - Ross Varnavides - EMVEE)

The Site Manager is responsible for all on-site operations including:

- Conferring daily (in person or by phone) during active works to review planned activities, monitoring requirements and any constraints or issues.
- Administering this CEMP to all site personnel (including sub-contractors).
- Overall implementation of the CEMP and RAP.
- Integrating the requirements of this CEMP into the project WHS and quality systems.
- Implementing best practise physical controls for dust, noise, vibration, contamination, stormwater, waste and asbestos.
- Compliance with all aspects of this CEMP.
- Maintaining site records including, incident reports, latent discoveries, complaints, and non-conformances (if required).
- Ensuring all Site Workers are appropriately qualified, experienced and trained to undertake their respective role in relation to development works.
- Undertaking regular inspections to ensure ongoing compliance with this CEMP.
- Safety of all personnel on site.
- Ensuring that the management procedures identified in the CEMP are carried out and complied with.
- Implementing environmental incident and complaints handling procedures.
- Conducting periodic inspection/review of all personnel.
- Identifying and correcting non-conformances with the CEMP.
- Undertaking site actions, as detailed by the environmental consultant, to protect the environment and to minimise and/or rectify any environmental damage/incident.
- Ensuring all pertinent OH&S regulations and standards are implemented and upheld.
- Ensuring all licences and regulatory approval are received and complied with.

The role of Site Manager may be delegated to other person as long as said person has a thorough understanding of the potential environmental impacts associated with the development activities and authority to order changes to work practices and stop work if necessary.

3.3 Environmental Consultant (Pendragon Environmental Solutions)

Pendragon Environmental Solutions will be responsible for supplying a suitably qualified and experienced Environmental Consultant in accordance with Section 1.5. The Environmental Consultant will be responsible for:

- Developing this CEMP.
- Regular liaison with the site auditor and with regulatory representatives as requested.
- Providing independent environmental supervision and monitoring, including routine site inspections and attendance during high-risk activities such as asbestos handling and cap placement.
- Preparing written inspection notes and monitoring summaries, and compile these into monthly and quarterly environmental performance reports for the client, auditor and Head Civil Works Contractor Project Manager.
- Reviewing contractor records and advising the auditor, client and Head Civil Works Contractor on compliance and any required improvements.
- Designing and implementing monitoring and sampling programs for dust, airborne asbestos fibres, groundwater and landfill gas, consistent with the RAP, SAQP, IMAR and auditor's guidance.
- Designing and implementing soil assessments through an auditor approved SAQP (PES2026, Appendix F) to validate excavations into 'clean sand' across the residential strip and for capping material to be used.
- Undertaking random and regular inspections to ensure ongoing compliance with this CEMP and issuing non-conformance notices as necessary to the site manager.
- Directing actions, as required, to protect the environment and to minimise and/or rectify any environmental damage/incident.
- Reviewing this CEMP upon request from the Site Manager.
- Assessing and providing comment on information/documentation received from the Site Manager as required.
- Assessing and provide direction regarding latent discoveries (as required by the Site Manager).
- Revision of this CEMP, periodically and/or as required.

3.4 Site Auditor (Australian Environmental Auditors)

Australian Environmental Auditors (Charlie Barber) have been appointed as the mandatory accredited contaminated sites auditor pursuant to the Contaminated Sites Act 2003 and Contaminated Sites Regulations 2006 administered by the Department of Water and Environmental Regulation (DWER) in Western Australia. The Auditor will be responsible for:

- Reviewing and endorses this CEMP and any subsequent revisions relevant to contaminated sites management.
- Receiving and evaluates monitoring and validation data generated during Stage 1, and provides advice on compliance with the RAP, IMAR and contaminated sites guidelines.
- Preparing the Final Mandatory Auditor's Report following completion of Stage 1 works and subsequent monitoring.

- Being the primary technical contact with DWER and DoH on contaminated site matters, with the client responsible for formal submissions. Significant incidents or exceedances will be notified in accordance with regulatory requirements.

3.5 Community Engagement Consultant (361)

Environmental performance information relevant to the community (for example, dust and noise monitoring summaries, high-impact work notifications and complaint responses) will be channelled through the Community Engagement Consultant in line with the Project Communications Management Plan.

3.6 Site Workers (supervisors, operators and subcontractors)

It is the responsibility of site personnel involved in any element of work at the Site to:

- Comply with this CEMP, the project WHS Management Plan and task-specific SWMS.
- Attend inductions and toolbox talks and follow instructions regarding contamination controls, PPE, access restrictions and emergency procedures.
- Immediately report any environmental incidents, near misses, complaints or unexpected finds to their supervisor.

Communication of events and incidents pertaining to site works is the responsibility of the Site Manager. In the event of an emergency, the relevant emergency service (if applicable) and Pendragon Environmental Solutions should be notified as soon as practicable.

Table 3: Key Stakeholder Contact Details.

Role	Name	Company	Contact Details
Project Director	Robert Moltoni	Moltoni Group	rmoltoni@moltoni.com.au 0411 647 876
Site Manager (Head Civil Works Contractor)	Ross Varnavides	EMVEE Pty Ltd	rv@emveegroup.com.au 0447666482
Environmental Consultant	Ryan Lawrence	Pendragon Environmental Solutions	ryan@pendragonenvironmental.com 0430310085
Site Auditor	Charlie Barber	Australian Environmental Auditors	cbarber@envaud.com.au 03 8542 7500
Community Engagement Consultant	Jamie Robertson	361	jamie.robertson@361degrees.com.au 08 9467 3689

4. Training and Awareness

Construction Safety Awareness Training is mandatory in Western Australia (effective 1 January 2007). The requirements for site personnel to be trained is detailed in the Occupational Safety and Health Act 1984, together with the Occupational Safety and Health Regulations 1996 (Regulation 1.3). Such training is not designed to take the place of work site or task specific instruction, training or supervision but rather training to provide all site works and regular visitors with basic knowledge of the hazards associated with site work (Department of Consumer and Employment Protection, 2005).

Site induction training managed by the site manager during which all personnel engaged in site work shall be made aware of the provisions of this document to promote a general awareness of the environment and to manage and minimise any potential impact and/or disturbance to the environment, shall be mandatory. Refreshers are to be provided for during scheduled site meetings. Training is to be included as a standard item on such agendas.

Whilst training requirements, content and schedules, including the most appropriate methods of achieving the aims and objectives of this document (dependant on site activities, staff structures and scheduled meetings), may only be developed upon award of contracts for site works, the following shall be regarded as a minimum prior to commencement of work:

- The role of the CEMP in managing and mitigating environmental impacts with a particular focus on potential contaminants and asbestos containing materials.
- The roles and responsibilities of all site personnel as they relate to the environment.
- Personal responsibilities for environmental management.
- The impact of this CEMP on work methods.

Evidence of training shall be maintained on project records.

5. Environmental Risk Assessment

5.1 Approach

Environmental risks associated with Stage 1 earthworks at Lot 20 Adelaide Street have been assessed by identifying project activities, associated environmental aspects, potential impacts and receptors, and then assigning inherent and residual risk ratings with reference to the RAP, IMAR and relevant WA guidance. The focus is on contamination related risks (e.g. asbestos, contaminated soil/fill, LFG and groundwater) and on secondary construction impacts such as dust, noise, vibration, stormwater, traffic and community amenity.

5.2 Key risks and receptors

The principal environmental and health risks for Stage 1 include:

- Asbestos and contaminated soil exposure.
 - Disturbance of asbestos-containing material (ACM) and other contaminated soils during excavation, cut and fill and stockpiling.
 - Potential for airborne fibre generation, worker exposure and off-site migration of contaminated dust to nearby residences and roads.
- Dust, LFG and odour.
 - Generation of nuisance dust and contaminated particulates from earthworks, stockpiles, traffic on unsealed surfaces and windy conditions.
 - Potential odour release from isolated hydrocarbon-impacted soils or other unexpected materials.
 - LFG release from disturbed soils.
- Noise and vibration.
 - Elevated noise and vibration from heavy plant, vehicle movements and compaction, affecting nearby residents and sensitive receptors.
- Surface water, stormwater and sediment
 - Erosion and sediment transport from disturbed surfaces and stockpiles, with potential for off-site discharge to road drains or adjacent properties.
 - Mobilisation of contaminated sediments if water is not appropriately contained and managed.
- Groundwater.
 - Using impacted groundwater for dust suppression.
 - Potential for earthworks and groundwater abstraction to alter infiltration patterns or pathways, although these risks are assessed as low for Stage 1 given works occur well above the water table.
 - Need to establish baseline groundwater conditions and to generate a database of conditions.
- Traffic, access and community amenity
 - Increased heavy vehicle movements, changes to local traffic patterns and temporary reductions in visual amenity during bund and earthworks construction.
 - Community concern or loss of confidence if environmental controls and communication are perceived as inadequate.
- Unexpected finds
 - Discovery of previously unidentified/unexpected contamination, waste types or archaeological/heritage items during excavation.

Sensitive receptors include on-site workers, residents along Adelaide Street and within Jacaranda Springs, nearby commercial/industrial premises, local road users and the surrounding environment (air, soil, surface water and groundwater).

6. Construction Environmental Management

The following procedures have been designed to mitigate potential aesthetic/nuisance issues which may arise as a result of works.

6.1 Environmental Incidents and Latent Discoveries (Contamination and Asbestos)

Based on previous works and an understanding of what can be present within landfills there is potential that instances of potential asbestos containing material (PACM), mechanical items, containers (drums, tanks, cans, bottles), medicinal waste and odorous/discooured soils can be encountered.

Should an environmental incident or latent discovery occur during the course of site works, that through its novelty, visual condition, surrounding conditions (staining or liquids) or odour could reasonably be expected to present a risk to workers, surrounding receptors during work, or future receptors the Site Workers shall immediately stop work and notify the Site Manager. The Site Manager shall take prompt and immediate action to minimise any impact and where necessary, liaise with the Environmental Consultant who will detail the issue to the auditor, if necessary, who may escalate to regulators as required. Latent discoveries shall be handled strictly in accordance with the below.

Details of environmental incidents/latent discoveries shall be recorded on an *Incident Report Form* (Appendix C). Corrective actions may be agreed upon between the Site Manager, Pendragon Environmental Solutions, and/or the auditor and relevant authority, dependent upon the severity of the non-conformance, incident, and/or discovery. Preventative measures shall be subject to monitoring and review and included in the monthly, quarterly and final reporting.

The areas of latent discoveries will be cordoned off and a sign posted to prevent disturbance and potential further distribution. Where action can be taken to prevent further environmental impact in a safe and practical manner, it should be done so.

The Site Manager should assess and address latent discoveries on a case-by-case basis. Where appropriate to do so, latent discoveries of PACM should be treated in accordance with measures specified in Table 6.1, by an appropriately qualified and experienced contractor.

Table 6.1: General Contamination Management Conditions.

Issue:	Contamination and Health Risk
Objectives:	To minimise health and environmental impacts during the removal of asbestos containing materials.
General Conditions:	Ensure that all site workers are aware of commitments and specific directives, use/wear of Personal Protective Equipment (PPE), Site Safety Rules, Identification and the safe handling/disposal of identified PACM. Daily pre-start atmospheric landfill gas assessments will be undertaken in excavation/disturbed areas as detailed in the SAQP (PES2026) Appendix F. Works disturbing asbestos should not be undertaken during period of high wind or dust creation. Water to be used liberally to keep material being disturbed wetted to minimise dust creation. Internal tracks to be kept wetted when in use.

Issue:	Contamination and Health Risk
	Vehicle movements limited where possible and kept to <10km/hr. Ensure all site workers have been administered a copy of this document and are fully briefed. In the event of a PACM discovery, works shall cease, access to the area be restricted, photographs taken, the Site Manager notified, and an incident report completed The Site Manager shall liaise with the Environmental Consultant to determine an appropriate course of action. Validation sampling to be undertaken by Pendragon Environmental of capping sand, the base of residential strip excavation and latent discoveries in line with an approved SAQP (PES2026) Appendix F. Where required, removal of hazardous materials, shall be undertaken by an appropriately trained and licensed contractor in strict accordance with the National Occupational Health and Safety and Department of Health WA Guidelines. At no times must PACM fragments be damaged or broken. Air monitoring for asbestos fibres will be undertaken as detailed in the SAQP (PES2026) Appendix F. Landfill gas monitoring will be undertaken as detailed in the SAQP (PES2026) Appendix F.
Performance Indicators:	No non-conformance notices issued.
Responsibility:	Site Manager supported by Pendragon Environmental Solutions with technical advice and monitoring/testing.
Critical Dates:	Prior to commencement of employment safety induction (to include training, awareness of commitments and specific directives regarding in-situ asbestos). Inspections undertaken by the Site Manager and Environmental Consultant during and immediately following works.
Monitoring:	Compliance inspections undertaken daily by the Site Manager and Pendragon Environmental Solutions. Air quality monitoring for dust (throughout) and asbestos fibres (during uncontrolled fill disturbance) to be undertaken by Pendragon Environmental Solutions with details in the SAQP (PES2026) Appendix F. Groundwater quality of water to be used for dust suppression will be undertaken monthly and groundwater network around site quarterly in line with the SAQP (PES2026) Appendix F. LFG sampling will be undertaken at existing on/off site bores (monthly), around current excavations/trenches (weekly) and in active disturbed areas (daily) to be undertaken with details in the SAQP (PES2026) Appendix F. Daily prestart atmospheric checks where soil is being disturbed. Weekly monitoring will be undertaken using a grid system across the working exposed areas with samples taken continuously on transects spaced 10 m apart extending 5m outside the exposed areas and recorded on the field sheet. Monthly monitoring of LFG we would use the existing network of bores above in-situ landfill (bores LFG01, LFG02, LFG03, LFG05, LFG06 and LFG08) to assess gas conditions. All results will be recorded on the monthly field sheet (PES 2026, CEMP). Quarterly monitoring of LFG will be undertaken using the existing network of onsite and offsite bores to assess gas conditions. All results will be recorded on the quarterly field sheet.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month. Quarterly reporting to the auditor and project director will be undertaken containing monthly results from the previous quarter and commenting on trends and findings.
Response:	Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators.

Issue:	Contamination and Health Risk
Corrective Action:	Immediately invoke safety and precautionary measures and impact assessment. Observations and monitoring data shall be used to guide implementation of additional measures, if and when required. Corrective actions will be developed by the Site Manager in consultation with Pendragon Environmental Solutions on a case by case basis.

6.2 Environmental Management Strategies

Table 6.2: Dust Control.

Issue:	Dust during civil works impacting on site workers, traffic, surrounding businesses and the environment.
Objectives:	Take all reasonable and appropriate precautionary measures to manage, control, minimise or avoid dust generation.
Management Procedure:	All Site Workers are to wear appropriate PPE. If dust generating activities are taking place, the work areas/material is to be dampened with water spray/mist, at the discretion of the Site Manager. Internal tracks to be kept wetted when in use. Trucks moving material internally to utilise covers. Vehicle movements limited where possible and kept to <10km/hr. Ensure that sediments are retained on site where possible with surrounding areas periodically cleaned by a vacuum truck should visible sediment outside the site boundary's. Ensure the boundary of the site is secured with a sediment fence/mesh (extended to 3m high along Adelaide street) and regularly assed for suitability and cleared of accumulated debris. Works generating excessive dust should be scheduled to avoid times of high wind. In keeping with good housekeeping practices, work areas within the site shall be cleaned regularly to minimise nuisance by way of rising dust. Other dust minimisation measures detailed in the RAP (Abacus 2025) include creation of the 4m high swale between site remediation works and local residents. Dust monitoring will be undertaken which will alert the site manager and Pendragon Environmental Solutions should dust generation exceed prescribed average concentrations. Should an exceedance alert be received, work will be instructed to stop whilst the cause of the exceedance is determined. The site manager is to then amend working practises to minimise further dust generation.
Performance Indicators:	Visual dust generation. Complaints pertaining to dust. Recorded exceedances by the dust monitoring network.
Responsibility:	Site Manager.
Critical Dates:	Through site works particularly earth moving works.
Monitoring:	Daily visual inspection undertaken by the Site Manager. Dust monitoring stations (6) are to be established and monitored by Pendragon Environmental Solutions (Figure 3) and as detailed in the SAQP (PES2026) Appendix F. Monitors will run 24 hours a day assessing PM10 concentrations. The trigger level of 50 µg/m3 will be initially used consistent with NEPM guidelines. A weather station will be set up at a single fixed location throughout to allow full assessment of results.
Response:	Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators. Site Manager to implement corrective action as required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month. Quarterly reporting to the auditor and project director will be undertaken containing monthly results from the previous quarter and commenting on trends and findings.
Corrective Action:	Cease dust generating works, change working strategy. Implement control measures to reduce dust (such as increased wetting or utilisation or an

	appropriate dust minimising additive such as DustMag™). Observations and complaints shall be used to guide implementation of additional measures, if and when required.
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Table 6.3: Vibration.

Issue:	Vibration from plant/equipment impacting on site workers and surrounding residents and environment.
Objectives:	Take all reasonable precautionary measures to minimise vibration from site works. The equipment used must be the dampened where possible to minimise vibrations. To ensure vibration management is in accordance with the provisions of Australian Standard AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.
Management Procedure:	Ensure that all site workers are aware of commitments. Consider equipment to be used to contemplate alternatives. Ensure each item of plant is fitted with vibration dampeners as applicable and in strict compliance with relevant industry standard. Manage use of plant or equipment and ensure workers are trained to manage the use of plant and equipment to minimise vibrations. Check plant/equipment making excessive vibrations to ensure its effective operation and state of repair. If required, the operator will be instructed to cease work until suitable repairs/replacement can be carried out; if found to be unsatisfactory then seek direction from the Site Manager. The operator will be issued with instructions based on the outcome of this direction, which may require the removal of the offending equipment from site.
Performance Indicators:	Vibration complaints. Dilapidation surveys of surrounding buildings if undertaken.
Responsibility:	Site Manager.
Critical Dates:	Prior to commencement of work safety inductions (to include training, awareness of commitments, directives, working hours, use of PPE and managing use of equipment).
Monitoring:	Daily inspections.
Response:	If any vibration complaints are received, the Civil Contractor will be responsible for working with Council, EPA and/or nearby residents or land users to address it.
Corrective Action:	Investigate incidents thoroughly with appropriate corrective and preventative actions. Ensure management measures are implemented and maintained. Observations and complaints shall be used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.4: Noise.

Issue:	Vibration from plant/equipment impacting on site workers and surrounding residents and environment.
Objectives:	Take all reasonable precautionary measures to minimise vibrations from site works. The equipment used must be the quietest reasonably available." To ensure noise impacts are minimized and managed appropriately. To ensure noise attenuation is in accordance with the provisions of Australian Standard AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.
Management Procedure:	Ensure that all site workers are aware of commitments and specific directives including the use/wear of PPE. All work should be carried out in a way that does not cause audible noise on a Sunday or public holiday at any time or on a Saturday or business day before 7:00am or after 7:00pm. Work outside of these hours should be carried out under the discretion of the Superintendent with written approval from the relevant local authority. Ensure each item of plant is fitted with noise suppression devices as applicable and in strict compliance with relevant industry standard. Manage use of plant or equipment making noise and ensure workers are trained to manage the use of plant and equipment to minimise noise. Check noise suppression system of any plant/equipment making noise beyond acceptable levels and ensure its effective operation and state of repair. If required, the operator will be instructed to cease work until suitable repairs can be carried out; if found to be unsatisfactory then seek direction from the Site Manager. The operator will be issued with instructions based on the outcome of this direction, which may require the removal of the offending equipment from site.
Performance Indicators:	Noise complaints.
Responsibility:	Site Manager.
Critical Dates:	Prior to commencement of work safety inductions (to include training, awareness of commitments, directives, working hours, use of PPE and managing use of equipment).
Monitoring:	Daily inspections and noise logger, if necessary.
Response:	If the controls do not reduce noise such that nearby receptors still raise complaints, it will be the responsibility of the Project Manager to engage a third-party with the qualifications and licenses necessary to conduct a noise survey. The third-party may advise additional controls such as attenuation barriers or insulation. It would be the Site Manager responsibility to implement any recommended additional controls. If noise cannot be controlled to the satisfaction of the nearby receptors, it will the responsibility of the Civil Contractor to adjust processes accordingly.
Corrective Action:	Investigate incidents thoroughly with appropriate corrective and preventative actions. Ensure management measures are implemented and maintained. Observations and complaints shall be used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.5: Storm Water, Sediment and Erosion Control.

Issue:	Runoff: stormwater management measures. Sediment and erosion control and stockpile management
Objectives:	To ensure the transportation and handling of materials are undertaken in a safe and environmentally responsible manner. Stormwater: To protect receiving natural waterways/waters and council drainage systems. To control storm runoff. To implement appropriate sediment and erosion controls and prevent sediment from being deposited on roads. Excavation and Stockpiling of Soil: Excavated soils are to be stockpiled in a way that will minimise dust creation and sediment laden run off.
Management Procedure:	Keep carriageways clean of any material carried onto the roadway by vehicles from the site. Undertake drainage in accordance with best practice, design guidelines, policies and standards and approved drainage report and plans. No discharge of water on site. Minimize the amount and time land is disturbed or cleared of vegetation. Should a stockpile be deemed to be potentially contaminated. Whilst testing is being undertaken until cleared all the material is to be contained within impermeable bunds to contain any water run-off prior to treatment or diversion. Maintain all water control structures to acceptable standards and inspect regularly, and specifically after rainfall events, for effectiveness. Undertake activity such that it will not interfere, alter or pollute any wetland, watercourse, surface water expression or groundwater, or alter water quality of such waters.
Performance Indicators:	No uncontrolled discharge from site.
Responsibility:	Site Manager.
Critical Dates:	For the entire duration of works.
Monitoring:	Daily inspections particularly after heavy rain/wind.
Response:	Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators.
Corrective Action:	Ensure management measures are maintained. Direct clean ups as and when required. Investigate incidents with appropriate corrective and preventative actions. Observations and complaints shall be used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.6: Traffic, Parking and Pedestrian Movement.

Issue:	Traffic/pedestrian/site safety.
Objectives:	To isolate construction activities/traffic from the general public/local traffic/pedestrian movement. To minimise congestion and build-up of construction traffic. To ensure debris is not distributed across roads. Zero accidents, incidents and/or complaints.
Management Procedure:	Personnel/construction workers/visitors shall only access site wearing appropriate protective personal equipment (PPE). Workers shall only access the Site having gained prior approval from the Site Manager. Site workers are to notify the Site Manager of dates/times they will be on-site. It is the responsibility of the Site Manager to ensure there are sufficient parking opportunities around the site which doesn't negatively impact surrounding residents. Adequate barriers and signs, indicating restricted areas and warning pedestrians/oncoming traffic, shall be provided to prevent unauthorised access to the site. Signage shall not be damaged, defaced, removed or altered in any way and shall be maintained properly. Signage shall only be removed by the Site Manager, following the completion of civil and revegetation works. Schedule trucks/delivers outside of main day care centre drop-off/pick-up hours.
Performance Indicators:	Accidents, incidents and/or complaints.
Responsibility:	Site workers are responsible for their own safety, use of appropriate PPE and reporting accidents/incidents to the Site Manager. The Site Manager is responsible for regulating and managing access to the Site.
Critical Dates:	Prior to commencement of work/construction safety induction (to include training, awareness of commitments, traffic conditions, directives, working hours and waste disposal). For the entire duration of works.
Monitoring:	Daily inspection of pedestrian/traffic safety which are to be undertaken by the Site Manager.
Response:	Report incidents (first responsibility rests with person affected or person observing the accident/incident in serious cases) to the Site Manager using the Incident Report form provided in Appendix C. Offending user is to be notified in writing. Recurring offences shall result in disciplinary action in accordance with the site manager's internal procedure.
Corrective Action:	Investigate and amend traffic management plan to prevent recurrence. Amendments are to be communicated immediately to all personnel and construction workers. Remove offending vehicle/worker from site. Accidents/incidents/complaints shall be used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.7: Waste Management.

Issue:	Conservation of resources. Environmentally responsible disposal of waste generated during works.
Objectives:	To maximise conservation of resources through effective avoidance, reduction, diversion and management of waste materials. To maintain a clean site in the interests of safety. To ensure any materials leaving site are appropriately disposed and tracked.
Management Procedure:	Provide/inspect/maintain bins for general and recyclable waste. Ensure all waste generated throughout works is disposed of the appropriate bins/facility. Every effort shall be made to maintain a clean and tidy site, not only to satisfy and/or meet environmental requirements but also in the interests of site safety. Materials/wastes on site shall be secured to prevent unnecessary and unsightly dispersal around the site and public areas (streets and footpaths). Waste containers shall not be allowed to overflow. Litter and debris trapped against site fences (if present) shall be removed daily. Graffiti and other posters or stickers on hoardings and fencing shall be removed immediately particularly if it is offensive in nature. Burning of wastes is prohibited.
Performance Indicators:	Tidiness of the Site and surrounds.
Responsibility:	It is the responsibility of all site personnel to ensure proper disposal of waste. It is the responsibility of the Site Manager regulate and monitor waste disposal practices.
Critical Dates:	For the entire duration of works.
Monitoring:	Daily inspections. Rubbish removal at least monthly or as required to ensure the site stays waste free based on daily inspections.
Response:	Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators.
Corrective Action:	Direct clean ups (applicable to all site workers) as and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.8: Other Environmental Considerations.

Issue:	Environmental protection and workplace/public health and safety.
Objectives:	Site activities do not compromise the environment of health and safety of site workers and/or the general public. To identify opportunities to employ best practise during site works.
Management Procedure:	Odours: If odours are encountered during Site works, through uncovering of volatile contaminants or putrescible waste, then work should be stopped and the Site manager noted who will liaise with the environmental consultant as required. Fuels: Any refuelling required at the Site must be conducted using appropriate licensed fuel transport vehicles. Refuelling must be conducted in a designated area using proper procedures with trained personnel to reduce the potential for spills. Procedures must be in place, and spill kits available, for responding to any spills. Any fuel or chemicals maintained at the Site must be in properly sealed containers, properly banded, and protected from moving vehicles and plant. Fill Importation: Any imported must be assessed by Pendragon Environmental and cleared as suitable prior to importation. Any imported construction or landscaping material must comply with the relevant Australian Standards for that material.
Performance Indicators:	Zero incidents/accidents/complaints with minimum absence from work.
Responsibility:	Site Manager.
Critical Dates:	For the entire duration of works.
Monitoring:	Daily inspections.
Response:	If odours persist than it may be necessary to apply odour suppressants on the offending material. Fill imported will be subject to assessment by Pendragon Environmental Solutions and auditor approval. Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators.
Corrective Action:	Investigate incidents thoroughly with appropriate corrective and preventative actions. Ensure management measures are implemented and maintained. Observations and complaints shall be reviewed within 24 hours of receipt and used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

Table 6.9: General Health and Safety.

Issue:	Workplace/public health and safety.
Objectives:	Demolition/construction activities do not compromise the health and safety of site workers and/or the general public. To identify the inherent risks of demolition/construction, undertake thorough risk assessments to ascertain best management practices to mitigate/manage/control risks to an appropriate level.
Management Procedure:	Safety training shall be implemented through both general site safety inductions as well as area/activity specific training in accordance with the site manager's OHS Policies and Procedures. Access to the site is to be controlled. Signs are to be erected around the site identifying the presence of asbestos. The following Job Safety Analysis (JSA) measures shall be employed (as a minimum) in accordance with the site manager's internal OHS Policies and Procedures: ▪ High visibility clothing, protective foot and eye wear. ▪ Awareness and adherence to site activities and site OHS procedures. ▪ The Site is only to be accessed via approved access routes. ▪ Awareness of emergency alarm systems and procedures. ▪ PPE. ▪ Health and hygiene. ▪ Illness and injury management systems. ▪ Inform the Site Manager of proposed site activities. ▪ Access authorisation/permission conditions. ▪ Relevant and up-to-date MSDS's for all chemicals/products.
Performance Indicators:	Zero incidents/accidents/complaints with minimum absence from work.
Responsibility:	All site workers are ultimately responsible for their own safety and use of appropriate PPE and reporting any observed incidents to the Site Manager. Site Manager.
Critical Dates:	For the entire duration of works.
Monitoring:	Daily inspections.
Response:	Report incidents (first responsibility rests with person undertaking activity and/or observing incident) to Site Manager and to environmental consultant who will inform the auditor as required who may escalate to the regulators.
Corrective Action:	Investigate incidents thoroughly with appropriate corrective and preventative actions. Ensure management measures are implemented and maintained. Observations and complaints shall be used to guide implementation of additional measures, if and when required.
Reporting	Reporting to the auditor and project director will be undertaken monthly covering all actions undertaken within the previous month.

7. Complaints Incident and/or Emergency Response

Complaints shall be treated with respect, actions taken immediately and investigated thoroughly within 24 hours. Complaints received by external parties shall also be subject to investigation. The superintendent shall be notified in the first instance, or as soon as practicable should any incident occur onsite.

As soon as practicable after being made aware of the complaint, the Site Manager shall notify Pendragon Environmental Solutions, the Project Manager and Environmental Auditor and the relevant authority of the incident by telephone and subsequently by email.

The Site Manager shall maintain a Complaints Register (Appendix D) and shall, in liaison with the Environmental Consultant, direct an appropriate course of action.

The Complaints Register shall record the date, time and nature of any complaint, the name and contact details of the complainant, the causes and effects, the action(s) taken, person responsible for action and resolution of the complaint including preventative measures implemented to prevent recurrence. Preventative measures shall be subject to monitoring and review. The Site Manager shall certify each entry on the record.

7.1 Notifications

In the event of a complaint, incident and/or an emergency that may cause or causes environmental harm, as soon as practicable after being made aware of the incident or emergency, the Site Manager shall notify Pendragon Environmental Solutions, the Project Manager and Environmental Auditor and the relevant authority of the incident by telephone and subsequently by email. The Site Manager shall record the following information (Appendix C):

- Number of the Building Licence/Development Approval/Site Reference.
- Name and telephone number of the designated contact person (if not Site Manager).
- Location of the incident.
- Time of the incident and the time the Site Manager became aware thereof.
- Cause or suspected cause of the incident.
- The environmental harm caused, threatened, or suspected to be caused by the incident.
- Details of immediate actions taken to limit environmental harm.
- Details of actions to be implemented to inhibit further damage and/or prevent recurrence of similar incidents.
- Actions taken to mitigate any environmental harm caused by the incident.

The data will be included in the monthly, quarterly and final reporting.

8. Contingencies, Auditing, Reporting and Review

8.1 Contingencies

During site works, the Contractor(s) shall allocate sufficient resources (personnel, plant, equipment, materials) to the site and store on-site, at suitable locations and at all times, sufficient resources to immediately attend to any non-conformance, incident and/or emergency event.

8.2 Reporting/Environmental Inspections

Reporting will be undertaken in line with Appendix B. Site inspections should utilise appendix E or similar incorporating the grid system proposed for simplicity and consistency.

8.3 Auditing and Review

The Site Manager should regularly undertake random conformance inspection audits during development works. Any non-conformances witnessed during these inspections shall be recorded on an Incident Report Form (Appendix C) and appropriate disciplinary and/or corrective action taken, as deemed appropriate by the Site Manager.

8.4 Document Monitoring

Monitoring and Recording

The responsibility of general environmental monitoring rests primarily with the Site Manager and Environmental Consultant (as directed by the Site Manager). Monitoring responsibilities are detailing in appendix B.

The Site Manager assisted by the environmental consultant shall daily monitor each element of the site work process to ensure that appropriate environmental protection/procedures are in place. Aspects that, other than those that may potentially impact on the environment, require continuous monitoring are:

- Dust.
- Hazardous materials (including asbestos), contaminated soils and waste management.
- Activities that may impact on water resources.

Communication/Complaints

When the community or other third party comments on environmental matters, such comments shall be directed to the Site Manager immediately for discussion with the Environmental Consultant and Community Engagement Consultant. Issues requiring authority approval (e.g. road/footpath closure, water quality, etc.) shall be directed to the Site Manager.

Incidents/Accidents

All environmental incidents shall be recorded and all relevant parties shall be informed immediately. The Contractor(s) shall develop appropriate environmental emergency plans which will form part of the Emergency Response Plan to be located in the Site Office.

Training

All site workers including subcontractors shall be informed during site induction on site specific issues relating to environmental management. Additional training shall be undertaken as necessary and training records shall be kept and maintained by the Site Manager.

References and Bibliography

Abacus Environmental (2025) Remediation Action Plan (RAP), Lot 20 Adelaide Street, Hazelmere.

Australian Environmental Auditors (2025) Interim Mandatory Auditor's Report (IMAR), Lot 20 Adelaide Street, Hazelmere.

Department of Environment Regulation (DER), 2015. Assessment and Management of Contaminated Sites.

Department of Health (DOH), 2021. Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Department of Health: enHealth, Management of Asbestos in the Non-Occupational Environment, 2005.

Department of Water and Environmental Regulation, 2021: Assessment and Management of Contaminated Sites, activities regulated under the Contaminated Sites Act 2003, Contaminated Sites Regulations 2006 and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013).

DWER, Guideline: Assessment and management of contaminated sites, 16 June 2023.

Environmental Protection Act 1986.

EPA, 2008, Environmental Guidance for Planning and Development. Guidance Statement No.33.

Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005).

Guideline Environmental Guidance for Planning and Development (2005) published by the EPA Health (Asbestos) Regulations 1992

MDW Environmental Services, Groundwater Monitoring Event #4, Lot 20 Adelaide Street, Hazelmere, reference E2012-031, 13 June 2013.

National Environment Protection Council: National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM).

National Occupational Health and Safety Commission Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018 (2005)]

National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002 (2005)]

National Occupational Health and Safety Commission, 2005. NOHSC Guidance Note on the Membrane Filter Method for Estimating Method Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

National Environment Protection Council (NEPC), 1998, National Environment Protection Measure for Ambient Air Quality

National Environment Protection (Ambient Air Quality) Measure (2021).

National Environmental Protection Measure (NEPM), 1999. Assessment of Site Contamination.

NSW Environment Protection Authority (EPA), 2020: Assessment and Management of Hazardous Ground Gases, Contaminated Land Guidelines.

Parson Brinckerhoff, Site Investigation, Former Adelaide Street Landfill, Lot 20 Adelaide St, Hazelmere, Western Australia, reference 2145245A PR2:16644 Rev A, 20 July 2006.

Thuroona Services, Lot 20 Adelaide Street, Hazelmere, Remediation Action Plan – Earthworks Package, J21012 Rev A, DRAFT, 19 Dec 2023 a.

Thuroona Services b, Lot 20 Adelaide Street, Hazelmere, Detailed Work Plan, reference J21012 Ref B, DRAFT, 7 May 2024.

Thuroona Services c, Lot 20 Adelaide Street, Hazelmere, Detailed Site Investigation – Balance of Site, J21012 Rev C, DRAFT, 27 May 2024.

WA Occupational Safety and Health Act 1984

WA Occupational Safety and Health Regulations 1996

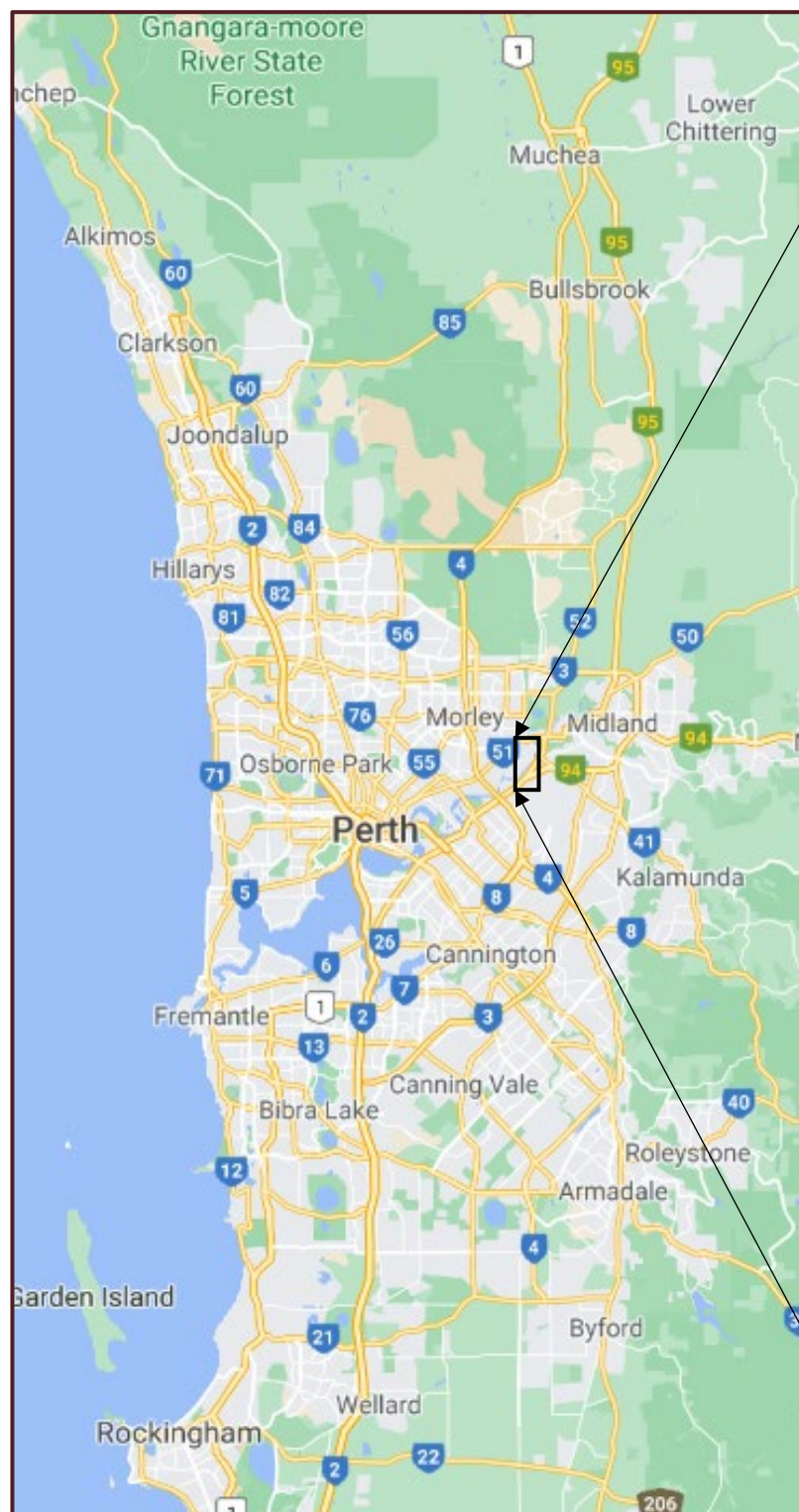
Figures

Figure 1: Site Location/Layout/Activities

Figure 2: Fixed Dust Monitoring Location

Figure 3: Airbourne Asbestos Fibre Monitoring Location Example

Figure 4: 50mx50m ID Grid



Drawing Title: Site Location/Layout/Activities

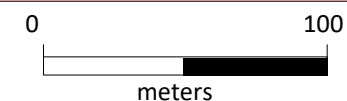
Figure Number: Figure 1

Revision: 4, May 2026

Legend:

Notes:

Scale is approx.





Drawing Title: Fixed Dust Monitoring Location

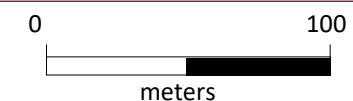
Figure Number: Figure 2

Revision: 4, May 2026

Legend:

DM-x Dust Monitoring Location

WS Weather Station





Drawing Title: Airbourne Asbestos Fibre
Monitoring Location Example

Figure Number: Figure 3

Revision: 4, May 2026

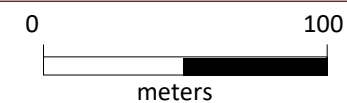
Legend:



Working Area Example

FM - 1

Example sample location





Drawing Title: 50x50m ID Grid	Legend: 50x50m cell	N	0100 meters pendragon environmental solutions
Figure Number: Figure 4			
Revision: 4, May 2026			

Appendices

Appendix A: Ryan Lawrence CV



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ryan@pendragonenvironmental.com



Areas of Expertise

Contaminated sites investigations, risk assessment and remediation.
Asbestos investigation and remediation.
Airborne contamination investigations including Asbestos and Volatile Organic Compounds.
Acid Sulphate Soil Investigation (ASS).
Construction Environment/Site Management Plans.
Bushfire Attack Level assessments.
Auditing, environmental review and due diligence.
Community consultation and participation.

Education

Master of Business Administration (Edith Cowan University), 2017.
Master of Science in Environmental Management (Industrial and Urban Systems), 2011.
Bachelor of Arts (Honours), major in Geography (UWE University of the West of England, Bristol, England), 2006.

Professional Certifications/Affiliations

Certified Contaminated Site Specialist (CEVP CS Specialist No. SC41038).
Certified Environmental Practitioner (CEVP No 894).
Restricted Asbestos Removal licence; (await licence number).
Level 1 Bushfire Attack Level (BAL) assessor.
Environment Institute of Australia and New Zealand, EIANZ.
Australasian Land & Groundwater Association (ALGA).

Continuous Professional Development

Certification for contaminated site specialist: SCPA, 2017.
Certification for environmental practitioner.

Representative Experience

Ryan is an environmental scientist and Certified Environmental Practitioner (Contaminated Site Specialist) with over eighteen years consulting experience in contaminated land investigation, assessment and remediation, hazardous material (HazMat) assessment and management and acid sulfate soils.

Wide ranging experience in soil and groundwater contamination and remediation, demolition and HazMat management and risk assessment. Responsibilities include strategic business development and planning, client liaison, research, project development and supervision, quality control systems and general operations.

Selected Project Experience

Contaminated Land and HAZMAT

Applying NEPM ASC, Victoria, NSW, QLD, WA and NT Guidelines:

Soil and water contamination: explosives, heavy metals, oils and fuels, chemicals, solvents, acids, pesticides/herbicides, etc. Hazardous materials including asbestos, lead and chrome-based paints, synthetic mineral fibers, polychlorinated biphenyls (PCBs), ceramic based fibers, chlorofluorocarbons (CFCs): identification, detailed investigation and risk assessments, remediation and management including approvals by contaminated land auditors and Western Australian, Northern Territory and Queensland Government.

Emerging chemicals: per- and polyfluoroalkyl substances (PFASs including PFOS, PFOA and PFHxS), also referred to as perfluorinated chemicals (PFCs), and MTBE.

Construction Management, Sampling and Analysis Quality, Detailed Site Investigations and Health, Safety and Environmental Plans.

Negotiations with planning and environmental authorities and agencies.

Selected investigation include:

- Specialist remedial advice to lead the assessments of the BP refinery closedown in Kwinana, including soil and groundwater assessments and remediation.
- Carabeen Avenue PFAS in groundwater sampling and analysis and detailed site investigation at the request of the Western Australian Department of Water and Environmental Regulation (Contaminated Sites Auditor: Senversa).
- Carabeen Avenue multi-stage landfill gas investigations and assessments at the request of the Departments of Health and Water and Environmental Regulation (Contaminated Sites Auditor: Senversa).
- Carabeen Avenue multi stage development Remediation Action Plan and Remediation and Validation for site contamination (Department of Water and Environmental Regulation, Contaminated Sites Auditor: Senversa).
- Hazelmere waste and landfill gas investigations and assessments at the request of the Departments of Health and Water and Environmental Regulation (Contaminated Sites Auditor: Australian Environmental Auditors).
- Industrial and Commercial: sampling and analysis of many sites within the industrial areas of Western Australia with the objectives of ascertaining environmental conditions and to facilitate remediation of contaminated sites.
- O'Connor contaminated sites investigation and large scale demolition and HazMat management (asbestos and heavy metals). The site previously functioned as a paint production facility and contained extensive asbestos contamination due to historic demolition activities. A staged contaminated site investigation was undertaken and a HazMat management and remedial action plan developed and implemented. Regular site visits were under-taken to oversee demolition works, to ensure latent discoveries were correctly managed and that the HazMat management plan was appropriately administered. Remediation included encapsulated cell technology. Project delivered on time, on budget and without any additional contamination issues.
- HAZMAT inspections and management for demolition of infrastructure at various BHP and Rio Tinto mine sites.
- HAZMAT inspection and management for Landcorp for the demolition of Narngulu abattoir and several assets across Perth. These include preparing for refurbishing and/or demolition of schools for land development.

Restricted asbestos removal, 2016.
Bushfire Attack Level (BAL) assessment 2017.
Scientific Writing, 2010.
NGERS Greenhouse Gas Reporting, 2010.
Sample Collection and Quality Control, 2008.
ACAD, 2008.
Manual Handling, 2006.
Senior First Aid, 2006.
Fire Officer, 2006.

Fields of Special Competence/Key Strengths

Planning, preparing, implementing and reporting on Environmental Inspections.
Proven skills in Environmental Project Management.
The design and implementation of Environmental Monitoring Programs.
Excellent communication skills, in both technical report writing and oral presentations.
Personal strengths are reliability, responsibility and professionalism.
A strong team member as well as individual worker, bringing a positive attitude to any working situation.

- Contamination and HAZMAT assessment of multiple rural lots for the Kenwick link project to clear area for railyard redevelopment. This project has been running since 2017 with multiple stages added.
- Former service station, Pinjarra: staged contaminated site investigation, asbestos removal, demolition management and underground fuel storage tank removal at a former service station in Pinjarra. A remediation management plan adopting monitored natural attenuation (MNA) was developed and implemented. The project was delivered within agreed timescale, budget and approved by DER following auditor review.
- CSIRO Laboratories, Helena Valley: Asbestos air monitoring and HazMat assessment.
- Multi-lot development, Pinjarra: HazMat assessment and asbestos management plan developed and implemented across 28 lots in the commercial precinct of Pinjarra.
- Former nursery, Wanneroo Road: contaminated land investigation and HazMat remediation plan development.
- Advice, investigation, assessment, remediation and management of several green and brown fields and infill development sites for HazMat (asbestos, metals, etc.) across Perth and surroundings.
- Contaminated site investigation and remedial action plan for an industrial site in Malaga contaminated by petroleum hydrocarbons. Investigations included mapping of plume, vapour intrusion and detailed risk assessment for off-site migration of hydrocarbons.
- Acid Sulfate Soil (ASS) assessment, treatment and management for multiple projects throughout Australia, including (but not limited to) Henley Brook, Munster and Forrestdale Business Park.
- Darwin Ludmilla and Rapid Creeks: contaminated site investigations at multiple sites for PFAS contamination on varying land uses, including sensitive ecological communities, develop and implement site management plans to facilitate re-use and off-site disposal of impacted soils.
- Industrial site, Maddington: Assessment and reporting of a site contaminated by mineral oils from the storage of transformers using a ground safe decontamination.

Environmental Auditing and Management

- Griffen Coal, Collie: Assisting with the planning and undertaking of site environmental audits and review of the annual environmental report.
- BMA Marine Sites, Australia: Draft and review of the quality and environmental improvement strategies.
- Perth Airport, Jandakot: Provision of on-going support and advice concerning environmental matters. Review of management plans drafted for land users at the site, annual environmental reports, handling approval applications and provision of technical environmental advice regarding proposed works/operations.
- Chevron, Barrow Island: Developed environmental risk assessment and mitigation sections of the environmental management plan for the Chevron gas pipelines between Barrow Island and the Mainland.
- Woolworths Distribution Centre: Construction environmental management plan. This was a major extension to a working facility which came under federal and commonwealth jurisdiction. The management plan had to specifically deal with a RAMSAR wetland site in close proximity and the movements of 100+ trucks during a working day.
- Undertook a wetland buffer assessment and planning process with the City of Gosnells, Department of Biodiversity, Conservation and Attraction, Department of Water Environmental Regulation. This involved developing the appropriate strategy to satisfy all stakeholders to remap the wetland buffer and undertake rehabilitation within the buffer to the benefit of the local residents.

Project Management

- Balga Aquatic Centre: Managing an air quality investigation undertaken to address chlorine gas presence. The investigation identified the source and developed management strategies. Ongoing monitoring showed that strategies have been successful and no further degradation or health issues remain.
- Provided support and advice at Perth Airport including: Reviewing management plans drafted for land users at the site, Reviewing annual reports, handling approval applications and providing technical advice on proposed works. This work included undertaking pre and post tenant land assessments and reviewing proposed remediation strategies.
- Edith Cowan University, Churchlands Campus re-development: Directing and monitoring the removal of HazMat (including asbestos). Managing demolition and overseeing all environmental works and investigations. This job involved designing a containment cell to retain a contaminated soil. The use of this particular

remediation technique (opposed to offsite disposal) created a net saving of around \$3 million. This project won the 2009 CCF award for excellence.

- Cape Preston Iron Ore Mine: Managing the delivery of an environmental management plan regarding land based site works and the construction of a water break out for the Cape Preston Iron Ore mine. The management plan addressed working practices, marine fauna, benthic communities and the psammosere ecosystems.

Appendices

Appendix B: Communications chart, Table of responsibilities, Inspection Regime

Inspection Type	Scope	Frequency	Responsible	Record
Daily site inspection (HSE / environmental)	Dust, odour, noise, vibration, rubbish, fencing, bunds, signage, stockpile condition, water management, traffic routes	Daily (each workday)	Site Manager	Daily Site Inspection Checklist / Site Diary
Daily environmental walk through	Targeted check of active cell, dust suppression, asbestos controls, waste segregation, airborne asbetsos / dust monitor operation, LFG assessment in excavations	Daily when bulk earthworks in progress	Environmental Consultant	Environmental Field Log
Weekly formal environmental inspection	Full site inspection against CEMP/RAP requirements (dust, asbestos, soil/fill management, surface water, LFG)	Weekly	Environmental Consultant	Weekly Environmental Inspection Report
Twice weekly landfill cell inspection	Cell by cell review of excavation, sorting, cobble placement, capping quality, and ACM screening.	Minimum twice per week during active landfill regrading (as indicated in IMAR)	Environmental Consultant	Weekly Inspection Notes / Email to Client & Auditor
Monthly compliance / performance review	Review of monitoring data (dust, AFM, groundwater, LFG), soil incidents, complaints, non conformances and corrective actions	Monthly	Project Manager + Environmental Consultant + Auditor (as required)	Monthly Environmental Summary
Post rainfall / event inspections	Structural integrity of bunds, drains, swales; evidence of erosion or offsite discharge	After significant rainfall or high wind events	Site Manager + Environmental Consultant	Event Based Inspection Record
Pre demobilisation inspection (Stage 1 close)	Verification of Stage 1 end state (cobble barrier continuity, residential strip grading, bund removal, clean up of temporary areas)	Once at Stage 1 completion	Project Manager, Environmental Consultant + Auditor / Client Rep	Stage 1 Completion Inspection Report

Inspection Type	Scope	Frequency	Responsible	Record
Daily site inspection (HSE / environmental)	Dust, odour, noise, vibration, rubbish, fencing, bunds, signage, stockpile condition, water management, traffic routes	Daily (each workday)	Site Manager	Daily Site Inspection Checklist / Site Diary
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Monthly compliance / performance review	Review of monitoring data (dust, AFM, groundwater, LFG), soil incidents, complaints, non conformances and corrective actions	Monthly	Project Manager + Environmental Consultant + Auditor (as required)	Monthly Environmental Summary
Post rainfall / event inspections	Structural integrity of bunds, drains, swales; evidence of erosion or offsite discharge	After significant rainfall or high wind events	Site Manager + Environmental Consultant	Event Based Inspection Record
Pre demobilisation inspection (Stage 1 close)	Verification of Stage 1 end state (cobble barrier continuity, residential strip grading, bund removal, clean up of temporary areas)	Once at Stage 1 completion	Project Manager, Environmental Consultant + Auditor / Client Rep	Stage 1 Completion Inspection Report

Appendices

Appendix C: Incident Report Form

ENVIRONMENTAL INCIDENT REPORTING FORM

This form is to be completed when you become aware of an Environmental Incident.

INCIDENT REPORTED BY: _____ **SIGNATURE:** _____

SUPERVISOR: _____ **DATE:** _____

LOCATION OF INCIDENT: _____

TIME OF INCIDENT: _____ **DATE OF INCIDENT:** _____

DETAILED DESCRIPTION OF INCIDENT:

(Such as how it happened, size and type of spill, possible impacts etc.)

MITIGATION/CLEAN UP REQUIRED

(Such as what was done and what should be done next etc.).

BELOW IS TO BE FILLED OUT BY THE SITE MANAGER

Is further remediation or investigation required? **YES** **NO**

*Attach additional sheets if required.

Site Manager's final sign off:

Date:

Appendices

Appendix D: Complaints Register

Customer Complaint Register

Date Complaint Received	Reference Number (e.g. PES17005-1,2,3....)	Complaint Made By (e.g. Resident, Pedestrian etc.)	Complaint Details	Incident Report Created (Y/N)	Corrective Action Taken	Outcome

Date	Version	Reviewed/created by	Authorised by	Review/Audit	Reference
March 2026	1	Ryan Lawrence	CvdW	March 2027	PES25019

Customer Complaint Register

Date Complaint Received	Reference Number (e.g. PES17005-1,2,3....)	Complaint Made By (e.g. Resident, Pedestrian etc.)	Complaint Details	Incident Report Created (Y/N)	Corrective Action Taken	Outcome

Date	Version	Reviewed/created by	Authorised by	Review/Audit	Reference
March 2026	1	Ryan Lawrence	CvdW	March 2027	PES25019

Appendices

Appendix E: Inspection Forms

Daily Environmental Inspection <u>20 Adelaide Street, Hazelmere</u>	Date	
	Assessor	

Item 1: Activities Occurring on Site

Grid Id	Activities Occurring

Item 2: Site Conditions

Assessed Item	Yes	No	Details
Weather (wind strength, precipitation)			
Have any complaints been received since previous inspection?			
Are any works under a stop work restriction?			
Site surrounds condition (debris on roads etc)			
Site fence condition (rubbish debris, signage)			
Dust presence/potential, water cart usage			

Odour presence/potential			
Vibration issues?			
Noise Issues?			
Stockpile conditions/makeup (e.g. increased inclusions of items other than concrete/bricks)			
Cobble/caping material comments (e.g. make up, consistency)			

Item 3: Comments

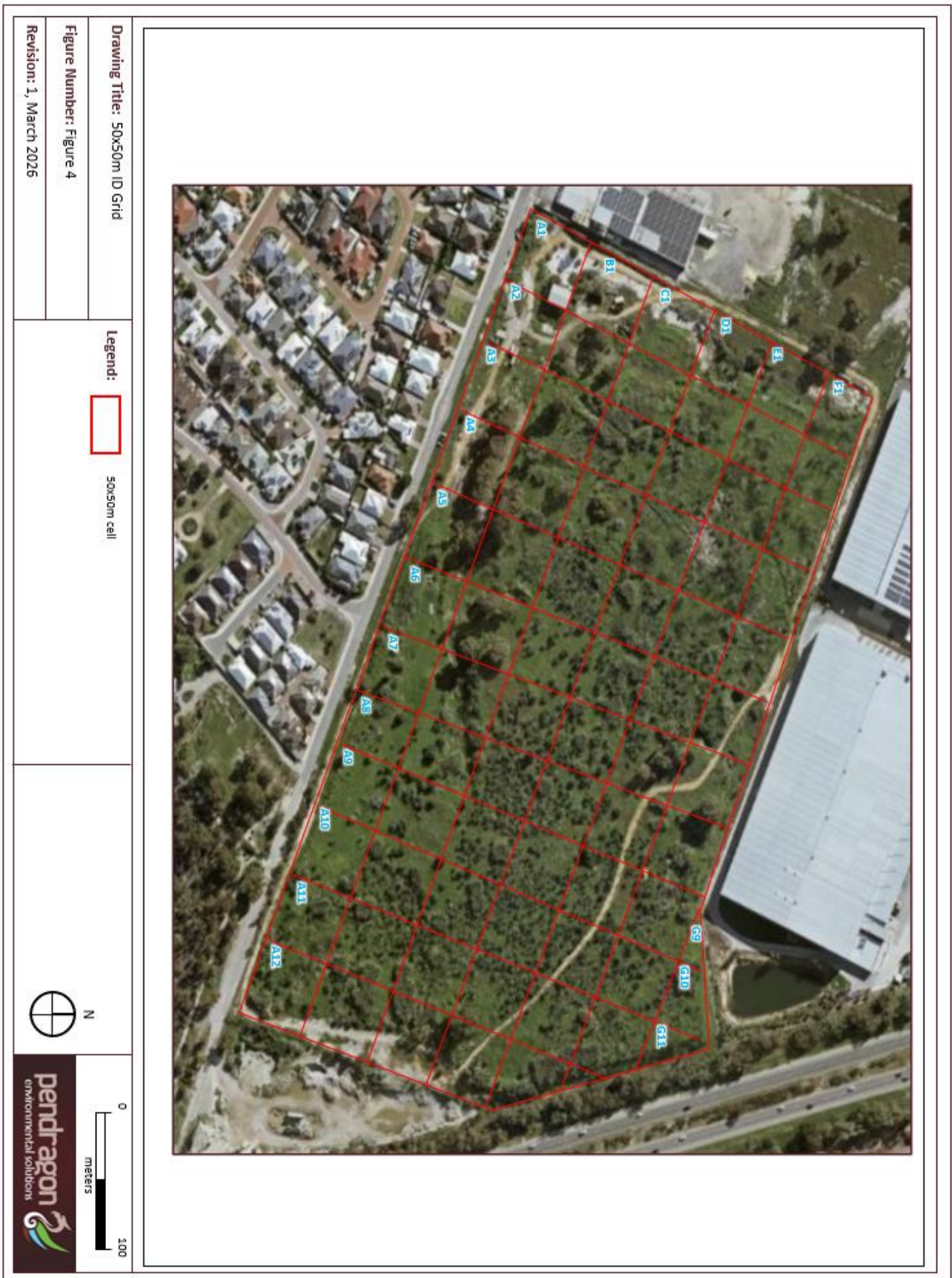
Item 4: Excavation landfill gas surface readings if not logged

[illegible]

Item 5: Sketch of Cell and Approximate Sample Points/Transects

Item 6: Signature

Assessor	Date



Weekly Environmental Inspection <u>20 Adelaide Street, Hazelmere</u>	Date	
	Assessor	

Item 1: Activities occurring on site

Grid Id	Activities Occurring

Item 2: Site conditions

Assessed Item	Yes	No	Details
Weather (wind strength, precipitation)			
Have any complaints been received since previous inspection?			
Are any works under a stop work restriction?			
Site surrounds condition (debris on roads etc)			
Site fence condition (rubbish debris, signage)			
Dust presence/potential, water cart usage			

Odour presence/potential			
Vibration issues?			
Noise Issues?			
Stockpile conditions/makeup (e.g. increased inclusions of items other than concrete/bricks)			
Cobble/capting material comments (e.g. make up, consistency)			

Item 3: Comments

[illegible]

[illegible]

Item 5: Surface landfill gas readings if not logged

[illegible]

Item 6: Soil samples taken

Grid Id	Action Item

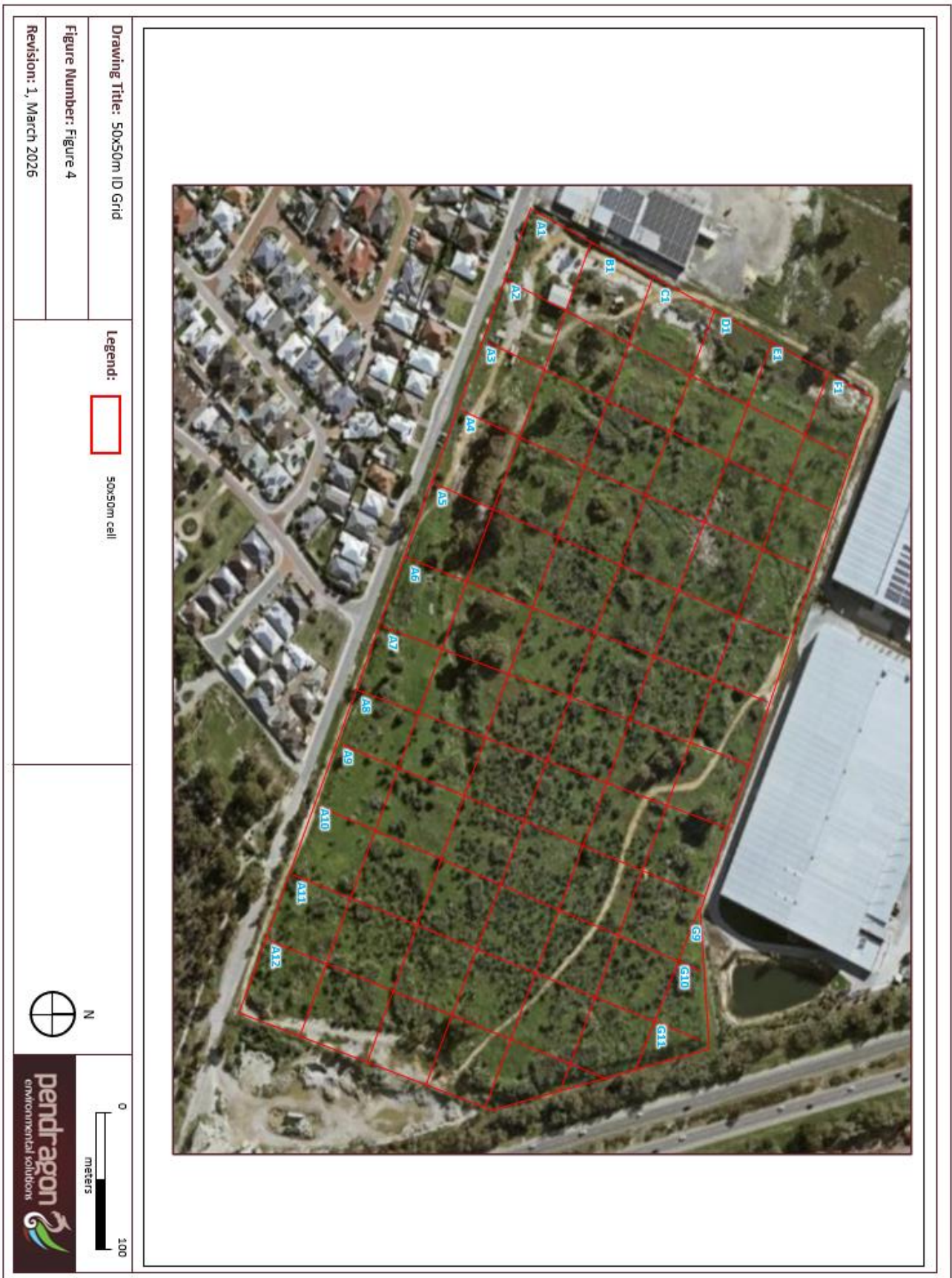
Item 7: Site water dust suppression sampling details if undertaken

Comments	Field Measurements				
	pH	Electrical Conductivity	Dissolved Oxygen	Redox Potential	Temperature
		($\mu\text{S/cm}$)	(mg/L)	(mV)	($^{\circ}\text{C}$)

Item 8: Sketch of cell and approximate sample points

Item 7: Signature

Assessor	Date



Monthly LFG Inspection
20 Adelaide Street, Hazelmere

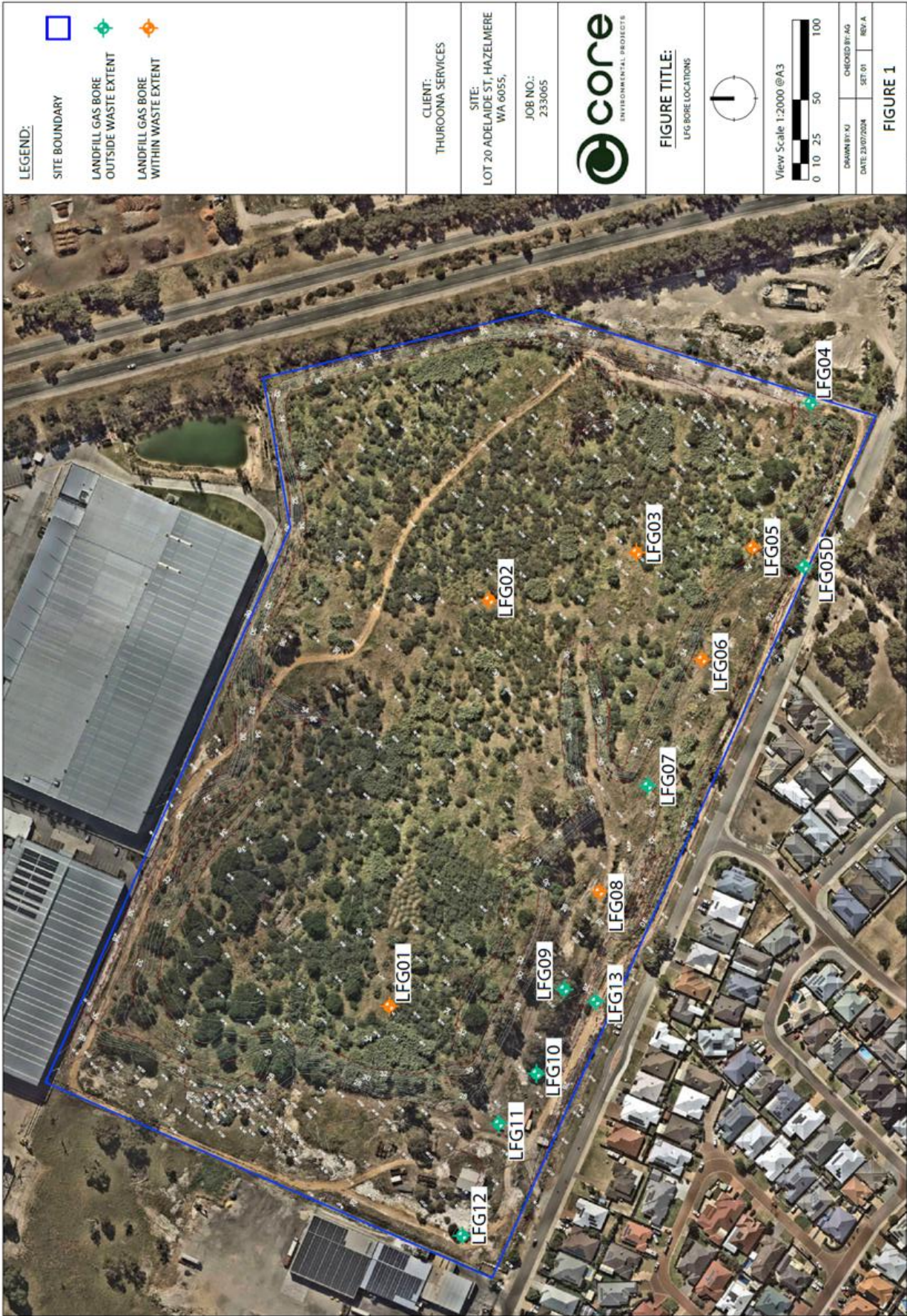
Date

Assessor

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG01									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG02									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG03									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG05									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG06									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG08									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										



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Quarterly LFG Inspection
20 Adelaide Street, Hazelmere

Date

Assessor

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG01									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge					Barometric Pressure (mb)	Pre Purge			
	Post Purge						Post Purge			
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG02									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge					Barometric Pressure (mb)	Pre Purge			
	Post Purge						Post Purge			
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG03									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG04									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

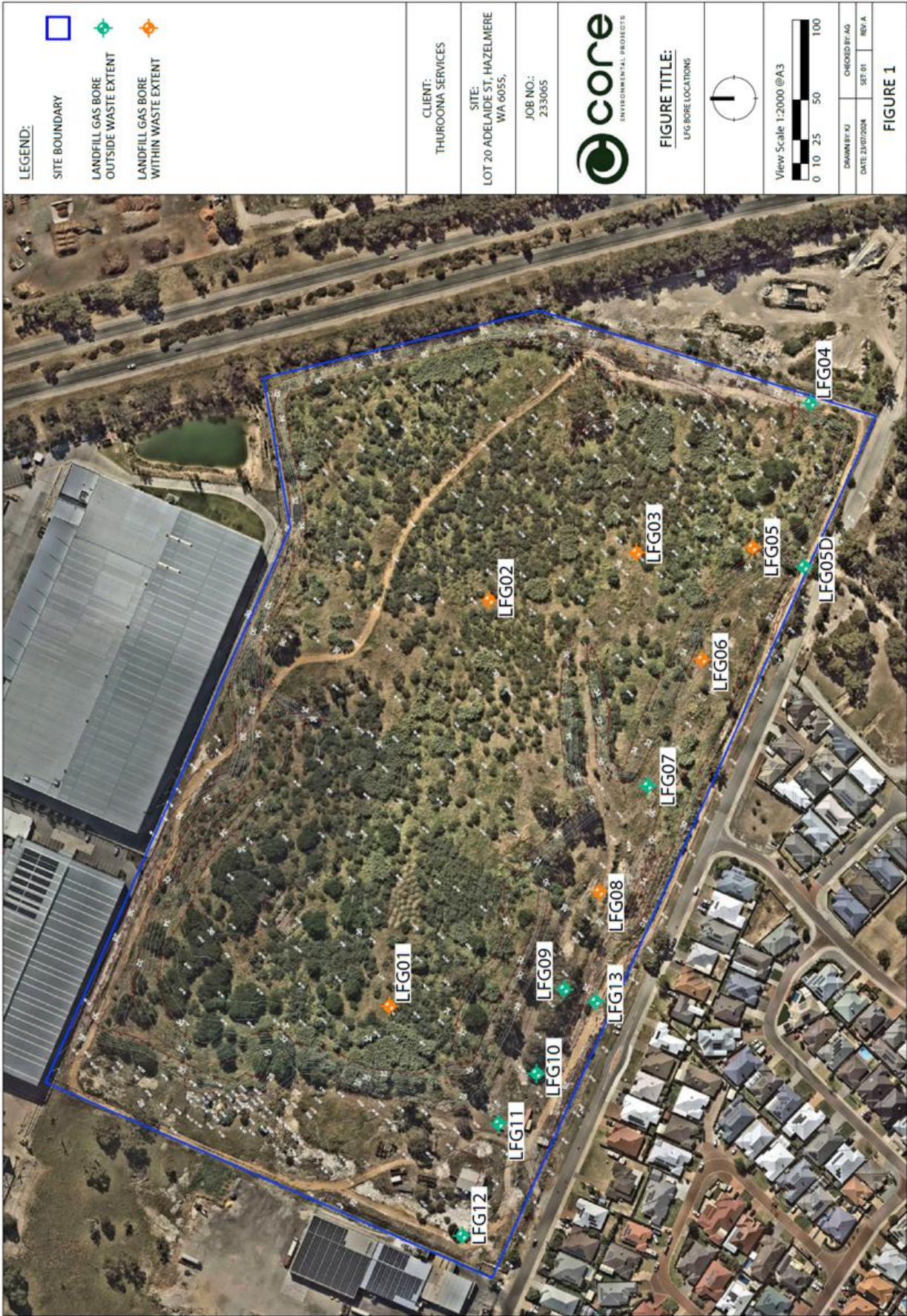
Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG05									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG05D									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG06									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG07									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG08									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG09									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name					Job Number					
Site Address					Date					
Client					Works by:					
Bore/Site Details										
Bore Number	LFG10									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										
Bore/Site Details										
Bore Number	LFG11									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										

Project Name				Job Number						
Site Address				Date						
Client				Works by:						
Bore/Site Details										
Bore Number	LFG12									
Bore Condition/Sealed										
SWL (mbgl)										
Flowrate/Bore Pressure										
Flowrate (L/hr)	Post Purge									
Relative Pressure (mb)	Pre Purge				Barometric Pressure (mb)	Pre Purge				
	Post Purge					Post Purge				
LFG Meter Measurements										
	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Reading 9	Reading 10
Pump Time (s)	0	30	60	90	120	150	180			
CH4 (%)										
CO2 (%)										
O2 (%)										
CO (ppm)										
H2S (ppm)										
Observations/Notes										



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Quarterly LFG Inspection
20 Adelaide Street, Hazelmere

Date	
Assessor	

Sample Number	Type	Location (MGA50-94)		Field Measurements							Comments
	(Primary, QA/QC: indicate type)	E	N	Ground Water Encountered (mbgl)	pH	Electrical Conductivity	Dissolved Oxygen	Redox Potential	Temperature	Purged volume	
						(µS/cm)	(mg/L)	(mV)	(°C)	(L)	
WMB-1		406504.04	6467036.79							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	
WMB-2		406693.90	6466947.24							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	

Sample Number	Type	Location (MGA50-94)		Field Measurements							Comments
	(Primary, QA/QC: indicate type)	E	N	Ground Water Encountered (mbgl)	pH	Electrical Conductivity	Dissolved Oxygen	Redox Potential	Temperature	Purged volume	
						(µS/cm)	(mg/L)	(mV)	(°C)	(L)	
WMB-3		406997.15	6466823.35							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	
WMB-4		406617.75	6467311.73							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	

Sample Number	Type	Location (MGA50-94)		Field Measurements							
	(Primary, QA/QC: indicate type)	E	N	Ground Water Encountered (mbgl)	pH	Electrical Conductivity	Dissolved Oxygen	Redox Potential	Temperature	Purged volume	Comments
						(µS/cm)	(mg/L)	(mV)	(°C)	(L)	
WMB-5		406731.40	6467262.78							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	
WMB-6		406998.45	6467183.20							10	
										20	
										30	
										40	
										50	
										60	
										70	
										80	

Groundwater Bore Locations



Legend:

- MW1-x** Water Monitoring Location
- PDSE-x** Proposed Dust Suppression Bore

Appendices

Appendix F: Sampling Analysis and Quality Plan – Site Works

Sampling and Analysis and Quality Plan Site Works

Lot 20 Adelaide Street, Hazelmere WA

April 2026

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Report

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File:	PES25019
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Synopsis:	This document details a Sampling and Analysis Quality Plan taking due cognisance of the findings of earlier contaminated sites investigations and assessments in accordance with the <i>Guideline for Assessment and Management of Contaminated Sites</i> , activities regulated under the Contaminated Sites Act 2003, the Contaminated Sites Regulations 2006 and the National Environment Protection (Assessment of Site Contamination) Measure 1999, ASC NEPM 1999 as amended in 2013) of the Western Australian Department of Water and Environmental Regulation.

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1. Introduction

This Sampling and Quality Plan (SAQP) has been developed to address sampling requirements for soil, groundwater, air quality (dust, airborne asbestos and landfill gas (LFG)) detailed in the Remediation Action Plan (RAP - (Abacus Environmental 2025)) approved to be implemented on site during remediation/earthworks at Lot 20 Adelaide Street, Hazelmere (the Site) Figure 1.

This SAQP document is in accordance with the Guideline of the Department of Water and Environmental Regulation (DWER) Assessment and Management of Contaminated Sites, Department of Health (DOH), 2021. Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, EPA Victoria Publication 1684, Landfill Gas Fugitive Emissions Monitoring Guideline, February 2018 (EPAV Publication 1684) and the National Environment Protection (Assessment of Site Contamination) Measure 1999, ASC NEPM 1999 as amended in 2013.

1.1. Data Quality Objectives

Data Quality Objectives (DQO's) are qualitative and quantitative statements derived from the outputs of the DQO Process that:

- Clarify the study objective.
- Define the most appropriate type of data to be obtained.
- Determine the most appropriate media from which the data is to be obtained.
- Specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of the data needed to support the decision.

The DQO process (AS4482.1-2005) follows a systematic approach for defining the criteria that a data collection design should satisfy, including the number of samples and when, where and how to obtain these samples. DQO's are employed to develop a scientific and resource effective data collection design to assure decision makers that the type, quantity and quality of environmental data are appropriate for the intended application. In addition, decision makers will guard against committing resources to sampling and analysis efforts that do not support defensible decisions.

Step 1: State the Problem

The problem pertains to whether groundwater, soils and air quality (LFG, dust and airborne asbestos fibres) at Lot 20 Adelaide Street, Hazelmere, is contaminated by earlier potentially contaminating activities or land uses, or impacted by proposed works and the extent of such contamination in terms of concentration, vertical and lateral extent.

Whilst financial resources are secondary, time constraints are paramount to obtain the necessary approvals to move the investigation forward timeously.

Step 2: Identify the Decision

The Decision pertains to whether the site as a whole and/or individual stages, with specific reference to soil, groundwater and LFG may be classified in terms of Schedule 1 of the Contaminated Sites Act 2003. Actions that may result from the resolution of the Decision are to remediate the site, if contaminated, to facilitate the intended land use.

The decision statement would ascertain whether the site can be remediated and validated suitable for development.

Step 3: Identify the Inputs to the Decision

The following historical and recent information and data will be inputs to the decision:

- Remediation Action Plan (Abacus Environmental 2025),
- Interim Mandatory Auditor's Report (Australian Environmental Auditors 2025),
- Lot 20 Adelaide Street, Hazelmere, Detailed Site Investigation – Balance of Site, J21012 Rev C, DRAFT, (Thuroona Services, 2024 c),
- Groundwater Monitoring Event #4, Lot 20 Adelaide Street, Hazelmere, reference E2012-031, (MDW Environmental Services, 2013),
- Construction Environmental Management Plan (Pendragon Environmental Solutions, 2026).

Obtain samples of groundwater from existing available groundwater monitoring bores to ascertain the concentrations of the potential contaminants of concern (PCoC) around the site and for water to be used for dust suppression:

- Groundwater quality: characterise the hydro-chemical quality of groundwater taking due cognisance of past potentially contaminating land uses and activities.
- Depth to ground water level, direction of groundwater flow and hydraulic gradient.

Obtain soil validation samples of the proposed residential strip prior to filling and of proposed fill to be used of the potential contaminants of concern (PCoC).

Obtain landfill gas samples of gasses produced from the landfill from the existing bore networks and surface samples during site works.

Obtain dust samples around the site during earthworks.

Obtain airborne asbestos fibre monitoring around active work areas.

Assessment (action) levels are set in accordance with:

- Table 1C Groundwater Investigation Levels (GILs) for Fresh Water [ASC NEPM] which apply to typical slightly-moderately disturbed systems i.e. a 95% species protection level and Assessment Levels for Water Table D1: Selected Assessment Levels for Water, Relevant to Beneficial Use – Short- and Long-Term Irrigation Water.
- EPA Victoria Publication 788.3 Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills, February 2015 (BPEM) and appropriate STEL/ TWA criteria for gases such carbon monoxide and hydrogen sulphide.
- Contaminated Sites Ground and Surface Water Chemical Screening Guidelines (DoH, 2025).
- PFAS NEPM (HEPA, 2025).
- The 2025 updated NHMRC health-based guideline values for PFAS in the National Health and Medical Research Council (NHMRC), 2011: Australian Drinking Water Guidelines Paper 6 (Version 4.0, updated June 2025).
- Soil Investigation (action) levels (IL's) are set in accordance with the ASC NEPM.
- Dust (action) levels (IL's) are set in accordance with '*A guideline for managing the impacts of dust*

and associated contaminants from land development sites, contaminated sites remediation and other related activities' (DEC, 2011).

- LFG (action) levels (IL's) are set in accordance with the 'Assessment and Management of Hazardous Ground Gases, Contaminated Land Guidelines' (NSW EPA, 2020) and 'Assessing Risks posed by Hazardous Ground Gases to Buildings' (CIRIA, 2007).
- Asbestos will be assessed using the Department of Health (DOH), 2021. Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Step 4: Define the Study Boundaries

The spatial boundaries are the perimeters of Lot 20 Adelaide Street (Figure 1). It is assumed that:

- Groundwater qualities will be representative of current (*in situ*) conditions.
- Groundwater is not subject to significant change.
- Soil qualities will be representative of current (*in situ*) conditions.
- Soils are not subject to significant change, disintegration or alteration.
- Air Quality (landfill gas, airborne asbestos fibres and dust) will be representative of current (*in situ*) conditions.
- Air Quality (landfill gas, airborne asbestos fibres and dust) is not subject to significant change.

Temporal constraints, other than obtaining and testing samples to support site classifications and approvals validated by a mandatory audit, are therefore not warranted.

The scale of decision making is limited to Lot 20 Adelaide Street primarily and, if required, potential off-site migration and possible impacts on immediate downstream uses/users.

Practical constraints on data collection pertain to the accuracy of equipment used on site for groundwater quality, LFG, airborne asbestos and dust. Other practical constraints relating to groundwater and soil include the holding times of samples and the method of obtaining samples, representativeness of samples and cross-contamination by equipment used. Dust, airborne asbestos and LFG sampling is impacted by atmospheric influences, whilst LFG is also impacted by subsurface gas migration variability and LFG and groundwater is potentially impacted by monitoring well integrity.

and for groundwater sampling (ground water sampling equipment comprising low flow bore pumps, bailers and water quality analysers) air quality (LFG sampling equipment).

Step 5: Develop a Decision Rule

If there are contaminants with concentrations above the relevant assessment levels for residential (soils, groundwater and land fill gas) post works, then the site will be regarded as *possibly contaminated*. Further assessments will be undertaken prior to undertaking remediation (if required, the goal would be to either meet the assessment levels or encapsulating/removing sources of contamination or managing/mitigating the risk) as memorials on titles are to be avoided (preferred).

Step 6: Specify Tolerable Limits on Decision Errors

The possible ranges of the PCoC or contaminants are expected to vary between less than their detection limits (laboratory detection and/or limits of reporting or LoR's), the assessment levels and concentrations

exceeding the assessment levels having due regard for historical results, particularly where historically impacted bores have been destroyed and will not be replaced. The Decision Errors (DE's) are:

- 1: Deciding that groundwater/soil/air (LFG and airborne asbestos fibres) is contaminated when it is not. The true state of nature for this Decision Error is that groundwater/soil/air (LFG and airborne asbestos fibres) is uncontaminated.
- 2: Deciding that groundwater/soil/air (LFG and airborne asbestos fibres) is uncontaminated when it is not. The true state of nature for this Decision Error is that groundwater/soil/air (LFG and airborne asbestos fibres) is contaminated.

The consequences of DE1 pertain to delaying the investigation and the costs of remediation. The consequences of DE2 pertain to retaining, and possibly disturbing, sources of contaminants thereby releasing contaminants in the future (slow) and/or during construction (quick) that impact on human health and/or the downstream environment. DE2 has more severe consequences since the risk of jeopardizing human health far outweighs remediation costs.

The baseline condition or null hypothesis (H_0) is that groundwater/soil/air (LFG and airborne asbestos fibres) is *Not Contaminated* whilst the alternative hypothesis (H_a) is that groundwater/soil/air (LFG and airborne asbestos fibres) is *Contaminated*. The false positive decision error occurs when the null hypothesis is rejected when it is true (DE 1 Error) i.e. when groundwater/soil/air (LFG and airborne asbestos fibres) is contaminated but deemed not. The false negative decision error occurs when the null hypothesis is not rejected when it is false (DE 2 Error) i.e. when groundwater/soil/air (LFG and airborne asbestos fibres) is contaminated when it is not.

Generally, ranges of possible values for the PCoC where the consequences of decision errors are relatively minor (the grey region where costs are balanced with the risks to human health and the environment and the ability to measure small differences) will be considered (generally stated as between the LoR and the assessment Level plus or minus one or more Standard Deviations). Current policy and a risk averse approach do not facilitate assigning probabilities to concentrations above and below the assessment level (to reflect the tolerable probability for the occurrence of decision errors) without detailed ecological and/or health risk assessments and are therefore currently excluded from this sampling program but may be reconsidered during further detailed site assessments.

The degree to which the quality of analytical data will be considered acceptable in terms of meeting the objectives of the sampling program will be assessed by means of a critical review of field and laboratory Quality Assurance and Quality Control (QA/QC) processes and QC samples (refer Section 2.6 of this document) taking due cognisance of the completeness of documentation and data, comparability, representativeness and the precision and accuracy of both sampling and analysis for each analyte in each matrix with the objective to ensure that the data reported is most suitable and does not jeopardize decisions pertaining to contamination and/or the absence thereof.

Step 7: Optimize the Design

A review of DQO outputs and existing environmental data resulted in the development of data collection design alternatives detailed below:

- Groundwater samples are to be collected from existing bores around the site to quantify groundwater conditions across Lot 20 Adelaide Street prior to earthworks commencing and then quarterly through earthworks.
- Groundwater samples are to be taken of bore to be used for dust suppression prior to earthworks commencing and then monthly through earthworks.

- Should any sample detect any PCOC above its relevant assessment level, then further sampling, at increasing densities and/or depths, is to be undertaken to ascertain lateral and vertical delineation of contaminants taking due cognisance of compliance with AS4482.1-2005.
- Soil validation testing will be undertaken at the base of excavation within the residential strip and of sand to be used for fill within the residential strip and to create the dividing berm.
- Air Quality Assessments (Dust) will be undertaken across the site immediately prior to earthworks commencing and will continue until earthworks are completed.
- Air Quality Assessments (Landfill Gas) will be undertaken utilising existing LFG bores on site monthly above known landfill and all bores quarterly, on and off site quarterly and within active disturbed areas daily and weekly.
- Airborne asbestos will be tested when asbestos is being disturbed.

1.1 Conceptual Site Model

A Conceptual Site Model (CSM) which considers the findings and uncertainties and data gaps is presented in Appendix A taken from Thuroona Services DSI (2024).

1.1.1 Known and Potential Sources of Contamination

Identified known and potential sources of contamination include:

On site: Uncontrolled construction and demolition waste containing concentrations of various metals and metalloids, asbestos, petroleum hydrocarbons and PFAS.

Off site: none identified.

1.1.2 Potential Chemical of Concern

PCoC were determined based on the findings of detailed earlier investigations (Thuroona Services, 2024):

Table 1: Potential Chemicals of Concern and Location.

Potential Chemicals of Concern	Rationale	Associated Areas
Groundwater		
Contaminants associated with uncontrolled construction and demolition waste: - Total Dissolved Solids (TDS) including nutrients (nitrate, total nitrogen and phosphorous). - Total Recoverable Hydrocarbons (TRH). - Benzene, Toluene, Ethylbenzene and Xylene (BTEX). - Polychlorinated biphenyls (PCB). - Dissolved heavy metals and metalloids: aluminium, arsenic, barium, cadmium, chromium, copper, iron, manganese, mercury, nickel and zinc. - Per- and poly-Fluoroalkyl substances (PFAS).	Encountered during earlier sampling programs and investigations. To characterise groundwater and dust suppression water.	Within the extent of the old landfill and downstream thereof. With water to be used for dust suppression.
Soils		
Contaminants associated with uncontrolled construction and demolition waste: - Asbestos. - Total Recoverable Hydrocarbons (TRH). - Benzene, Toluene, Ethylbenzene and Xylene (BTEX). - Heavy metals and metalloids: aluminium, arsenic, barium, cadmium, chromium, copper, iron, manganese, - Per- and poly-Fluoroalkyl substances (PFAS).	Encountered during earlier sampling programs and investigations. To validate future residential soil quality soil quality.	Within the residential strip post stripping/removal of in-situ landfill waste and within mined sand to be used as residential fill.
Dust		
Particles as PM ₁₀	To ensure dust generated is managed during disturbance	Around the site to capture changing wind directions.
Landfill Gas		
Standard LFG parameters: O ₂ , CO ₂ , CH ₄ , H ₂ S, CO and LEL	To validate air quality.	On and Off site during site works and within excavations during site disturbance.
Airbourne Asbestos Fibres		

Potential Chemicals of Concern	Rationale	Associated Areas
Asbestos Fibres	To ensure works are not releasing asbestos fibres and that management controls are appropriate to minimise risk.	Around the working area and on key personnel.

1.1.3 Contaminant Transport

Considering historical, current and future operations, contaminant transport mechanisms are limited to:

- Vertical infiltration through the permeable landfill material (albeit somewhat compacted due to the age of the landfill, 30 years, and capped with silty sand).
- Vertical and lateral migration through the vadose zone to and along the groundwater gradient in the saturated zone in the unconfined superficial aquifer.
- Wind: vapours and dust.
- In-situ soils.

1.1.4 Sensitive Receptors

Lot 20 is currently vacant, sensitive receptors (temporary and long term) are limited to in situ groundwater and groundwater that may be impacted by lateral migration in a north-north westerly direction, air quality (dust, LFG and Airbourne asbestos fibres) to surrounding residents and site personnel and soil impacts to site personal.

Relevant to a decision pertaining sensitive receptors are:

- With respect to groundwater:
 - The closest surface waterbody appears to be Helena River, almost 4 km to the east. However, groundwater flow has been measured to be to the north-northwest. Therefore the impacts to waterbody's is deemed negligible.
 - Groundwater will not be used for potable purposes post-development because the site will be connected to scheme water.
 - Future residents could access groundwater for residential irrigation and other non-potable domestic uses (deemed unlikely due to the size of potential Lots).

Consistent with Department of Health (DoH, Healthy WA) advice bore water should never be used for drinking, bathing, watering edible plants, filling swimming and paddling pools, food preparation or cooking unless it has been tested and treated to the extent necessary for the intended use.

This SAQP aims at determining groundwater quality ahead of earthworks and larger groundwater/landfill gas considerations that will be made post stage 1 of the development Rap (Abacus Environmental 2025).

- With respect to soil/air (LFG and airborne asbestos fibres):
 - Impacts to surrounding stakeholders and site personnel. Dust and asbestos will be minimised and monitored through the implementation of the CEMP (PES, 2026).

1.1.5 Data Gaps and Uncertainties

Groundwater quality was last determined in 2024 hence there is no uncertainty whether the PCoC are still present, have they decreased or increased in concentrations.

Soil quality will be determined to ascertain the vertical and lateral impacts beneath former landfilling.

LFG risk has not been adequately quantified at the site. The initial investigation (Core 2024) identified the risk of LFG on site is likely low but the risk if LFG has not been adequately characterised on the site boundaries. The earthworks to be undertaken as part of Stage 1 works will also likely change the potential pathways for LFG migration.

1.2 Sampling Objective

The objectives of this SAQP are to:

- Undertake an appropriate level of sampling and analysis to ascertain the current quality of groundwater and the concentrations of PCoC in groundwater and to ascertain whether groundwater quality improved or deteriorated since the last sampling event and through site works.
- Undertake an appropriate level of sampling and analysis to ascertain the conditions of soil beneath former landfilling and soil quality of fill to be used within the residential strip.
- Undertake an appropriate level of sampling and analysis to ascertain the risk of LFG parameters for site workers, to ascertain whether LFG quality improved or deteriorated since the last sampling event and through site works and the post development LFG risk to the residential strip.
- Undertake an appropriate level of sampling pertaining to air quality (dust and airborne asbestos) to ensure the risk profile to stakeholders hasn't changed and that management controls are appropriate and being appropriately applied.
- Provide accurate data upon which to assess the potential risk to human health and the environment based upon the current and future land use and exposure scenarios.

2. Data Quality

It is intended that sampling will provide data of sufficient rigour and integrity to:

- Provide information regarding the presence/absence of PCoC in groundwater, LFG and retained residential soils.
- Ascertain the completeness of potential exposure routes identified in the CSM (Appendix A).

Data quality indicators and associated evaluation criteria presented in Table 2 have been established to ensure achievement of the above objectives.

Table 2: Data Quality Indicators and Evaluation Criteria.

Data Quality Indicators	Evaluation Criteria
Documentation and data completeness.	Site conditions and characteristics accurately defined. Sampling locations accurately surveyed and documented. Sampling techniques aligned with relevant industry and regulatory guidelines. Field Quality Assurance and Quality Control (QA/QC) methods undertaken and accurately documented. Sufficient photographic and written evidence gathered. Samples obtained from areas of concern and justification documented.
Data comparability.	Use of appropriate techniques for sampling, storage, documentation and transport of samples. Use of a National Association Testing Authorities (NATA) accredited laboratory for all sample analysis. Undertake appropriate QA/QC Data Validation on field and laboratory data.
Data representativeness.	Obtain a sufficient number of samples at each sample location to allow confidence in conclusions drawn regarding groundwater conditions. Obtain samples from all pertinent areas of Lot 20 Adelaide Street.
Precision for Sampling and Analysis.	Use of suitably qualified and experienced personnel. Obtain field QA/QC samples in compliance with relevant regulatory guidelines and standards. Assessment of Relative Percentage Differences (RPDs) between primary, duplicate and triplicate samples and highlight any exceedances of the acceptance criteria ($\geq 50\%$). Exploration of any non-conformances highlighted during assessment and validation including assessing of whether the data is acceptable considering the non-conformance.

2.1 Limitations on Sampling

Limitations on groundwater and LFG sampling pertain to the utilisation of existing bores. Should a bore be damaged, inaccessible or damaged additional bores are to be installed (utilising the appropriate previously auditor endorsed SAQP) to maintain the integrity of the sampling network.

Soil sampling is limited to chemical and metal instances. Virgin sand from site will be sourced to be used as fill and so as such will not contain construction and/or demolition waste, therefore asbestos fragments and free fibres will be absent. Furthermore, the stripping of soils will be undertaken across the residential

strip to a level beneath the uncontrolled fill utilising controls developed in the CEMP (Pendragon Environmental 2026). The absence of deleterious material will be confirmed with a visual inspection (of both quarried sands to be used as fill and with the residential strip) prior to filling/use of fill during sampling for chemical of concern.

Soil sampling is also not proposed to be undertaken within the proposed industrial area as the uncontrolled fill will be left in-situ, cobbles created during earthworks will be placed as per the RAP (Abacus Environmental 2025) which will all be covered with a geofabric and a capping layer of clean fill.

2.2 Assessment Levels

Groundwater assessment levels are set in accordance with:

- Table 1C Groundwater Investigation Levels (GILs) for Fresh Water [ASC NEPM] which apply to *typical slightly-moderately disturbed systems* i.e. a 95% species protection level and appendix D Assessment Levels for Water Table D1: Selected Assessment Levels for Water, Relevant to Beneficial Use – Short- and Long-Term Irrigation Water.
- Contaminated Sites Ground and Surface Water Chemical Screening Guidelines (DoH, 2025).
- PFAS NEPM (HEPA, 2025).
- The 2025 updated NHMRC health-based guideline values for PFAS in the National Health and Medical Research Council (NHMRC), 2011: Australian Drinking Water Guidelines Paper 6 (Version 4.0, updated June 2025):
 - Perfluorooctane sulfonic acid (PFOS): 8 nanograms per litre or 0.008 µg/L.
 - Perfluorooctanoic acid (PFOA): 200 nanograms per litre or 0.2 µg/L.
 - Perfluorohexane sulfonic acid (PFHxS): 30 nanograms per litre or 0.03 µg/L.
 - Perfluorobutane sulfonic acid (PFBS): 1,000 nanograms per litre or 1 µg/L.

Soils will be assessed against the National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM) investigation/screening levels. Exposure to soils is expected to be limited within the proposed land use, hence, the more conservative *Residential A* levels, which are based upon *garden/accessible soil (home grown produce <10% fruit and vegetable intake and no poultry)* will be applied. Soil quality data will therefore be assessed against the relevant tables in the ASC NEPM and particularly the Health Investigation Levels (HIL's for Residential A) and Ecological Investigation Levels (EIL's for Urban, Residential and Public Open Spaces) in Tables 1A and 1B.

Asbestos will be assessed using the Department of Health (DOH), 2021. Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

The Western Australian guideline Assessment and Management of Contaminated Sites (DWER, 2021) states that the ASC NEPM does not provide specific guidance on the assessment of ground gases and that for ground gas assessments in Western Australia, the same broad approach outlined in the DWER guideline and ASC NEPM, including the development of a SAQP, Conceptual Site Model (CSM) and data evaluation, should be followed. The assessment should adequately characterise the nature and extent of contamination, including site-specific worst-case scenario conditions, so that current and future gas generation trends, migration and accumulation can be reasonably predicted, assessed and managed. The DWER guideline also advises that the following document has detailed guidance on assessing ground gases: Assessment and Management of Hazardous Ground Gases, Contaminated Land Guidelines (NSW EPA, 2020), hence this document will be used as the primary guidance for this

LFG (bore) investigation. This guideline is considered appropriate as it contains recent guidance, prepared by a competent Australian jurisdiction and draws upon contemporary international knowledge from other competent authorities including the Construction Industry Research and Information Association (CIRIA) based in the United Kingdom. If necessary, additional guidance, e.g. the guideline Assessing Risks posed by Hazardous Ground Gases to Buildings (CIRIA, 2007) will be obtained. LFG assessments undertaken daily and weekly of disturbed soils will be undertaken in line with EPAV Publication 1684.

2.3 Decision Rules

If there are contaminants with concentrations above the assessment levels indicating the presence of PCoC, then the site will be regarded as *possibly contaminated*. Further assessment will be undertaken to quantify the vertical and lateral extent of contamination and to allow a Tier 2 Risk Assessment to be undertaken.

2.4 Sampling Media

Groundwater requires further investigation and assessment:

Table 3: Sampling Media.

Media	Sampling Required		Rationale
	Yes	No	
Groundwater	x		Assess concentrations, and lateral extent and potential of migration of PCoC from historic landfill operations. Provide groundwater quality data sufficient to meet DQOs and close out current uncertainty regarding groundwater quality.
Surface water		x	There are no surface water expressions on Lot 20 Adelaide Street.
Air Quality	x		Assess dust, airborne asbestos fibres and LFG to ensure contamination profile and risk isn't changed during site works.
Soil	x		Assess concentrations, and lateral of PCoC from historic landfill operations. Provide soil quality data sufficient to meet DQOs and close out current uncertainty regarding residential suitability.

3. Sample Design and Analyte Selection - Groundwater

Groundwater sampling will be undertaken in accordance with the relevant guidelines (Australian Standard AS/NZS 5667.11 and Schedule B2, ASC NEPM).

Sampling of Soils will be undertaken in accordance with Schedule B2 of the ASC NEPM, Australian Standard AS/NS 4482.1-2005, CRC Care Technical Report 11 (Clements *et al.*, 2009) and internal sampling procedures.

3.1 Analyte Selection

Analytes were selected taking due cognisance of previous investigations and to facilitate an appropriate chemical characterisation of groundwater at Lot 20 Adelaide Street.

The choice of groundwater analytes for this investigation is:

- pH, electrical conductivity (EC), total dissolved solids (TDS), alkalinity, calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), fluoride (F), sulphate (SO₄), nitrate, nitrite, ammonia, reactive phosphorus, total phosphorus, total nitrogen and total kjeldahl nitrogen.
- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX).
- Polycyclic aromatic hydrocarbons (PAHs).
- Dissolved heavy metals and metalloids: aluminium (Al), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), vanadium (V) and zinc Zn).
- Per- and poly-Fluoroalkyl substances (PFAS).

3.2 Sample Locations

Samples of groundwater (Figure 2 and Table 4) will be obtained from existing bores (MW1 – MW6) with due consideration of groundwater gradients and the north-westerly regional flow direction and the staged development.

Table 4: Locations of Groundwater Monitoring Bores (Figure 2).

Bore ID	Location	Easting	Northing	Profile Description	Height RL (m)
MW1	Southwestern boundary	406504.04	6467036.79	0-2m yellow sand 2-4m yellow sand/brown clay 4-6m red clay	27.281
MW2	South centre of site	406693.90	6466947.24	0-3m yellow sand 3-7m red clay 7-9.5m Coarse sand	30.607
MW3	Southeastern boundary	406997.15	6466823.35	0-2.5m yellow sand 2.5-7m brown clay 7-11m red clay 14-14.5m coarse sand	34.622

MW4	Northwestern boundary	406617.75	6467311.73	0-4m brown clay 4-5.5m fine sand 5.5-7m coarse sand 7-10m red clay	27.751
MW5	Centre north boundary	406731.40	6467262.78	0-3m brown clay 3-4m fine sand 4-6m coarse sand 6-11m red clay	29.034
MW6	Northeast boundary	406998.45	6467183.20	0-2.5m brown clay 2.5-3.5m fine sand 3.5-5m coarse sand 5-9m red clay	31.611

Inferred hydraulic characteristics:

Landfill/Fill material: around 20m/day, albeit variable is considered highly permeable.

Clean sand fill (at least 1.2m thick) placed/to be placed across all residential lots: around 5m/day.

Lower fill (between 1.2m and 2.5+m below surface; average 1.2m) comprising compacted screened landfill material: between 0.1m/day and 0.2m/day.

The natural clayey sand at the base of the landfill and across the site: 0.001m/day, practically impermeable.

Literature Searches:

The Guildford Formation in Perth, Western Australia, is characterized by a range of hydraulic properties depending on the specific lithology (clayey sand, sand, or clay). Hydraulic conductivity, a measure of how easily water flows through a material, varies significantly. For example, clayey sands within the formation can have a hydraulic conductivity of 0.01 to 0.21 m/day, while sands can range from 4.53 to 9.33 m/day. The formation also acts as a confining layer for the superficial aquifer, with ephemeral aquifer systems often perched on top of it.

GHD, 2015: Water Corporation Balannup Sewer Pressure Main Anstey-Keane Dampland Hydrological Assessment:

- Hydraulic conductivities were determined through in-situ testing of the surficial sands using a Guelph (constant-head) permeameter, rising head tests of both existing and newly installed monitoring bores and empirical estimates from particle size distribution. The ranges in estimated hydraulic conductivity summarised below indicate an order of magnitude differences between and within the various sand and clayey sand units:
 - Bassendean Sand: 3.7m/day to 13.8m/day.
 - Guildford Formation clayey sand: 0.01m/day to 0.21m/day.
 - Guildford Formation sand: 4.53m/day to 9.33m/day.

3.3 Frequency of Sampling

The spatial boundaries are the perimeters of site (Figure 1) whilst the temporal boundaries pertain to earlier sampling events, proposed sampling events will be quarterly during construction of Stage 1 scheduled for 2026.

3.4 Groundwater Sampling

Groundwater sampling will be undertaken in accordance with the requirements of the Australian Standards AS/NZS 5667.11:1998.

Groundwater levels will be measured with an interface probe and recorded prior to purging/sampling with a low-flow pump (alternatively a PFAS compatible bailer if bore yields are too low) whilst measuring and recording of temperature, pH, electrical conductivity, total dissolved solids, dissolved oxygen and redox potential at regular intervals using a calibrated in-line water quality analyser. At least five bore volumes will be discharged prior to sampling and only once field water quality parameters do not vary by more than 10 per cent.

Groundwater will be discharged into sterile new sampling containers provided by the NATA accredited Australian Laboratory Services (ALS). Samples for dissolved metals will be field filtered through a new disposable sterile syringe, one at each location to avoid cross-contamination and sterile nitrile gloves will be worn by the sampler and will be changed between each location.

Samples will be placed immediately in a chilled (4°C) insulated cooler and submitted to ALS Laboratories (primary laboratory) and MPL Laboratories (secondary laboratory) for analysis as soon as possible after obtaining these samples.

Decontamination procedures for reusable equipment that comes into contact with water (the interface probe), to prevent cross contamination between sampling locations, will be the same for all analytes, and will entail decontamination by thorough rinsing with deionized bottled water then immersed in Liquinox followed by a final rinse.

The disposable tubing used for the low flow pump, will not be decontaminated as it will be replaced between sample points. The water quality analyser will not be part of the sample train but will be used to assess when water quality parameters during purging stabilised hence it is not considered a source of potential cross contamination and does not require decontamination.

3.5 QA/QC Samples

In addition to the primary samples, QA/QC samples will be obtained to assess aspects of field protocols and laboratory performance, and to ensure the representativeness and validity of the data set. QA/QC samples will include:

- One blind replicate (field duplicate) sample: to identify the variation in analyte concentrations between samples from the same location and/or the repeatability of laboratory analysis marked such that there is no indication of duplication.
- One split (field triplicate) sample: to ascertain analytical proficiency of laboratories.
- One trip blank for each insulated cooler: to identify potential contamination during sample handling, storage, and transportation.
- One rinsate sample from the interface probe: to confirm that sample equipment decontamination procedures are sufficient.

3.6 Reporting of Groundwater Results

Results will be provided in the quarterly monitoring report to track trends and confirm suitability and will be detailed in the remediation validation report.

4. Site Water Dust Suppression Sampling

A central bore has been selected to be used to source water on site to be utilised for dust suppression (Figure 2). Water will be pumped as needed from the bore using into storage containers to gravity feed water trucks. To confirm the suitability of this water an initial test will be performed prior to works commencing and repeated monthly throughout earthworks.

Samples will be collected monthly directly from the container and deemed representative of water used.

Water will be collected into sterile new sampling containers provided by the NATA accredited Australian Laboratory Services (ALS). Samples for dissolved metals will be field filtered through a new disposable sterile syringe and sterile nitrile gloves will be worn by the sampler and will be changed between each location.

The choice of analytes for this investigation is:

- pH, electrical conductivity (EC), total dissolved solids (TDS), alkalinity, calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), fluoride (F), sulphate (SO₄), nitrate, nitrite, ammonia, reactive phosphorus, total phosphorus, total nitrogen and total kjeldahl nitrogen.
- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX).
- Polycyclic aromatic hydrocarbons (PAHs).
- Dissolved heavy metals and metalloids: aluminium (Al), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), selenium (Se), vanadium (V) and zinc Zn).
- Per- and poly-Fluoroalkyl substances (PFAS).

4.1 Reporting of Site Water Dust Suppression Results

Results will be provided in the monthly monitoring report to track trends and confirm suitability and will be detailed in the remediation validation report.

5. Sample Design and Analyte Selection - Soils

5.1 Soil Sampling Methodology

Soil sampling will be undertaken in accordance with DWER 2021 Contaminated Sites Guidelines; Schedule B2 of the ASC NEPM (2013); Guideline for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (DoH, 2021) and the field operating practices and procedures detailed in the Pendragon Environmental Solutions Sampling Protocol Plan.

Soil profiles with relevant descriptive information and observations (staining and odour, waste and ACM) will be recorded on appropriate standard field logging sheets, using the unified soils classification system. Sample locations will be photographed and coordinated with a GPS.

Insulated coolers will be security sealed and transported to the NATA accredited laboratories, ALS and Eurofins/ARL, for analysis within analyte holding times.

5.2 Analyte Selection

Soil analytes have been selected based upon CoPC identified in previous investigations, the CSM, taking due cognisance of the findings of guidance provided in pertinent regulatory guidelines and the professional experience of Pendragon Environmental Solutions. The choice of analyte is generally based on the location of the sample and the likely potential contaminants from previous potentially contaminating land uses and activities.

It is therefore proposed to analyse samples within the residential strip and within excavated fill sand for the following:

- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX).
- Polycyclic aromatic hydrocarbons (PAHs).
- Heavy metals and metalloids: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), zinc, (Zn) and mercury (Hg).
- Per- and poly-Fluoroalkyl substances (PFAS).

5.3 Sample Locations/Density

The residential strip including the sand mining area will be treated as one area as shown in figure 3. The area is approximately 5 hectares in size and will be sampled at regular intervals to ensure a minimum of 55 samples plus QA/QC are achieved in line with NSW (2022) sample design guidance. To achieve this the available area for validation will be gridded to ensure an appropriate spread of samples.

Sand excavated on site is to be used as fill across the residential strip and to create a protective berm. The sand will be excavated from areas outside of historic landfilling and will be stripped to natural sand and visually assessed prior to excavation and stockpiling. Stockpiles will be created up to 100m³, once created stockpiles will be visually assessed for waste and ACM and then sampled at the rate described in table 5:

Table 5: Sampling Density for Validation of Capping Material

Sampling density for validation of capping material			
Material (m ³)	Sampling Required		
	Frequency (m ³)	Suite 1 (%)	Suite 2 (%)
0-500	1/50	100	10
500-1,000	1/100	100	10
1,000-5,000	1/250	100	10
5,000-9,000	1/500	100	10
Suite 1 = asbestos, TRH, PAH and Heavy metals Suite 2 = PFAS			

5.4 Sampling Methodology

Soil samples will be collected using a surface grab method following stripping in the residential strip. Soil samples will be collected directly into the laboratory provided sampling jars from a depth of 10cm below the surface.

Stockpile sampling of excavated sand will be undertaken following a visual assessment where the stockpile is assessed for visual differences/indicators of contamination. Samples will then be collected directly into the laboratory provided sampling jars.

Directly adjacent to all sample points (within 10cms) a grab sample will be taken to ascertain the presence of volatile hydrocarbons with a PID.

5.5 Frequency of Sampling

Sampling will be undertaken periodically through the residential clearing strip as areas become available. Stockpiles of excavated sand will be assessed when requested (i.e. when there is enough sand to warrant). The intention will be to regularly validate sand to enable backlogs to not occur being mindful of laboratory turn around times.

The spatial boundaries are the perimeters of site (Figure 1 and 3) whilst the temporal boundaries pertain to earlier sampling events, proposed sampling events will be dependent upon extent of earthworks completed during construction of Stage 1 scheduled for 2026.

5.6 QA/QC Samples

In addition to primary samples, QA/QC samples will be obtained to assess aspects of field protocols and laboratory performance, to ensure the representativeness, precision and validity of the data set. QA/QC samples will include:

- Blind replicate (field duplicate): to identify the variation in analyte concentrations between samples collected from the same location and/or the repeatability of laboratory analysis. Blind replicates will be collected at a frequency of one for every ten primary samples (3) (individual samples will be marked such that there is no indication of duplication).

- Split (field triplicate): to ascertain analytical proficiency of laboratories. Split samples will be collected at a frequency of one for every ten primary samples (3).
- Rinsate: to confirm that sample equipment decontamination procedures are sufficient. One rinsate will be collected for each piece of equipment where cross contamination from sampling is possible.
- Transport blank: to determine the amount (if any) of contamination introduced during the transport and storage of samples from the time of sampling until analysis. Transport blanks will be collected at a frequency of one per esky used.

5.7 Reporting of Soil Results

Results will be provided in the monthly monitoring report to track trends and confirm suitability and will be detailed in the remediation validation report.

6. Sample Design and Analyte Selection - LFG

6.1 Multiple Lines of Evidence Approach

The following multiple lines of evidence when captured are considered sufficient to develop the assessment of landfill gas risk:

- Review of the ground and material composition at the site.
- Review of the topography, geology and hydrogeology with respect to potential lateral migration.
- Review of all collected discrete gas monitoring data.
- Review of total organic carbon in soils.
- Review of all collected monitoring data.
- Review of historical data collected at the site.
- Gas balance assessment.

6.2 LFG Sampling Plan

LFG sampling will be undertaken at existing on/off site bores (Figure 4), around current excavations/trenches and in active disturbed areas.

Daily prestart atmospheric checks where soil is being disturbed. All results will be recorded on the daily field sheet (PES 2026, CEMP).

Weekly monitoring will be undertaken using a grid system across the working exposed areas with samples taken continuously on transects spaced 10m apart extending 5m outside of the exposed area at a height of 50mm and recorded on the weekly field sheet (PES 2026, CEMP).

Monthly monitoring we would use the existing network of bores above in-situ landfill (bores LFG01, LFG02, LFG03, LFG05, LFG06 and LFG08) to assess gas conditions. All results will be recorded on the monthly field sheet (PES 2026, CEMP).

Quarterly monitoring will be undertaken using the existing network of onsite and offsite bores to assess gas conditions. All results will be recorded on the quarterly field sheet (PES 2026, CEMP).

6.3 LFG Bore Sampling Plan

Assessment of the LFG bore measurements will involve a semi-quantitative assessment following the procedure for a Level 2 risk analysis (NSW EPA, 2020). The risk analysis will calculate a gas screening value (GSV) based on the flow rate and the maximum gas concentration for methane and carbon dioxide:

$$\text{GSV (L/hr)} = \text{Maximum borehole flow rate (L/hr)} \times \text{maximum gas concentration (\% v/v)}$$

The GSV value will be used to determine the Characteristic Gas Situation (CS) based on the worst-case GSV determined for either methane or carbon dioxide. The CS will be determined based on the criteria detailed in Table 6.

Table 6: Criteria for Determining the Characteristic Gas Situation Value.

GSV Threshold (L/hr)	CS	Risk Classification	Additional Factors
<0.07	1	Very low risk	Typically, methane <1% v/v and/or carbon dioxide <5% v/v; otherwise consider increase to CS 2.
<0.7	2	Low risk	Borehole flow rate not to exceed 70 L/hr; otherwise consider increase to CS 3.
<3.5	3	Moderate risk	-
<15	4	Moderate to high risk	Consider need for Level 3 risk assessment.
>70	5	High risk	Level 3 risk assessment required
<70	6	Very high risk	
1. The CSM identifies the source of gas and its generation potential.			
2. Soil gas investigations will be conducted in accordance with the guidance provided in Section 3.4 (NSW EPA, 2020).			
3. Where there is no detectable flow, the lower measurement limit of the instrument will be used.			
4. To determine a GSV of <0.07, an instrument capable of accurately measuring concentrations to 0.5% v/v and flow to 0.1 L/hr will be used.			

In addition to the risk analysis screening the concentrations of gases and the Lower Explosive Limit (LEL) reported for each monitoring site will be reviewed. The review will adopt the following action levels to ascertain the gas risk and landfill gas conditions:

Table 7: Gas Action Levels.

Risk	Level	Reference
Methane concentration in subsurface geology at the landfill boundary	1.0 % v/v	EP Act (2021) and (EPA VIC 2015)
Carbon dioxide concentration in subsurface geology at the landfill boundary	1.5 % v/v above background.	Action Level (EPA VIC 2015)
Landfill surface final cap	100 ppm (methane)	
Lower explosive limit (LEL) for methane in air	1 %v/v (set at 20% of reference value)	NSW EPA (2020)
Upper explosive limit (UEL) for methane in air	3 %v/v (set at 20% of reference value)	
Carbon monoxide	30 ppm Time-Weighted Average (TWA)	Safe Work Australia, 2024
Hydrogen sulphide	10 ppm TWA	Safe Work Australia, 2024

Results from monthly, weekly and daily field testing will be report within the monthly update tracking

report, with a detailed analysis in the quarterly report and included in the final remediation validation report.

6.4 LFG Bore Sampling Methodology

Monitoring will be carried out in accordance with EPA VIC Publication 1684 (2018), which provides a prescriptive procedure for both subsurface monitoring and surface emission monitoring.

6.4.1 LFG Monthly/Quarterly Sampling Methodology

Monitoring events will be scheduled to be undertaken monthly (bores LFG01, LFG02, LFG03, LFG05, LFG06 and LFG08) and quarterly (All available bores):

- The interval between monitoring events will depend on meteorological conditions, particularly atmospheric lows which facilitate conditions conducive to landfill gas movement. Due cognisance will be given to available atmospheric data (<https://barometricpressure.app/perth>) to ascertain prevailing low-pressure conditions. Measurements will be taken during low atmospheric pressure conditions and/or within falling atmospheric pressure. Following sampling hourly BOM barometric pressure data will be sourced from the Perth Airport Station No 009021 which is about 2.5km to the west of the site. This data will be utilised along with the site-specific data generated from the weather station to ensure that the 5th percentile three-hour pressure decreased (ascertained from the previous 2 years of data from {the Perth Airport data station}) has been captured during some of the monitoring events.

The methodology adopted for this LFG investigation is consistent with current guidance:

- Monitoring in the field will be using a Geotech GA5000 (or similar) portable infra-red gas analyser with internal flow pod (or equivalent) and PID (ppm-range) for the following parameters:
 - Methane - % LEL *To convert percent Lower Explosive Limit (%LEL) to percent by volume (%v/v),*
Divide by 100: Turn your %LEL reading into a decimal (e.g. 20% becomes 0.20).
Multiply by the "Full Scale": Multiply that decimal by the volume concentration that equals 100% LEL for that specific gas.
For Methane, since 100% LEL = 5% v/v: 10% LEL = 0.10 times 5% = 0.5% v/v.
100% LEL = 1.00 times 5% = 5.0% v/v.
 - Carbon dioxide - %v/v
 - Oxygen - %v/v
 - Carbon monoxide - ppm
 - Hydrogen sulphide - ppm
 - Balance gas - %
 - Atmospheric and relative well pressure - mb
 - Gas well flow – L/hr
 - Volatile Organic Compounds (VOCs) - ppm
- The calibrated gas analyser will be handled in strict accordance with the instructions of the manufacturer.

- The gas analyser will have pressure transducers zeroed and gases checked and field calibrated as required prior to any monitoring
- The integrity of the wells will be documented prior to monitoring.
- The gas analyser will be turned on and the flow rate checked to be zero (i.e. the pump remains switched off).
- An ambient air reading will be collected prior to monitoring at each location to assess the ambient gas levels in the vicinity of the bores and structures.
- Differential pressure and flow will be undertaken prior to turning on the gas analyser pump and before any gas readings.
- The gas analyser will be connected to the quick fit connection on the vapour cap.
- The pump for the gas analyser will then be switched on, the pressure transducer will be zeroed and measurements for O₂, CO₂, CH₄, H₂S, CO and LEL will be taken every 30 seconds. If the monitored gas concentrations have not reached a stabilised concentration after three minutes of continuous sampling, record the gas concentrations at three minutes, along with the direction and rate of change in concentration (increase or decrease in % v/v over a regular period such as 30 seconds), and note them as non-stabilised final readings. If very high HGG concentrations are recorded on the instrument (>30% v/v methane and/or 30% v/v carbon dioxide), then monitoring of the bore should be extended beyond three minutes (up to 10 minutes) to try to further assess the persistence of the gas detected within the well.
- Whilst sampling the PID (ppm-range) will then be used to measure the VOCs over a minimum period of three minutes. PID readings will be taken from the exhaust of the GA5000 unit.
- All gas and vapour concentrations will be recorded until stabilisation, and a summary of steady state, peak and/ or low concentrations will be recorded as per EPA VIC Publication 1684 (2018) and CIRIA C665 (2007) requirements.
- Readings for the flow rate, differential pressure and atmospheric pressure will be taken instantly, after sampling, these values indicate the gas flow rate.
- The gas analyser will be disconnected from the vapour cap.
- The meter will be purged (back to zero/ atmospheric conditions and if cannot be purged to this appropriate field calibration should be undertaken and recorded) in open air until ambient readings are obtained to ensure no cross contamination with subsequent measurements and then switch off.
- Any field observations will be noted e.g., moisture in sampling tubes (pre- and post-HGG monitoring) and depth to water within bore if present.
- All measurements will be included in a detailed LFG monitoring record and assessed for appropriateness, including for trends in LFG concentrations.

6.4.2 LFG Weekly Sampling Methodology

Surface emission screening of methane concentrations will be undertaken using a category 2 TDL-500 laser spectrometer (or similar) in line with the methodology set out in EPA VIC Publication 1684 (2018). This is proposed to include surface emissions monitoring:

- Prior to the commencement of monitoring, the following details will be recorded: site identification, start time of the monitoring, date, atmospheric pressure, prevailing weather and recent weather conditions, current ground conditions, instruments used and serial numbers, person completing monitoring. Monitoring will be carried out under dry ground conditions where possible.

- The inspectra laser will be turned on at a location unlikely to be affected by LFG (or other air contaminants) to confirm the instrument is reading methane concentrations indicative of the prevailing background conditions. The background concentrations will be recorded in the appropriate documentation.
- Surface emissions will be monitored continuously along each transect at walking speed at a height of approximately 50 mm above the ground surface, or 50 mm surface. Data will be logged regularly at the intervals set out above.
- Surface emissions monitoring will divert from the grid to any penetrations or features of concern and any reading above action level will be recorded in addition to those at grid intersections.
- The unit used will deploy an audio and visual alarm should action levels be exceeded.
- Where observations (including landfill gas odours or bubbling through ponded water) suggest that significant landfill gas emissions are likely to lie off the transect being monitored, the transect will be diverted from to investigate these possible point sources. Any significant changes in weather during monitoring will be noted.
- Wind speed will be sourced from the on-site weather station for comparison.
- Results will be recorded, and locations of elevated methane (note that the EPA VIC (2015) Table 6.4 prescribes 100 parts per million (PPM) as the LFG Action Level, this assessment will record methane above background concentration in ppm) marked on a plan. Areas of elevated methane and aspects of interest will be marked on the ground (for example, with a stake or spray paint) and photographed, for easy relocation and further action if required.
- Once removed, the meter will be purged in open air until ambient readings are obtained to ensure no cross contamination with subsequent measurements and then switch off.
- All measurements will be included in a detailed LFG monitoring record and assessed for appropriateness, including for trends in LFG concentrations.

6.4.3 LFG Daily Sampling Methodology

The methodology for daily monitoring of potential methane concentrations in the active exposed surface soils will be undertaken using a category 2 TDL-500 laser spectrometer (or similar) in line with the methodology set out in EPA VIC Publication 1684 (2018). This is proposed to include surface emissions monitoring:

- Prior to the commencement of monitoring, the following details will be recorded: site identification, start time of the monitoring, date, atmospheric pressure, prevailing weather and recent weather conditions, current ground conditions, instruments used and serial numbers, person completing monitoring. Monitoring will be carried out under dry ground conditions where possible.
- The inspectra laser will be turned on at a location unlikely to be affected by LFG (or other air contaminants) to confirm the instrument is reading methane concentrations indicative of the prevailing background conditions. The background concentrations will be recorded in the appropriate documentation.
- Surface emissions will be monitored continuously along each transect at walking speed at a height of approximately 50 mm above the ground surface, or 50 mm surface. Data will be logged regularly at the intervals set out above.
- The unit used will deploy an audio and visual alarm should action levels be exceeded.
- Where observations (including landfill gas odours or bubbling through ponded water) suggest that significant landfill gas emissions are likely to lie off the transect being monitored, the transect will be

diverted from to investigate these possible point sources. Any significant changes in weather during monitoring will be noted.

- Wind speed will be sourced from the on-site weather station for comparison.
- Results will be recorded, and locations of elevated methane (note that the EPA VIC (2015) Table 6.4 prescribes 100 parts per million (PPM) as the LFG Action Level, this assessment will record methane above background concentration in ppm) marked on a plan. Areas of elevated methane and aspects of interest will be marked on the ground (for example, with a stake or spray paint) and photographed, for easy relocation and further action if required.
- Once removed, the meter will be purged in open air until ambient readings are obtained to ensure no cross contamination with subsequent measurements and then switch off.
- All measurements will be included in a detailed LFG monitoring record and assessed for appropriateness, including for trends in LFG concentrations.

6.5 Reporting of LFG Results

Daily, weekly and monthly results will be provided in the monthly monitoring report and all results within the quarterly report to track trends and confirm suitability and will be detailed in the remediation validation report.

7. Dust Monitoring

Monitoring of dust around site will be undertaken to confirm the effectiveness of site controls. Visual dust conditions and observations will be included in the daily environmental log along with weather conditions.

7.1 Dust Sampling Plan

Dust monitoring stations (6) are to be established and monitored by Pendragon Environmental Solutions (Figure 5).

Monitors will run 24 hours a day assessing PM10 concentrations. The trigger level of 50 $\mu\text{g}/\text{m}^3$ will be initially used consistent with NEPM guidelines.

A weather station will be set up at a single fixed location throughout to allow full assessment of results.

Dust reports will be detailed with the monthly update report tracking trends and exceedances and included within the final remediation validation report.

Alarms will be set up to notify nearby workers and SMS notifications will be set up to automatically notify the site manager and environmental consultant of the real time exceedance to allow mitigation measure to be enacted.

7.2 Reporting of Dust Results

Results will be provided in the monthly monitoring report to track trends and confirm suitability and will be detailed in the remediation validation report.

8. Airbourne Asbestos Fibre Monitoring

Limited asbestos was noted during test pitting and dumped asbestos sheeting at the surface will be removed prior to disturbance works to reduce risk. Therefore, the monitoring for the presence of airborne asbestos fibres will be undertaken during earthworks.

8.1 Asbestos Monitoring Strategy

During works along the future residential strip 'Step 1' (RAP, Abacus Environmental 2025 and Figure 1) and where uncontrolled landfill material will be excavated and placed within the commercial area due to the increased risk associated with disturbing material and closer proximity to residents', asbestos monitoring will be undertaken at flagged working areas as shown in Figure 6. The strategy is to have a monitor every 50m along the western and southern boundary and every 100m along the north and eastern boundary. To practically achieve this a working area will be established and monitors set up until that working area is completed. This will be undertaken daily throughout 'Step 2' (RAP, Abacus Environmental 2025) works. Personnel working with the material during monitoring periods will also be equipped with a monitor to assess exposure risk.

Boundary air quality monitors will be set up around material being stockpiled from the residential strip 'Step 2' (RAP, Abacus Environmental 2025).

During works spreading cobbles 'Step 5' (RAP, Abacus Environmental 2025) a similar strategy will be proposed where a working area is identified and flagged. Monitors will then be established every 50m along the western and southern boundary (on boundary with residents and in the direction downwind of warm summer dust generating winds coming from the east) and every 100m along the north and eastern boundary (low density boundaries). Monitors will be set up in line with the above, shown as an example in Figure 6.

Monitors will be utilised for the first two weeks of the commencement of works in this area and then for a working week every calendar month to confirm ongoing compliance. Personnel working with the material during monitoring periods will also be equipped with a monitor to assess exposure risk. Should elevated airborne fibre results dictate monitoring will be increased and working controls amended.

Should a latent discovery of asbestos be made then prior to works re-commencing a series of air quality monitors will be set up around the discovery at a rate of a monitor every lineal 50m (anticipated to be a 50x50m square) and with personnel working the material until the risk has deemed to have returned to the baseline with the ongoing risk and monitoring frequency reconsidered.

8.2 Asbestos Cowl Sampling Plan

Monitoring of airborne asbestos fibres will be undertaken in cognisance of the Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005) and Department of Health WA, Asbestos Contaminated Sites Guidelines (2021), whereby a calibrated single pump will be used to provide a suction rate of 1.9L/Min through a new laboratory supplied 0.8um 25mm cassette/cowl.

Prior to works commencing on site 5 air monitors are to be set up around the site (boundary corners

and centre of the site) for a 5-day period to ascertain background levels.

Used cassettes were collected during the working day and submitted weekly to a NATA accredited Laboratory.

8.3 Reporting of Airbourne Asbestos Results

Dust reports will be detailed with the monthly update report tracking trends and exceedances and included within the final remediation validation report.

9. Data Evaluation, Validation and Reporting

9.1 Data Evaluation and Validation

Strict field and laboratory QA/QC in accordance with the requirements of the Australian Standard AS4482.1:2005 and ASC NEPM, will be implemented prior to and adhered to throughout all sampling events. The data obtained from these events will be assessed and detailed in terms of an Analytical Data Validation process which will include field sampling records, Chain of Custodies (CoC's) and detailed laboratory analytical and QA/QC certificates.

The validation process will include a thorough review of field and laboratory data with reference to:

- Processes and/or methods that may interfere with the integrity of the samples.
- Cross contamination in sampling procedures.
- Interferences from preservatives.
- Interferences from laboratory processes.
- Accuracy and precision of laboratory results.

The validity of analytical data will be assessed by a critical review of all QA/QC processes and QC samples and their results in accordance with relevant guidelines and standards including a comparison with the stated DQO's and DQL's, taking due cognisance of documentation/data completeness, comparability, representativeness and the precision and accuracy of both sampling and analysis for each analyte with the objective to ensure that the data supports and achieves the objectives of the groundwater investigation and assessment.

Documentation, field notes and forms that will be completed and provided to the auditor for review include:

- Daily Inspection Form
- Weekly Inspection Form
- Monthly Inspection Form
- Groundwater Results
- Dust Suppression Groundwater Results
- Dust Monitoring Results
- Airbourne Asbestos Results
- Soil Results
- Photographs of site activities.
- Details and actions taken pertinent to any received complaints or incidents.
- Equipment calibration records provided by equipment suppliers will be retained and provided in the quarterly report and remediation validation report.

9.2 Reporting

Given stakeholder interest, sampling events will be reported by means of a monthly update report detailing all actions undertaken within that calendar month with formatted data to be provided to the

client and Environmental Auditors Australia. Monitoring data reported monthly (LFG, dust suppression groundwater results, dust monitoring results and airborne asbestos results and any soils results taken) along with a comment on latent discoveries. A quarterly report will be provided based on the monthly reports including groundwater results with a detailed examination of trends and high-level interpretation. This quarterly report will be compared to all previous results to enable changing environmental parameters to be tracked and trends identified as works commence.

A remediation validation report will be submitted after completion of Stage 1 civil works detailing actions undertaken, and outcomes received.

References and Bibliography

Abacus Environmental (2025) Remediation Action Plan (RAP), Lot 20 Adelaide Street, Hazelmere.

Australian Environmental Auditors (2025) Interim Mandatory Auditor's Report (IMAR), Lot 20 Adelaide Street, Hazelmere.

Core-EP, Landfill Gas Sampling and Analysis Quality Plan (SAQP): Lot 20 Adelaide Street, Hazelmere WA, 9 October 2023.

Core-EP, Landfill Gas Factual Update, 23 July 2024.

Department of Environment Regulation (DER), 2015. Assessment and Management of Contaminated Sites.

Department of Health (DOH), 2021. Guideline for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Department of Health Western Australia, 2025: Contaminated Sites Ground and Surface Water Chemical Screening Guidelines.

Department of Health: enHealth, Management of Asbestos in the Non-Occupational Environment, 2005.

Department of Water and Environmental Regulation, 2021: Assessment and Management of Contaminated Sites, activities regulated under the Contaminated Sites Act 2003, Contaminated Sites Regulations 2006 and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013).

DWER, Guideline: Assessment and management of contaminated sites, 16 June 2023.

Environmental Protection Act 1986.

EPA, 2008, Environmental Guidance for Planning and Development. Guidance Statement No.33.

Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres NOHSC:3003 (2005).

Guideline Environmental Guidance for Planning and Development (2005) published by the EPA Health (Asbestos) Regulations 1992

Heads of EPA Australia and New Zealand (HEPA), 2025: PFAS National Environmental Management Plan Version 3.0, Heads of EPA Australia and New Zealand 2025. CC BY 4.0.

MDW Environmental Services, Groundwater Monitoring Event #4, Lot 20 Adelaide Street, Hazelmere, reference E2012-031, 13 June 2013.

National Environment Protection Council: National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM).

National Occupational Health and Safety Commission Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018 (2005)]

National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002 (2005)]

National Occupational Health and Safety Commission, 2005. NOHSC Guidance Note on the Membrane Filter Method for Estimating Method Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

National Environment Protection Council (NEPC), 1998, National Environment Protection Measure for Ambient Air Quality

National Environment Protection Council, 2013: National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended in 2013: <https://www.nepc.gov.au/nepms/assessment-site-contamination>

National Environment Protection (Ambient Air Quality) Measure (2021).

National Environmental Protection Measure (NEPM), 1999. Assessment of Site Contamination.

National Health and Medical Research Council (NHMRC), 2011: Australian Drinking Water Guidelines Paper 6 (Version 4.0, updated June 2025) National Water Quality Management Strategy, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

NSW Environment Protection Authority (EPA), 2020: Assessment and Management of Hazardous Ground Gases, Contaminated Land Guidelines.

NSW Environment Protection Authority, 2022: Sampling design part 1 – application.

NSW Environment Protection Authority, 2022: Sampling design part 2 - interpretation

Parson Brinckerhoff, Site Investigation, Former Adelaide Street Landfill, Lot 20 Adelaide St, Hazelmere, Western Australia, reference 2145245A PR2:16644 Rev A, 20 July 2006.

Pendragon Environmental Solution, 2026. Construction Environmental Management Plan – Site Works, Lot 20 Adelaide St, Hazelmere.

Standards Australia AS/NZS 5667.1-1998: Water Quality Sampling, Part 1: Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.

Standards Australia AS/NZS 5667.11:1998: Water Quality – Sampling, Part 11: Guidance on Sampling of Groundwater.

Thuroona Services, Lot 20 Adelaide Street, Hazelmere, Remediation Action Plan – Earthworks Package, J21012 Rev A, DRAFT, 19 Dec 2023 a.

Thuroona Services b, Lot 20 Adelaide Street, Hazelmere, Detailed Work Plan, reference J21012 Ref B, DRAFT, 7 May 2024.

Thuroona Services c, Lot 20 Adelaide Street, Hazelmere, Detailed Site Investigation – Balance of Site, J21012 Rev C, DRAFT, 27 May 2024.

WA Occupational Safety and Health Act 1984

WA Occupational Safety and Health Regulations 1996

Figures

Figure 1: Site Location, Layout and Activities.

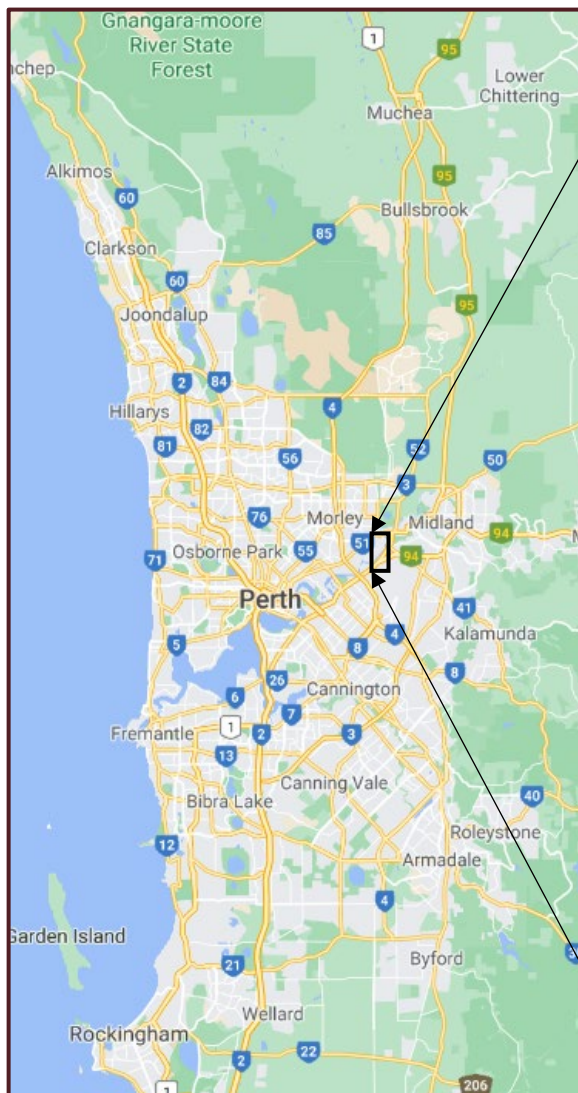
Figure 2: Groundwater Monitoring Locations.

Figure 3: Soil Validation Area.

Figure 4: LFG Monitoring Bore Network.

Figure 5: Fixed Dust Monitoring Location.

Figure 6: Airbourne Asbestos Fibre Monitoring Location Example.



Drawing Title: Site Location/Layout/Activities

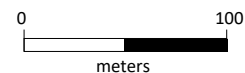
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Revision: 4, May 2026

Legend:

Notes:

Scale is approx.





Drawing Title: Groundwater Monitoring Locations

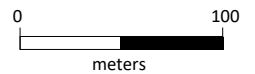
Figure Number: Figure 2

Revision: 4, May 2026

Legend:

MW1-x Water Monitoring Location

PDSB-x Proposed Dust Suppression Bore



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environmental solutions



Drawing Title: Soil Validation Area

Figure Number: Figure 3

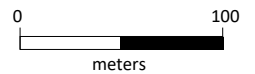
Revision: 4, May 2026

Legend:



Residential strip and sand mining area for validation

Dust Monitoring Location



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LEGEND:

- SITE BOUNDARY 
- LANDFILL GAS BORE OUTSIDE WASTE EXTENT 
- LANDFILL GAS BORE WITHIN WASTE EXTENT 

CLIENT:
THUROONA SERVICES

SITE:
LOT 20 ADELAIDE ST, HAZELMERE
WA 6055,

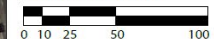
JOB NO.:
233065



FIGURE TITLE:
LFG BORE LOCATIONS



View Scale 1:2000 @A3



DRAWN BY: KJ	CHECKED BY: AG
DATE: 23/07/2024	SET: 01 REV: A

FIGURE 1

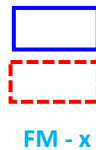
The information on this drawing is diagrammatic only and has been prepared from a variety of sources. Core Environmental Projects makes no representations or warranties, express or implied, as to the accuracy, completeness, or rights to the use of this information. This document is not to be used as a basis for any legal proceedings. This document shall not be used to create any liability or obligation to any party. The information contained herein is for informational purposes only.

Drawing Title: LFG Monitoring Bore
Network

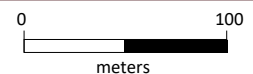
Figure Number: Figure 4

Revision: 4, May 2026

Legend:



FM - x





Drawing Title: Fixed Dust Monitoring Location

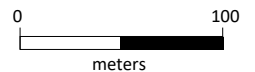
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Revision: 4, May 2026

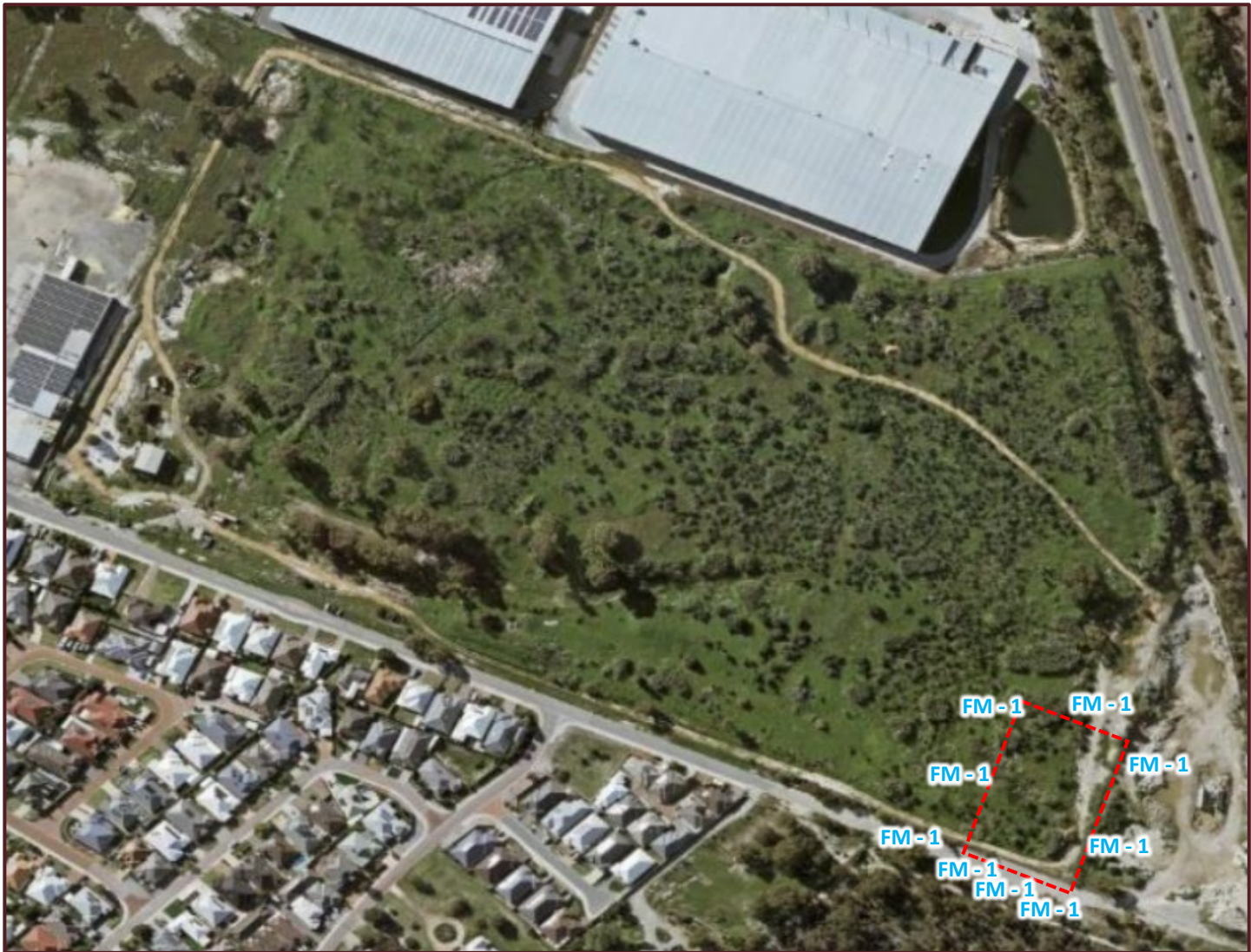
Legend:

DM-x Dust Monitoring Location

WS Weather Station



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Drawing Title: Airbourne Asbestos Fibre
Monitoring Location Example

Figure Number: Figure 6

Revision: 4, May 2026

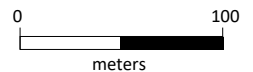
Legend:



Working Area Example

FM - 1

Example sample location



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Appendices

Appendix A: Conceptual Site Model.

Appendix A: Conceptual Site Model - Thuroona Services, 2025

CoPC	Plausible exposure pathways	Plausible receptors	Status of emission exposure pathway	
Source: Closed landfill				
Soil contamination - Asbestos - Metals - pH - Sulfides - Hydrocarbons - Phenols - Pesticides - Nutrients - Ammonia - PFAS - Medical waste	Wind erosion and dispersion due to soil fugitive dust emissions. ➤ Direct/secondary contact and/or uptake by receptors.	Future workers, residents or users of the site.	Complete – ACM Based on the investigation completed by PB (2006), concentrations of asbestos in soil are considered to pose a potentially unacceptable risk to human health and requires management during remediation works to be considered suitable for its proposed end use.	
		Off-site residents and sensitive receptors.	Potentially complete – PFAS Limited PFAS analysis has been completed on the fill soil associated with the closed landfill. Data suggests PFAS is compliant with PFAS in soil assessment criteria, however there is insufficient evidence to preclude PFAS as a CoPC from the landfill soils.	
		Onsite ecological receptors.	Potentially complete – other CoPC All other analytes (metals, sulfides, hydrocarbons, phenols, pesticides) investigated by PB (2006) were reported to be below the relevant adopted criteria and were considered to not pose a risk to human health or the environment. Guidelines have changed since the 2006 investigation and the dataset is considered insufficient to preclude these analytes as CoPC.	
		Off-site ecological receptors.		
	Ground gas - Hydrocarbon vapour - Methane	Vapour intrusion due to hydrocarbon impacted soils or land gas due to putrescible waste. ➤ Direct contact/uptake via inhalation by receptors.	Future workers, residents or users of the site.	Potentially complete – Vapour intrusion Hydrocarbon concentrations were not identified to exceed human health criteria in the Parsons Brinkerhoff (2006) investigations. It is considered unlikely that the investigation area will exceed relevant criteria, however given the limited investigations completed within the landfill portion of the site, it cannot be precluded. Potentially complete – Landfill gas It is unconfirmed whether putrescible waste was disposed of at the landfill site. No gas investigations have been completed within the closed landfill prior to or as part of this investigation and therefore cannot be ruled out as a potential risk to human health.
		Leaching into groundwater. ➤ Secondary contact via groundwater or surface water expression.	Off-site residents or recreational users.	Potentially complete – PFAS Limited PFAS investigations have been completed within the closed landfill, which formed part of the balance of site investigation conducted in 2023. PFAS in leachate exceeded the freshwater 99% species protection for high conservation value systems, however, did not exceed human health criteria or freshwater 95% and 90% species protection for slightly to highly disturbed systems. Further, the majority of PFAS concentrations were below LOR. The dataset obtained from the balance of site investigation suggest PFAS is not a risk to potential receptors, however, PFAS concentrations observed cannot be considered reflective of soil conditions across the closed landfill and therefore cannot be precluded.
Off-site ecological receptors located down-hydraulic gradient.	Potentially complete – other CoPC All analytes (metals, sulfides, hydrocarbons, phenols, pesticides) excluding asbestos investigated by PB (2006) were reported to be below the relevant adopted criteria in soils and exceedances in groundwater were limited to metals, nutrients, pH and sulfide which are likely to be reflective of local conditions and not a direct result of contamination. Guidelines have changed since the 2006 investigation and the dataset is considered insufficient to preclude these analytes as CoPC.			
Source: Balance site – former quarry/industrial site use				
Soil contamination - Asbestos - Metals - Sulfides - Hydrocarbons - Phenols - Pesticides - Nutrients - Ammonia - PFAS	Wind erosion and dispersion due to soil fugitive dust emissions. ➤ Direct/secondary contact and/or uptake by receptors.	Future workers, residents or users of the site.	Potentially complete – PFAS The soil assessment identified three test pits containing PFAS concentrations, presumed to be a result of PFAS-containing firefighting foams, however all samples were compliant with the adopted human health and ecological criteria for the proposed land uses (i.e., residential and commercial/industrial).	
		Off-site residents and sensitive receptors.	Potentially complete – other CoPC Based on the balance site investigation completed by Thuroona (as per Section 9), asbestos in soil, metals, sulfide, hydrocarbons, phenols and pesticides were below the adopted assessment criteria and are unlikely to pose an unacceptable risk to human health within the defined area on Figure F, however given the limited dataset will require validation. This does not include the PAOC's that have been identified that overlay this area, and these PAOC will require assessment and validation.	
		Onsite ecological receptors.		
		Off-site ecological receptors.	Minor ACM fragments were identified on the surface between TP15 and TP17 and is expected to be sporadic and a result of former site use associated with the existing infrastructure. It is recommended that an emu pick is completed prior to commencement of works to remove any potentially remaining fragments from the surface within the balance of site.	
		Ground gas Hydrocarbon vapour		

CoPC	Plausible exposure pathways	Plausible receptors	Status of emission exposure pathway
Methane	Vapour intrusion due to hydrocarbon impacted soils or land gas due to putrescible waste. ➤ Direct contact/uptake via inhalation by receptors.	Future workers, residents or users of the site.	Potentially complete – Vapour intrusion Based on the balance site investigation completed by Thuroona, the analyte concentrations do not exceed the adopted human health criteria and are not likely to be a risk to human health, however due to the limited number of samples, this will need validation during remediation. Potentially complete – Landfill gas There is no evidence to suggest that landfill gas has impacted the balance of the site, however no ground gas investigations have been completed within the balance of site prior to or as part of this investigation and therefore cannot be precluded.
	Leaching into groundwater. ➤ Secondary contact via groundwater or surface water expression.	Off-site residents or recreational users. Off-site ecological receptors located down-hydraulic gradient.	Likely incomplete – other CoPC Based on the leachate analysis completed, a limited number of metals (chromium III and copper) exceeded the Freshwater 95% or 90% species protection criteria, with total nitrogen and total phosphorus concentrations above the irrigation (long term) criteria. All other analytes were compliant with the guidelines, and it is noted that no human health criteria were exceeded. Statistical analysis was completed and the UCL95 concentration for total nitrogen (2,177 µg/L) was below the long term irrigation value (5,000 µg/L), while the total phosphorus UCL95 value (82 µg/L) was above the long term irrigation value (50 µg/L). It is further noted that total nitrogen concentrations were reported higher in groundwater, and total phosphorus consistent with concentrations in groundwater, reflective of regional conditions. The metals concentrations in the leachate analysis were generally consistent with the concentrations reported in groundwater, however TP27 tended to be higher. This test pit is in close proximity (up-gradient) to MW04, which reports concentrations compliant with adopted ecological and human health assessment criteria. This suggests that CoPC are likely attenuating through mixing processes within the aquifer (dilution, dispersion, advection) as well as chemical and biological processes (e.g., denitrification). Based on the above, these CoPC are unlikely to pose an unreasonable risk to the identified receptors. Validation assessment of soils during remediation will be able to support these findings.

Source: All former site uses (per above)

Groundwater contamination - Petroleum hydrocarbons - Monocyclic Aromatic Hydrocarbons (MAH) - Phenolics - Metals - Nutrients - Pesticides - PFAS	Unsaturated zone infiltration, followed by saturated zone transport and direct and secondary contact following off-site abstraction. ➤ Direct/secondary contact and/or uptake by receptors.	Onsite and off-site residents or workers – non-potable beneficial use and/or irrigation	Incomplete The identified CoPC consists of metals, nutrients and pH, and potentially sulphide. These CoPC are considered reflective of natural, regional conditions and not a risk to human receptors. Furthermore, all analytes were compliant with the relevant human health guideline criteria, with the exception of iron which is considered from an aesthetic perspective and is not a risk to human health. The nearest abstraction bore is located 400 m down-hydraulic gradient (from the eastern edge of the site). Based on the hydraulic conductivity identified by MDWES (2013), it may take between 3.5 to 117 years (depending on soil matrix) for groundwater from the site to reach the abstraction bore. Additionally, concentrations of CoPC in the groundwater are likely to attenuate prior to abstraction, through mixing processes in the aquifer (dilution, dispersion, advection) as well as chemical and biological processes (e.g., denitrification).
	Unsaturated zone infiltration, followed by saturated zone transport and discharge to wetlands. ➤ Direct/secondary contact and/or uptake by receptors.	Off-site residents or recreational users. Off-site ecological receptors located down-hydraulic gradient.	Likely incomplete The identified CoPC consists of metals, nutrients and pH, and potentially sulfide. Metals, nutrients and pH are considered reflective of natural, regional conditions and therefore not a risk to local ecological receptors. CSIRO (Dillon et al 2009) indicates that adverse effects are unlikely to be caused to groundwater-dependent vegetation by elevated nutrients and metals in groundwater. PFAS (PFOS only) exceeded the Freshwater 99% species protection for high conservation systems, however, was compliant with 95% and 90% species protection. The site and down-gradient of the site are considered highly disturbed systems, consistent with the 90% species protection criteria, and therefore are not considered to pose a risk to off-site ecological receptors. It is noted that up-gradient concentrations of PFOS are typically higher than down-gradient concentrations, supporting the presence of PFAS within the local water table, which infers that the site is not contributing PFAS to groundwater. Consideration must be given to the mixing processes within the aquifer (dilution, dispersion, advection) whereby concentrations of CoPC are likely to attenuate, which will additionally reduce any potential impacts to down-hydraulic gradient surface water outputs. Down-hydraulic gradient wetlands are located 1.6 km away from the site. Based on the hydraulic conductivity as identified by MDWES (2013), it may take between 13 and 470 years (depending on soil matrix) to reach the wetland and is therefore considered highly unlikely to be impacted by the site.